The History of Anaesthesia Society Proceedings

Vol 45

25th Anniversary

Contents of Volume 45

Papers, Posters and Abstracts from the Wokingham Meeting

We regret to report the death of the following members:

Dr D Shephard, Dr G White and some years ago Prof RI Bodman.

There may be others the Officers and Council do not know about; please let us know.

HISTORY OF ANAESTHESIA SOCIETY

2012 25th Anniversary Meeting at Wokingham, 29-30th June

Organiser: Dr Neil Adams

The organiser is very grateful to Dr Edward Young and his wife Sally for all their work as local contacts, to Dr Peter Featherstone for his help with the programme and website and finally to Dr Jean Horton for delivering an excellent Blessed Chloroform Lecture under such difficult circumstances.

He also expresses his personal thanks to Sue and Jonathan for their organisational and technical input.

The meeting was a celebration of the Society's 25th Anniversary; delayed by the Simpson Bicentenary in 2011.

The organiser took up the challenge after the sad death of Dr Marshall Barr a few weeks beforehand. Marsh was one of the organisers of the first meeting in Reading in 1986. A tribute follows herein.

Proceedings of the History of Anaesthesia Society

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HISTORY OF ANAESTHESIA SOCIETY

Council and Officers - July 2012

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For more information visit the website:
www.histansoc.org.uk

EDITORIAL

I've always thought that writing an editorial is the worst part of the editor's job but it pales into insignificance beside the trials and tribulations our Past President Neil Adams has endured organising the meeting to which this issue of the Proceedings is devoted. Not only did he take over running the meeting because of the sad demise of Marshall Barr but he then had to recruit a new Blessed Chloroform Lecturer. Combined with the intransigence and incompetence of the venue owners, it must have relieved him of some cranial hair but not, I hope, of his expectation of life. All this was on top of illness in his family.

My previous experience of editing also is rather insignificant compared with this post. I salute Alistair for his stalwart work over the last six years. To hold down a full time consultant post with a growing family is hard work but also to edit two volumes a year of the Society's Proceedings is heroic. The Society as a whole must be eternally grateful for his dedicated and painstaking work.

You will see in this copy of the Proceedings that sadly I have not been able to obtain full copy of two papers. Because of this I'm forced to publish only the abstracts despite many ignored messages to the authors. Other abstracts are published because the authors are presenting their papers at the 8th International Symposium on the History of Anaesthesia in Sydney, 22 - 25th January 2013

There is an excellent review of a Dutch authored book comparing the development of anaesthesia in the UK and Germany which I urge you to read and then perhaps buy the book to see if you agree with the reviewer.

You will find two 'page fillers' in this Volume. One corrects an error I made in 2006 at Malvern, the other a question using illustrations. I look forward to correspondence on these. I welcome letters from members.

FUTURE EVENTS

2013 5-6th July HAS Summer Meeting at Castle Green Hotel, Castle Green Lane, Kendal, LA9 6RG.
Contact: Dr Anne Florence (gasflo@btinternet.com)

The John Snow Society, as some of you will know, are holding a 2 day meeting on 15 & 16th March 2013 to commemorate the bicentenary of Snow's birth. There is absolutely no mention of Snow's anaesthetic achievements in the programme, nor in another similar, epidemiological meeting a month later.

As an editorial aside members may be interested to know that 2013 will be the centenary of Harry Brearley 'discovering' stainless steel in Sheffield.

WOKINGHAM MEETING

Dr Adrian Padfield

Dr Aileen Adams

Dr Anne Florence

Dr Atul Kapila

Dr Benjamin Fox

Dr Chris Kubitzek

Dr David Zuck

Dr Fabrizio Casale

Dr Hanna Pittman

Dr Peter Featherstone

Dr Neil Adams
For Dr Alistair McKenzie

Dr Poppy Aldam

Dr Richard Haddon

Dr Jean Horton

Dr Tim Smith

Dr John Sill

Professor Alan Dronsfield

Dr Pradeep Ingle

Dr Jo Wheble

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Dr. Tod Young	Altrincham
Dr. Eddie Young	Reading
Dr. David Zuck	London

Marshall Barr 1934-2012
Citation for the
History of Anaesthesia Society

It is such a privilege to be asked to speak to you about Marshall Barr. We are honoured to have his wife Mary, daughter Felicity and son James with us here today. The occasion must be so difficult for them but hopefully it will be of some comfort for them to sense the deep esteem in which Marshall is held by members of the Society. We all remember him in our own way but so many people's lives were touched and made better by him. This is because he had the remarkable ability to bring out the very best in others.

In an obituary she wrote of her father, his daughter Felicity summed him up superbly as "a gregarious Australian doctor with the manners and attitude of an English gentleman". Marshall spent the first half of his life in Australia and he never lost the 'can do' Australian attitude nor the Australian spirit of egalitarianism. He could converse with the highest in the land (quite literally, and had met the Queen on several occasions) but was equally happy speaking with those in less exalted positions. When the lady who cleans the Old Library at the Royal Berkshire Hospital was told of Marshall's death she said, with tears in her eyes "He was such a gentleman, and he always spoke to me". It just wouldn't occur to Marshall not to speak to her.

Some of you will have read Marshall's superb book about his time in Vietnam: *Surgery, Sand and Saigon Tea*. In it he describes his early life growing up in Brisbane during the Second World War when the threat of Japanese invasion was very real. He remembers with glee spotting one Japanese reconnaissance aircraft, though (slightly to his disappointment) Brisbane was never bombed unlike cities such as Darwin. But the young Marshall became an expert in aircraft recognition and he developed a life-long fascination with aircraft. Sadly he could not become a pilot himself because of poor vision in one eye. Marshall's father was a GP and Marshall himself went on to qualify in medicine from the University of Adelaide. He initially went into general practice with his father but to his father's disappointment and to the untold benefit of the rest of us he took up anaesthetics. He underwent his anaesthetic training in Perth, Western Australia.

In 1967 he volunteered for service in Vietnam with the Australian Medical Services. Both the horrors of war and the intense camaraderie are powerfully described in his book. With the rank of Temporary Major he served there for 18 months. He was in charge of all anaesthetic and resuscitation services and was there during the Tet offensive of February 1968. His experiences there had a profound effect on him which would last the rest of his life.

He left the army in 1968 and travelled to the UK to take up a temporary senior registrar post in anaesthetics at Barts. Here he met and formed a life-long friendship with Tom Boulton. He also met and formed a life-long friendship with a young neuro-theatre sister called Mary Snell. In the postscript to his book on Vietnam he describes her very touchingly as his English rose. They were married within the year and Marshall went on take up various locum consultant posts in the UK before returning to Australia to become Head of the Department of Anaesthetics at the Sir Charles Gairdner Hospital, in Perth.

Daughter Felicity was born during this time but after three years the Barrs made the momentous decision to return to the UK. There were many reasons behind the decision but particularly important to Marshall was the way the National Health Service and anaesthesia in the UK were organised and his enormous regard for people such as Tom Boulton. Tom Boulton had by this time moved from Barts to Reading and Marshall was absolutely delighted to be appointed to the consultant staff in Reading in 1973. Eddie Young was also a consultant there at the time. Marshall was a consultant in Reading until his retirement in 1994.

My own friendship with Marshall began at this stage. I was a registrar in Reading when Marshall was appointed and taking the final fellowship exams. I well remember Marshall correcting my feeble attempts at mock exam essays. Marshall's command of the English language and English grammar were always superb and my essays would be returned covered in corrections in red ink. I remember in particular one essay where I had used the word 'etc' about three times. 'Sloppy thinking' said Marshall 'it means nothing, if you want to say something give examples'. Quite right too, to this day I have never used the word 'etc' again. I even asked Marshall to look at the draft of the paper I had written on Yankauer which I presented this afternoon to the Society. His excellent suggestions managed to transform it into something I hope was reasonably acceptable.

Marshall was a superb clinical anaesthetist and gifted teacher. He became Departmental Clinical Tutor and subsequently Deputy Regional Advisor in Anaesthesia (Oxford Region) 1981-1987 then full Regional Advisor 1987-1992. He was at the forefront of important organisational changes in the training of registrars and senior registrars and particularly supported and encouraged those in the Married Women's Training Scheme. At regional level he was also Chairman of the Regional Specialty Training Committee and Chairman of the Regional Intensive Care Committee. At local level he was the first Consultant Representative on the Royal Berkshire Hospital Unit Management Group 1983-1985. He conducted the early relationship between the local consultants and the new system of hospital management with great sensitivity.

Marshall was also an accomplished bibliophile. From 1976 to the time of his death he was Honorary Librarian to the Reading Pathological Society (the local medical society for Hospital Consultants and GPs) and was Curator of the Royal Berkshire Hospital archives. He was President of the Reading Pathological Society for its 150th Anniversary year in 1991. From 1976 to 1983 he was Chairman of the West Berkshire Medical Libraries Committee and from 1991-1994 Member of the Oxford Medical Libraries Committee.

Another great passion was medical history. He was Foundation Council Member of the History of Anaesthesia Society and editor of its Proceedings from 1993-2001. At national level he was Council Member, Section of Anaesthetics, Royal Society of Medicine from 1991-1994. During the 1970s and 1980s he undertook book reviews for Anaesthesia and the British Medical Journal and was also referee for the British Medical Journal.

He was co-author with Margaret Railton of important books on the history of both Battle Hospital and the Royal Berkshire Hospital. He undertook research on Douglas Bader and his connection with the Royal Berkshire Hospital [where Bader's legs were amputated and his life saved after his disastrous flying accident in 1931]. Marshall visited Bader before the latter's death in 1982. He was the perfect interviewer, with his own knowledge of flying and medical history.

Marshall's work for charity was prodigious. He was founder of the Royal Berkshire Hospital's 150th Anniversary Appeal which in 1989 raised £1.5m to refurbish the hospital's Radiotherapy Department.

In recent years Marshall's huge achievement has been in establishing the medical museum here in Reading. He was the driving force behind the venture. Over the years he set up our Trustees and Management Committees, conducted very skilful negotiations over our premises and led our efforts to secure Heritage lottery funding. During this time it has an absolute privilege to have worked with him and to have experienced at first hand his enormous knowledge of medical history, his wonderful sense of fun and his constant encouragement.

Marshall was bitterly disappointed that he was unable to give The Blessed Chloroform lecture to the Society but was absolutely delighted that Jean Horton had so kindly agreed to give it in his place.

Marshall's life was full and wonderfully fulfilled and one we can truly celebrate. I wholeheartedly commend him to The Society. We shall all miss him dreadfully but it is a deep and lasting honour to have known him, to have worked with him and to have been his friend.

Tim Smith, June 2012

THAT WAS THE YEAR THAT WAS: THE UK IN 1986

Dr Poppy Aldam,

CT2 West Suffolk Hospital ST3 Addenbrooke's (Anaesthesia).

The History of Anaesthesia society was founded in 1986 - its aim to promote the study of the history of anaesthesia. The inaugural meeting was held on June 7th 1986 at the Royal Berkshire hospital.

Twenty five years later, the practice of anaesthesia has been fundamentally changed, with equipment and practices that would have been previously inconceivable. We now have routine monitoring and equipment that could have starred in a 1980s science fiction film. As remarkable as these changes may seem, they are no more marked than advances in technology, changes in the socio-economic climate and national statistics that have occurred over the last twenty five years.

The UK in 1986

In 1986 the United Kingdom had a population of 56.6 million and its conservative government led by Margaret Thatcher was struggling with issues of tax rises and rising unemployment. In many ways this may seem a striking parallel to the current situation being borne by the coalition government headed today by David Cameron. However, the unemployment rate in 1986 was 14.4% (equating to 3,204,900 people out of work) - a post war high for the United Kingdom. By comparison in April 2012 the UK population was recorded at over 62.6 million and the unemployment rate was 8.4% - the equivalent of 2.62 million. While the 1986 taxpayer was concerned about a Poll Tax, the 2012 tax payer has to contend with rises in VAT and fuel tax.

The average income for someone in full time employment in 1986 was just over £9,500 and the average UK house price was £36,200. To buy a new Ford Escort you would expect to pay in the region of £7,000. Once you'd brought your car, petrol cost 38p per litre. For a 30 year old man, a year's fully comprehensive insurance for a Ford Fiesta cost £123 - and had gone up by over £25 within the last year. Today, a similar policy could cost well in excess of £400. The M25 motorway was completed in October 1986 at a total cost of £631 million, and this did not account for the cost of land purchase. The M25 was instantly a popular road - within 3 weeks of being fully open, traffic levels were already exceeding the maximum designed capacity. By December 1986 a road designed for 88,000 vehicles per day, was carrying in excess of 200,000 - 15% of all UK motorway traffic at any one time was estimated as being on the M25. In 2012, 16 weeks work

merely strengthening the Hammersmith flyover in West London was rumored (by national newspapers) to have cost in excess of £100 million.

In shops in 1986, milk cost 17p per pint, bread was 33p per loaf, and beer was 35p per pint. A first class stamp with the Royal Mail cost 19p in 1986 - the same stamp today has risen by 317%; to 60p. IBM revealed the PC convertible - the first laptop computer - but it failed to be an instant commercial hit. This despite its 8088 processor capable of booting up in 5 minutes, 256KB RAM and dual 720KB dual 3.5" floppy disc drives. Weighing in at 6Kg, there was no room for a hard disc drive. A shame as Windows had been launched the previous November. Today's laptops boast 3.2GHz CPU, 8GB RAM and 1Terabyte hard discs; all weighing around 3Kg.

On Pop radio we were listening to Wham, The Petshop Boys and Police. The bestselling album in 1986 was 'Brothers in Arms' by Dire Straits. At the cinema, 'Top Gun' was the film of the year and Paul Newman won an Oscar for Best Actor in 'The Color of Money'. Sony's CR-ROM was out-selling all expectations, but their share of the videocassette market continued to decline as Betamax was passed over by consumers in favour of the Hitachi VHS system. On television over 20 million people tuned in to see England knocked out in the World Cup quarter finals 2-1 against Argentina - Diego Maradona and the 'hand of god' incident. The record for a football transfer fee was set - Juventus paid Liverpool football club a record £3.2 million for Ian Rush. In June 2012 Eden Hazard joined Chelsea from Lille for £32million, and earned around £170,000 per week.

The world in 1986

Events that changed the world in 1986 included the Challenger disaster with the death of seven United States astronauts when the space shuttle exploded 73 seconds after take-off from Florida. It was estimated the disaster was witnessed live on television by over 100 million people worldwide. In the same year, the Soviet Union successfully launched the Mir space station which orbited the earth until 2001. The United Kingdom and France announced plans to construct the Channel Tunnel; it was opened in 1994 and forged the first land link of the British Isles to the European mainland since the last ice age. Political unrest in Northern Ireland was at its height in the late 1980s with the Remembrance Day bombing in Enniskillen by the provisional IRA which killed 12 and injured 63. The success of the Northern Ireland peace plan can be no more apparent than that on 26th June 2012 during her visit to Belfast the Queen shook hands with the deputy first minister of Northern Ireland Martin McGuinness - a former Provisional IRA commander.

In Hospital in 1986

In 1986 there were 1.4 doctors per thousand of the population overseeing 7.4 beds per thousand heads. The introduction of the European Working Time Directive was decades away (passed in 2003) and for houseman and registrars 100 hour working weeks were common. By 2011 there were 2.2 doctors overseeing 4.2 hospital beds per thousand of the population and the NHS was fully compliant with the 48 hour working week.

In 1986 birth rate was 13.3 per 1000 women (11.9 per 1000 in 2011) and the average age at first childbirth was 23.7 years old (29.1 years old in 2010). The life expectancy for a male baby born in 1986 was 71.4 years, and 76.1 years for females. Twenty five years later, a male baby born in 2011 could expect to live to 78.4 years, and a female baby to 82.4 years. There were 2,511 centenarians in 1986 - by 2011 there were 12,640. 49% of all deaths in the mid-1980s were due to cardiovascular disease; coronary heart disease accounted for 26% and strokes 12%. By 2010, cardiovascular disease was responsible for 32% of deaths, with coronary heart disease now causing 14% and strokes 9% of deaths. Cancer accounted for 22% of deaths in 1986; twenty five years later it caused 37%.

In the news on June 7th 1986

As delegates travelled to the inaugural History of Anaesthesia meeting on June 7th 1986, newspaper headlines carried stories such as: 'Printers reject offer and vow to fight on' which detailed newsprint workers' rejection of a pay offer, and a difficult in-house struggle at Rupert Murdoch's News International. Headlines also detailed 'Chaos in Haiti' in its post-revolution state. The financial pages forecast a cut in mortgage rates but bemoaned the ongoing rise in insurance rates for cars. The newspapers went on to detail the departure of the '90 degrees south' expedition - an Anglo-Norwegian polar expedition setting out to follow the route set by Roald Amundsen during the historic 1911 race to the pole.

The sports pages detailed the new transfer record set by the transfer of Ian Rush from Liverpool to Juventus. Also in the sports news on June 7th, the group matches were underway for the 1986 World Cup in Mexico - the newspapers bemoaned Scotland's poor form as they lost to Denmark and sank to the bottom of Group D. In the cricket news, the second Cornhill test was underway with England's batsman collapsing to 294 all out having been 245 for 5 at the start of the day's play. The Times sports reporter commented 'perhaps the most interesting moment of a dull day was the appearance of a young lady streaker'.

Conclusion

There has been substantial change in the last twenty five years. The socioeconomic climate and the healthcare environment have changed in ways that would never have been anticipated. A review of the world news paints a striking picture - events that seem in recent memory in some ways seem a world away in others. Although it is easy to see the degree to which the world has changed, it is interesting to draw the similarities that exist. It seems that taxes will rise, technology will advance and the performance of some of England's sporting teams will disappoint.....

Sources: Statistics and data thanks to the Office of National Statistics, British Heart Foundation, UK census results. Newspaper headlines and stories taken from 'The Times'; June 7th 1986.

CHANGES IN ANAESTHESIA: 1986-2011

Dr. Hanna Pittman,

CT2 West Suffolk Hospital ST3 Addenbrooke's (Anaesthesia).

The last 25 years have seen widespread changes in the organisation, training and practice of Anaesthesia. Our professional bodies have grown and gained independence, we have seen the development of a formal national review process, and pharmacological and technical advancements which have influenced the further development and practice of anaesthesia.

The Association of Anaesthetists of Great Britain & Ireland (AAGBI)

Founded in 1932 by H.W. Featherstone and colleagues[1], in its early years it was involved in the development of the Diploma of Anaesthetics (1934), the Faculty of Anaesthetists of the Royal College of Surgeons of England (1947) and in Ireland (1959) and the negotiation of Consultant status in the NHS (1948). Initially, council meetings were held within the rooms of a prominent member (those of the President from 1938 to 1941). Later they moved to rooms within the Royal Society of Medicine (1941-1944), the Royal College of Surgeons (1944-1973), and then a suite of offices within the British Medical Association (1973-1985). It was only in 1985 that the Association first gained independent premises, at 9 Bedford Square. In 2002, the Association moved to 21 Portland Place, allowing it to expand and run larger seminars as well as providing better facilities for its members.[1] In 2002 the Anaesthesia Heritage Centre was opened, which houses a museum and the Association's archives and a rare book collection, providing valuable resources for research into the history of anaesthesia.[1] Today, the AAGBI supports 16 allied specialist societies.[1] Over the past ten years the Association has provided these societies with increasing practical & administrative support in the form of a full-time coordinator (2003) and the development of an event organising service (2004).[1]

The AAGBI's main aims are to represent and support anaesthetists medically and politically, whilst promoting improvements and advancements in clinical practice to optimise patient safety.[1]

The Royal College of Anaesthetists

The origins of the Royal College lie in the Faculty of Anaesthetists, formed within the Royal College of Surgeons in 1947 (under the guidance of Dr Archibald Marston, then President of the AAGBI).[2] The Faculty was developed to improve training, promote recognition of Anaesthesia as an independent speciality and upgrade the Diploma to a Fellowship.[2] During the 1970s there was increasing pressure for the Faculty to form an independent College as other Faculties had done, however it was only in

1988 that it became the Royal College of Anaesthetists within the Royal College of Surgeons, `a College within a college'. Full autonomy was gained in 1992, when the College moved to independent premises in Russell Square and was granted its Royal Charter. In 2006 the college moved to a new home, Churchill House, 35 Red Lion Square, to provide increased office space and to allow for the development of an Institute of Education. The College thus was enabled to cater for larger events and examinations. In 2009 the College purchased 34 Red Lion Square to permit ongoing development and expansion of its facilities. The Royal College of Anaesthetists is principally involved with the setting of clinical standards of care, the organisation and assessment of trainees undergoing examinations and provision of continued education.[2] The last 35 years have seen the increasing expansion and development of a more formal structured review process, leading to the generation of the National Confidential Enquiry into Peri-Operative Deaths (NCEPOD). The principal precursor to the development of NCEPOD was a confidential, anonymous study of mortality associated with anaesthesia carried out by Lunn and Mushin in 1982.[3] It looked at inpatients from five regions of Britain and aimed to provide a comparative index of results, from which regional variations could be identified and a contemporary standard of care established. Collaboration between surgical and anaesthetic specialities was not achieved for this study and this led to the foundation of the Confidential Enquiry into Peri-operative Deaths (CEPOD), set up in 1982. A joint review of practice, carried out over one year in three regions provided the index cases for further reviews and the establishment of NCEPOD in 1988. In its founding years NCEPOD's reviews concentrated on peri-operative mortality. However, over the past 20 years its reviews have covered a much wider range of clinical interventions to include invasive procedures, acute medical care and specific disease management. NCEPOD makes recommendations for future care based on the reviews carried out, ultimately to improve patient safety and clinical practice.[3]

New Agents and Drugs

Many have gained favour since the mid-1980s including: propofol; the volatile agents: sevoflurane and desflurane; non-depolarising muscle relaxants: rocuronium and the reversal agent, suggamadex. The anaesthetic properties of propofol were first noted in experiments in mice (1973), as part of testing of a large number of compounds (alkylphenols) for their anaesthetic properties, by the British company, ICI.[4] Much of the thirteen years of pre-clinical development was required to find an acceptable alternative to cremophor, the solubility agent used in althesin and

propanidid, which was thought to be responsible for anaphalactoid reactions encountered. In 1983, clinical trials confirmed that propofol's desirable properties were maintained in the new lipid emulsion. Approval for clinical use in adults was gained in 1986.

The majority of the volatile agents used today were discovered in the 1960s, during a drive to produce an agent to rival the gold standard agent, halothane. Research work carried out by Ohio Medical Products, led to the discovery and testing of hundreds of potential agents, including enflurane, isoflurane, sevoflurane and desflurane.[5,7] Early work highlighted isoflurane as the most suitable agent for commercial development.[6] Further testing and development of sevoflurane was initially delayed due to concerns about its stability with soda lime and possible toxic effects.[5] Similarly, clinical development of desflurane was hindered by problems with storage and delivery. Both products were finally licensed for use in the 1990s.

In the late 1980s, experimental work established that the speed of onset of the aminosteroid non-depolarising muscle relaxants was related to their potency, with less potent drugs having a faster speed of onset.[7] Using vecuronium as the starting point, substitutions were made (on the single quaternary group) to produce a drug with the desired properties. Rocuronium was discovered and it was licensed for clinical use in 1995.[8] It became more useful with the subsequent development of suggamadex, a cyclodextran. Cyclodextrans are molecules which have the ability to encapsulate lipophilic molecules, increasing their water solubility.[9]

They were therefore investigated as potential solubility agents, being additionally desirable for their relative lack of pharmacodynamic properties. In the early 2000s work was done with cyclodextrans to try and improve on the acidic solution in which rocuronium is prepared. Trials resulted in the identification of a cyclodextran with close physical compatibility for rocuronium. Surprisingly, the complex produced was found to be one of the most stable complexes discovered and with this discovery the focus of research changed. The cyclodextran was shown to remain in the plasma compartment after administration, where it would encapsulate rocuronium molecules, creating a concentration gradient. Rocuronium molecules at the neuromuscular junction would diffuse down its concentration gradient into the plasma, where they too would be quickly encapsulated. In this way removal of rocuronium from the neuromuscular junction and rapid encapsulation by suggamadex produced quick, specific reversal of neuromuscular blockade. Phase 1 clinical trials were carried out in 2005 and suggamadex was licensed for clinical use in 2008.

In contrast, drugs which have lost favour include: intravenous induction agents; methohexitone, althesin and propanidid and the neuromuscular blocking agents; curare, alcuronium and gallamine. When compared with propofol, the pharmacodynamic effects of methohexitone are less favourable. Induction with methohexitone has been shown to be associated with more excitatory phenomenon (therefore less smooth induction) and increased cardiac oxygen demand (with an increased heart rate).[10] Comparatively, propofol has been shown to have a more favourable wake up: more clearheaded and with less excitatory movements.[11] Althesin, a steroid induction agent and propanidid, a eugenol derivative were withdrawn from clinical use due to the high incidence of hypersensitivity reactions, attributed in part to the solvent cremophor. Additionally, both drugs compare less favourably to thiopentone. Althesin was shown to induce more involuntary movements and hiccup with a prolonged wake up following deep sedation.[12] Propanidid induced a greater degree of cardiovascular changes (hypotension & tachycardia), with more post-operative nausea, vomiting and headache.[13] The non-depolarising neuromuscular blocking drugs: alcuronium, curare and gallamine, have gone out of favour with the discovery of agents with a more rapid onset and shorter duration of action: atracurium and rocuronium. These newer drugs have a more predictable duration of action and reduced cardiovascular side effects.[7]

Monitoring

The 1980s saw the development and expansion of the clinical application of monitoring systems, which have now become a standard of care. The first capnograph was developed by K. F. Luft in 1943.[14] This was developed based on the principle of the absorption of light by air (Lamert & Beer, 1760 & 1852 respectively), and work by Luft in the 1930s and 1940s, which showed that CO_2 is a gas that absorbs infra-red radiation. War time component shortages delayed further development and production.[15] The early monitors, that became available between 1950 and 1980, were bulky and expensive and their use was limited to the investigation of the pathophysiology of disease. Clinical use within anaesthetic practice did not become widespread until the 1980s. The development of mass spectrometry created a method for measuring volatile agent concentration on a breath by breath basis. Mass spectrometers were capable of analysing up to 31 operating theatres at once. However, any technical problems at the central processor would therefore lead to a large functional loss. Stand alone mass spectrometers were too costly to provide a practical solution. So in the 1990s there was considerable competition to produce a more affordable, side stream gas monitoring system.[16]

Technologies explored at this time included: infrared spectrometry, Raman spectrometry, and piezoelectric crystal agent analysis. There was a drive to produce a technology which would also allow agent identification. The infrared photospectrometer emerged as a commercial and technical success due to its relative low cost and successful gas analysis and identification. The widespread clinical use of these monitoring systems led to the re-emergence of circle breathing circuits and safe use of more economical low flow anaesthesia. However, this has also led to dependence on monitors to ensure the safe delivery of anaesthesia.

The routine use of pulse oximetry within hospitals was also established in the 1980s. The basis for its production was in work done in the 1970s by Takuo Aoyagi, a Japanese physiological bioengineer. He was looking into ways to measure cardiac output using the transmission of light through tissue. He noted that the transmitted signal exhibited pulsatile variations making analysis difficult. Aoyagi developed a method to remove the pulsatile component by subtracting the signal at two different wavelengths, however noted that the resultant signal was 'saturation dependent'.[17] In 1974 the first prototype pulse oximeter (an ear probe) was created and in 1977, the first fingertip probe with fibre optic cables was produced. At the time few foresaw its value and its potentially extensive clinical applications, and therefore its early use was limited to aiding pulmonary function testing. The recognition, development and marketing of a less bulky, more convenient oximeter is credited to the American anesthesiologist, William New (Stanford, 1978). He recognised its potential in monitoring sedated or unconscious patients either in theatres or other hospital settings.[17] Widespread use in Europe developed in the 1980s and by the 1990s it had become an indispensable component of acute care and safe provision of sedation and anaesthesia.

Summary

The last 25 years has seen wide ranging changes within the professional bodies and the clinical practice of anaesthesia. The AAGBI and the Royal College of Anaesthetists gained full autonomy and independent premises and expanded the range of services which they could offer. NCEPOD was set up, creating a more formal national review process which aims to improve patient safety by looking at current practice and areas of clinical concern. The advent of shorter acting, better tolerated drugs has contributed to the evolution of day surgery and improved post-operative recovery, whilst, the increasing development and use of monitoring equipment has supported the re-emergence of circle systems and safe use of low flow anaesthesia. New technologies and discoveries continue to shape the future path of our profession, whilst our clinical skills provide the support we need to safely utilise these new developments.

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TRANSFORMATION OF ANAESTHETIC TRAINING DURING THE LIFE OF HAS

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In 1986, training in anaesthesia relied upon a flexible apprenticeship supplemented by examinations organised by the Faculty of Anaesthetists of the Royal College of Surgeons of England (FFARCS). After medical school, a candidate would apply to hospitals for specific jobs and progress through several years of training, initially working as a PRHO, then SHO, subsequently junior then senior Registrar before becoming a consultant. Initially a trainee would complete the Diploma of Anaesthesia during their SHO years before progressing to the FFARCS (later FRCA) during their Registrar training. The average working week was commonly 80 to 100 hours long, ensuring a wide range of clinical experience and a huge opportunity to gain practical skills.

Calman

The first major changes occurred in the wake of the publication of 'Hospital Doctors: Training for the Future', or the Calman Report[1], by the then Chief Medical Officer. He suggested that the training grades should be altered by the combination of the Registrar and Senior Registrar grades and the grade restructured so that training should not last more than 7 years. He proposed that this should be supported by the introduction of curricula for specialist training and that completion should be marked by a Certificate of Completion of Specialist Training (CCST); thereby bringing the UK into line with the rest of the European Union (EU). He also proposed a significant increase in the number of consultants and a change from a consultant led to a consultant provided service.

The 'Calman Report' led to the introduction from 1996 of the Specialist Registrar post consisting of, at most, seven years of training with an explicit curriculum and regular assessment of progress. The CCST was also introduced.

European Working Time Directive

The introduction of the European Working Time Directive (EWTD) led to significant reduction in working hours for doctors. The legislation came into force in the UK on 1st October 1998 and immediately applied to the majority of NHS employees with the exception of junior doctors. A phased implementation meant that junior doctors' hours were limited to 58 from 2004 and full compliance with a 48 hour working week wasn't achieved until 2009. To compensate for the reduced hours, there has been a significant increase in trainee numbers and an increased proportion of time

spent providing emergency and out of hours care. Whilst this has supported the traditional ways of working, it was noted in the 2010 'Temple Report'[2] on the impact of the EWTD, that this had led to a dilution of the quantity and quality of training opportunities, which has yet to be fully addressed.

New Deal

In 2000, a new contract for junior doctors was agreed between the BMA and the government. This outlined the requirements for working hours, working conditions and standards of living. This 'New Deal' created new pay bands, which linked pay to total number of hours cross referenced against the percentage of antisocial hours. It also stipulated rest requirements for junior doctors. The NHS became compliant with the 'New Deal' in 2003.

Modernising Medical Careers

The process of 'Modernising Medical Careers' (MMC) was initiated in 2002 with the publication of 'Unfinished business' by Sir Liam Donaldson, the Chief Medical Officer. The process continued until completion in 2007. MMC envisaged a swifter and clearer progression through training from newly qualified graduate to consultant. All traditional training grades were abolished and replaced with a 2 year of Foundation Training and 7 years of Specialty Training (or 'run-through training'). The new structure meant trainees selected their future specialties just over a year after qualifying.

To support appointments to this scheme, the 'Medical Training Application Service' was created, which changed from a CV led applications to free text box questions (reducing scoring for CV, and thereby previous experience, to 25%). Interviews were also altered to a formulaic approach, with standard questions and rigid mark schemes; the candidates' CVs and application forms were not to be considered when scoring interview performance.

Tooke

In response[4] to what he labelled as "a deeply damaging episode for British Medicine", Professor Sir John Tooke led an independent inquiry into MMC. The inquiry felt that whilst "the initial education principles underlying the initiative endure in the opinions of many clinicians, the emerging reality is characterised by inflexibility and concerns regarding the preparedness of someone certified as trained under the new system for consultant role". Furthermore, "the stability and certainty of 'run-through' training, a concept that emerged without clear consultant, is in the minds of most trainees more than offset by the lack of a broad base of clinical experience and premature

selection of a narrow field of endeavour". He also highlighted many other problems both with the theoretical underpinnings and the practical introduction of the MMC reforms.[5]

The Report's suggestions led to the almost universal breakup of 'run-through' training into Core and Specialty training, merging of GMC with PMETB and the creation of Medical Education England.

Conclusion

In August 2012, a newly graduated doctor, complete with a student debt of £30,000, will apply for a two year Foundation Training Programme via an anonymised national application process, open to all European Union medical graduates, principally scored on a candidate's reflections on a variety of personal or educational experiences. Their scores and preferences then lead to assignment to a post in a deanery. Having completed 6 four month Foundation jobs, a prospective Anaesthetist will then apply to a Core Training programme, either two years of CT Anaesthetics or three years of CT Acute Care Common Stem. The former involves 21 months of Anaesthetics and 3 months of Intensive Care Medicine; the latter involves 6 months of Medicine, A&E, Anaesthetics and Intensive Care before a final year in the favoured speciality. During this time, a candidate will work no more than an average of 48 hours per week, complete the three parts of the Primary FRCA (MCQs, OSCE & SOE) and seek to get 'signed-off' the roughly 200 work placed based assessments.

Subsequently a trainee, having completed Core Training, applies for a five year Speciality Training programme. The trainee initially works through ST3 & 4 (nomenclature left over from the failed experiment of run-through training), during which time they are exposed to the anaesthetic sub-specialities as well as further experience in Intensive Care and in Pain medicine. They will also complete the two parts of the Final FRCA (written and SOE) and the next batch of work place based assessments. During ST5 to 7, trainees take on more managerial and supervisory roles in preparation for becoming consultants as well as further experience in the sub-speciality of principal interest. Having completed ST7, they are awarded their CCT and are able to apply for consultant posts.

However, more change is afoot: £9,000 pa student fees; the RCoA e-portfolio; GMC re-validation; Intensive Care Medicine independence; PMETB joining GMC; Coalition NHS reforms. How training will look when this society celebrates its 50th anniversary is anyone's guess.

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TRANSFORMATION OF RESUSCITATION IN THE LIFETIME OF HAS

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Cardiopulmonary resuscitation remains one of the most challenging and dynamic situations in medicine, where successful outcomes are still relatively low. Resuscitation development has been well described, with notable milestones including the foundation of the Humane Societies in Holland and England in the 18th Century[1], the articles in the British Medical Journal and Lancet in the 19th Century and particularly the work of Kouwenhoven, Jude and Knickerbocker on closed chest massage in the 20th Century.

Before 1986

Closed chest cardiac massage was described first by Boehm (1878). After that, open chest massage became the standard management for cardiac arrest until 1960 when the classic paper on closed chest massage by Kouwenhoven, Jude and Knickerbocker was published.[2] Peter Safar and James Elam rediscovered the 'airway, head tilt, chin lift' and mouth to mouth breathing in CPR in the 1950's. The development of defibrillators (AED's and Biphasic) was one of the most important milestones in resuscitation history (first used 1947 Dr Claude Beck).[3] The American Heart Association published its first guidelines in 1974. It played a pivotal role in the development of basic and advanced life support and the basis for the Advanced Cardiac Life Support (ACLS) course (started in 1975), also education of lay public. In the early eighties, a series of health professionals from the UK imported and anglicised it, as the Advanced Life Support (ALS) Course.

Organisations and Courses

The Community Resuscitation Advisory Committee (CRAC) was formed in August 1981 with an aim to review the resuscitation standards. In July 1982, the constitution was amended and CRAC became the Resuscitation Council UK.[4] The Resuscitation Council UK (RCUK) was formed in August 1981 by a group of medical practitioners from a different specialties, with a vision to facilitate education of both lay people and healthcare professionals in the most effective methods of resuscitation appropriate to their needs.[5] The European Resuscitation Council(ERC) was founded officially in August 1989 and Resuscitation was recognised as its official Journal in 1991.[6] The International Liaison Committee on Resuscitation (ILCOR) was formed in 1992 to provide a forum for liaison between principal worldwide resuscitation organisations. Its members comprise

European Resuscitation Council, American Heart Association, Heart and Stroke Foundation Canada, Australian Resuscitation Council, Resuscitation Council of Asia, Inter-American Heart Foundation, Resuscitation council of Southern Africa and New Zealand Resuscitation Council. The RCUK is responsible for setting central standards for cardiopulmonary resuscitation and related disciplines in the UK.

In 1986, the year the History of Anaesthesia Society was founded, the ALS course published the *'ABC of Resuscitation'*.[4] The two day course, predominantly lecture based, was first run in 1991. In 1992, the ALS Course Working Party was formed, followed by publication of the Resuscitation Council (UK) ALS manual. The ALS Course has evolved into an objective, well structured, two day course which is predominantly workshop based, along with serial inclusion of new topics like external pacing training, ACS, audits and outcomes, ABG analysis. The development of e-ALS course, knowledge based e-learning, followed by a one day practical based, face to face course, was launched in November 2010.

Guideline development

Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care conference provided the platform for the first international resuscitation guidelines.[7] The ALS protocols have evolved from the simple ABC approach flowcharts to individual guidelines and algorithms for each type of cardiac arrest and development of simple protocols for acute coronary syndrome. Complex issues like 'DNR' and the presence of relatives in the resuscitation room, are now addressed. Initial flow charts published by RCUK showing basic and advanced life support for VF/VT arrests, asystole, EMD in adults and paediatrics , were published in the 'ABC of resuscitation' by the BMJ in 1986[8], though they had no status as guidelines then. The table summarises the initial ABC's of resuscitation in 1986-8:

	Infant	Child	Adult
• External chest compressions (per min)	120	100	60
• Depth (cm)	1-1½	2-3	4-5
• Respiratory rate	37	20	12
• Expired air resuscitation (per min)	24	20	12

Drugs included were, adrenaline, atropine, calcium and isoprenaline, and administration included IV and endotracheal routes with paediatric doses measured in mg/kg. Risk of hypothermia in children and post resuscitation care, including ventilation in ITU , invasive pressure monitoring, glucose control, ABG's and blood investigations were also highlighted.[8] The Compression:Ventilation (C:V) ratio for adults was 15:2 and for children/infants was 5:1.[8]

Current inclination for greater autonomy for patients and their relatives originated from the care of children in the 1980s.With greater media coverage, public awareness was increased in relation to the expectations and so a related formal document was published in 1996.[9]

1992: The ERC guidelines in 1992 brought about important changes. There was less emphasis on drugs, delay in the administration of defibrillating shocks was minimised and the simplicity of algorithms reduced the decision making time.[10] These were adopted by the RCUK and in addition to the usual resuscitation protocol; it included a precordial thump for VF/VT arrest and asystole and a consideration of high dose adrenaline (5mg) in asystole and EMD in adults. The C:V ratio in adults was 5:1."Stacks of three" shocks (200,200 and 360J) were recommended for VF/VT arrest every time with adrenaline 1mg repeated every 2-3min. In the EMD algorithm, there was mention of treating reversible elements such as hypovolemia, hypothermia, electrolyte imbalances, tension pneumothorax, cardiac tamponade, drug overdoses and PE.[10]

1997: In 1997 ILCOR finalized their advisory statement on basic and advanced life support in both adults and children which was adopted as guidelines by the RCUK after minor modifications. These were more refined and included a single ALS algorithm for the management of cardiac arrest with inclusion of training for external pacing. In case of a lone rescuer, they recommended performing resuscitation for 1 min before calling for help if the victim was an infant or a child or in likely trauma or drowning. It clearly stated that from a ventilation aspect, the inflation should be 1.5 to 2 sec with Tidal Volumes (TV) about 400-500ml and about 1 breath every 4-6 sec allowing the chest wall to fall before next breath is attempted. In cases of single person CPR a C:V ratio of 15:2 compared to 5:1 ratio with more than one person, was to be maintained. For effective circulation chest compressions of 4-5cm depth were emphasised with the rate to depend on the number of interruptions for ventilations with no fixed rate recommendation in adults. For a child/infant, 100 compressions /min with 5:1 ratio was emphasised. It was also stressed that presence of dilated pupils was an unreliable sign during CPR and should not be used to manage decisions. It was important to secure airway and ventilation, IV access and administer epinephrine, to correct reversible causes and maintain myocardial and cerebral viability within one minute. For endotracheal route of drug administration 2-3 times standard IV doses of drugs with 10ml NS dilution followed by 5 ventilations was suggested. The drugs remained unchanged, but a judicious use of sodium bicarbonate was suggested for patients with severe acidosis, cardiac arrest due to hyperkalaemia and TCA overdose. For VF arrests, the algorithms were now applicable for all kinds

of defibrillators and considerable stress placed on detection of VF/Pulseless VT. During CPR, it was recommended to perform a pulse check only if, after a defibrillating shock an ECG rhythm compatible with cardiac output was produced. If VF persisted, then further shocks in the sequence of three were recommended without a pulse check. For non-VF/VT rhythms with cardiac arrests, emphasis on correction of potentially reversible causes with epinephrine administration every 3 min, was given. It was suggested that routine electrical pacing for asystole was not beneficial except in trifascicular block with p-waves present. 5 rescue breaths for infant and child were emphasised along with the IO route for drugs in case of failure to secure IV. The need to consider the potentially reversible causes was introduced in the algorithm for all types of cardiac arrests.[11]

2000: In 2000 it was recognised that the chances of successful defibrillation decrease by 7-10% per minute delay and this was highlighted in the training. The concept of the chain of survival was introduced which included recognition of cardiac arrest, early activation of appropriate emergency services, early basic life support , early defibrillation and early advanced life support. Widespread deployment of AED's reduced the need to interpret rhythm. TVs to be achieved were increased to 700 to 1000ml to produce a visible chest rise and a recommendation of a rate of 100 compressions per minute now detailed. A 15:2 C:V ratio was specified in adults and older children, 5:1 in under 8 years, and newborns the ratio was 3:1. Percussion pacing was mentioned for p-wave asystole to stimulate the myocardium. Amongst the pharmacological changes, adrenaline was no longer recommended in doses >1mg and vasopressin was introduced as an alternative to adrenaline for VF/VT arrests which are refractory to 3 shocks. Similarly amiodarone was introduced for VF/VT arrests which are refractory to the initial 3 shocks. The need to increase the minute ventilation if using sodium bicarbonate was recognised. A choking algorithm was introduced in these guidelines. Importance of critical incident debriefing following resuscitation was stressed. There was an introduction to the possibility of peri-arrest arrhythmias with the flowcharts for treatments in detail for all of them.[12]

By 2004 the number 2222 for in-hospital cardiac arrests was standardised in the UK.

2005: The next guidelines were updated and published in 2005. An algorithm for in-hospital cardiac arrests and prevention of in-hospital cardiac arrests including guidance on DNAR were introduced in these guidelines. In the BLS, for lay persons it was suggested CPR be started if the victim is unresponsive or not breathing.They emphasized placing hands in centre

of chest to avoid the delay in finding exact location followed by 30 compressions followed by 2 breaths, each over 1 sec as compared to over 2 sec in the last guidelines. The new AED algorithm contained several new recommendations which included placing the axillary pad vertically to improve the efficiency and continuation of chest compressions whilst the pads are being attached. The AED's were programmed to deliver a single shock followed by a pause of 2 min for the immediate resumption of CPR. The adult ALS changes included CPR for 2 minutes prior to defibrillation if the arrest is unwitnessed by healthcare professionals, with a C:V ratio of 30:2 in 2 minute cycles irrespective of the rhythm and single shock/cycle at highest joules (150-200J biphasic) followed by continuation of CPR without checking vitals. A clear message if there was a doubt between fine VF/asystole was "not to shock". Uninterrupted chest compressions were recommended once a definitive airway was secured.

The important pharmacologic changes included repetition of adrenaline after every 2nd cycle (3-5min interval) in cardiac arrests and simplification of amiodarone dosing in VF/VT arrest. Emphasis was given to optimisation of neurological recovery by means of sedation, seizure control, introduction of therapeutic hypothermia (32-34 deg C), glucose control(although no recommendation for exact levels were given).The role of precordial thump was limited only for witnessed arrests and by experienced healthcare professionals. Open-chest cardiac compression was suggested for patients with cardiac arrest caused by trauma, in the early postoperative phase after cardiothoracic surgery, or when the chest or abdomen is already open, for example during surgery following trauma.

The Peri-Arrest Arrhythmias were aimed to provide simple algorithms for the non-specialist ALS provider. Bradycardia algorithm remained unchanged. The three tachycardias were combined into a single tachycardia algorithm. The initial sequence of actions was similar in all cases and the subsequent treatment depended on the stability of the patient.[13]

As far as the paediatric BLS was concerned, standard AED's were recommended from 8 years onwards, and the definition of child was extended till puberty (was until 8 years). The C:V ratio for 2 trained rescuers was 15:2 (for the lay public it was 30:2 to avoid confusion). Paediatric ALS changes included IV/IO route of drug administration rather than tracheal route, suggestion on use of cuffed ET tubes in children, one shock per cycle (rather than stacked shocks) in the dose of 4 J/kg and adrenaline dose of 10 mcg/kg for each occasion. A simplified Paediatric algorithm was introduced.[13] In neonatal ALS in 2005, there were concerns about the injurious effects of excess oxygen, particularly in preterm infants. On this

basis, it was suggested to start the ventilation with air and to add oxygen if required.[13]

2010: The next guidelines were introduced in 2010.14 In the BLS there is emphasis on high quality chest compressions and reducing the pauses between the compressions. Optimum depth recommended is now changed to 5-6cm in adults and at least 1/3rd chest compression in paediatrics. AED use is proposed to be increased by not restricting it to the trained personnel. AED algorithm has remained the same. It is now recommended to reduce the preshock pause to <5sec by planning ahead and continuing compressions till defibrillator is charged. The C:V ratios have remained the same for adults, paediatrics and newborns. The role of "compression–only" CPR for lay people was recognised in children as well as adults. A new section on pre-hospital cardiac arrest was introduced. Stress on preventing cardiac arrest and structured communication (SBAR) approach was given. Although the overall structure of advanced life support had remained the same, there were a few modifications

The assessment is by standard ABCDE approach

- Reduced emphasis on early tracheal intubation, unless achieved by highly skilled individuals with minimal interruptions of compressions.
- Increased emphasis on capnography
- Inclusion of "stacks of 3" shocks for VF/Pulseless VT occurring in Cath lab or immediate post-op following cardiac Surgery.
- Delivery of drugs via tracheal tube is no longer recommended
- In VF/VT arrest adrenaline to be given once chest compressions have started after 3rd shock, then every 3-5 min and Amiodarone is also given after the 3rd shock
- Atropine is no longer recommended for routine use in asystole or PEA
- Potential role of Ultrasound imaging is recognised

Post-resuscitation care include-

- Recognition of potential harm by hyperoxemia after ROSC- aim to achieve oxygen saturation of 94-98%.
- Emphasis on treatment of post cardiac arrest syndrome
- Recognition of the fact that comprehensive, structured post resuscitation protocol may improve survival in arrest victims
- Increased emphasis on the use of primary PCI in appropriate patients after ROSC
- Blood glucose levels>10mmol/l must be treated and hypoglycaemia must be avoided
- Therapeutic hypothermia in comatose survivors of cardiac arrest (in both shockable and non-shockable rhythms)

As far as the peri-arrest arrhythmias are concerned, assessment of the patients is now by an ABCDE approach. Also single set of adverse features (shock, syncope, myocardial ischemia, heart failure) for tachy/brady arrhythmias are introduced for consistency

Paediatric BLS is now simplified to assist teaching and retention. The emphasis is now on both pulse palpation and determining signs of life (response to stimuli, normal breathing, or spontaneous movement): not on a single parameter. Paediatric ALS is now simplified to minimise the difference between adult and paediatric pathways. Regarding ventilation, bag/mask ventilation remains the preferred method for ventilation which if fails can be replaced by LMA (or any supraglottic airway device).The use of capnometry/graphy is encouraged. Emphasis on avoiding hyperoxia in paediatric arrests is given. Post resuscitation care now involves induced hypothermia.

The newborn life support guidelines have included several specifications-

- For term infants use air for resuscitation at birth and use oxygen only if required (guided by pulse-oximetry)
- For Preterm babies(<32week)- use blended oxygen and air judiciously, guided by pulse-oximetry
- For Preterm babies (<28weeks) - to cover to the neck and to be nursed under radiant warmer with room temp at least 26oC.
- Recommended C:V ratio 3:1
- Adrenaline dose 10-30mcg/kg
- ETCO2 is recommended
- Therapeutic hypothermia if evolving moderate to severe Hypoxic ischemic Encephalopathy.

2012: The important additions and milestones in this year in resuscitation include-

Recognition of usefulness of Echocardiography by trained individuals in the peri-arrest setting to identify and treat conditions such as pericardial effusion. Focused Echocardiography in Emergency Life support (FEEL-UK) is an established and successful course.[15]

Embracing the social networking sites like Facebook as "Resuscitation Council (UK)" and Twitter@ResusCouncilUK. There is also a channel on YouTube

Studies on rib fracture during the CPR which stated that the incidence is in about 1/3 of CPR.

Clarification of basics in resuscitation in Pregnancy.

Endorsement of the NICE document for end-of-life care in adults by the Resuscitation Council.

Development of separate algorithm for those with tracheostomy and laryngectomy stoma.

Future of resuscitation: Innovative strategies like Dispatcher Assisted CPR, hands-only CPR and smart phone applications will probably be much more widespread. For the professional provider, resuscitation may include organ specific metabolism monitoring during CPR. Real-time computer-aided medical decision support based on multiple physiologic parameters might also be used to guide management. With all these aids, individualized goal-directed approach to cardiac arrest resuscitation could revolutionize the way treatment guidelines are developed, implemented and evaluated.[16] In addition emergency life support skills, including CPR, may become a mandatory part of the school curriculum.[17]

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BRITISH MILITARY ANAESTHESIA - 25 Years of Learning Lessons

A Personal Commentary on the Published Literature

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This is one of several papers given by anaesthetic trainees of the Anglia School of Anaesthesia that opened the delayed 25th Anniversary meeting of the History of Anaesthesia Society in Wokingham. The presentations documented the social, medical and contextual history of the 26 years in which the History of Anaesthesia Society has been in existence. These are my personal views and opinion of the lessons learnt from military conflicts over the last 25 years; not those of the British military.

No period of military history has seen more dramatic developments in the sphere of military anaesthesia and intensive care than the last 25 years. I propose to quick march through the major conflicts of the last 25 years, and hope to present some examples of how the anaesthesia and intensive care that we practice today has been influenced by the lessons that we have learnt from previous conflicts.

Op CORPORATE – The Falkland Islands Legacy

The Falkland Islands conflict of 1982 formed an important basis for the future developments in military anaesthesia and intensive care. The Falkland Islands are a group of cold, wet and windy islands 400 miles off the coast of South America. In 1982, the population of the Falkland Islands was 1820 people, 400,000 sheep and an uncountable number of penguins. The Islanders were cared for by a group of six general practitioners in Port Stanley. The medical care to the outer islands was coordinated through a series of large farms. Here the farmers' wives acted as "local matrons" and held medical equipment in their homes for use by the general practitioners when they attended patients. They also acted as the first medical point of contact, delivering first aid care and advice to the Islanders. There was also an agreement in place with Argentina to provide secondary medical care to the Islanders by means of a regular airline service to mainland South America.

On 2nd April 1982, it was reported that an unauthorised Argentine scrap metal dealer was travelling to South Georgia to demolish a whaling station. When he was challenged about his permits, he failed to produce his paperwork and refused to leave the Island. 20 Royal Marines were sent to

defend the island against the perceived Argentinian invasion of British territory. The Argentinians sent troops to defend the scrap metal dealer and simultaneously attacked Port Stanley; the Falklands Conflict had begun. Within days, 2400 British troops had arrived on converted cruise ships, and the air and naval operations began.

The problem for the military medical planners was where to base the medical facilities. The combination of land and sea based operations challenged the provision of care, and the nearest air resupply at Ascension Island 4000 miles away was also a major challenge. This was the first real test of military medical facilities since the fixed location medical service of WWII. A combination of sea based medical facilities on MV Uganda, land based Fitzroy Field Surgical Facility and 32 Field Hospital, with an air based helicopter transfer support, provided care to the deployed servicemen.

The clinical focus shifted following the sinking of HMS Sheffield. The provision of expert burns care and specialist critical care facilities were seriously limited and specialist critical care aeromedical transfer services were not widely available. A grave lesson was learnt about the difficulties of conducting an operation far from UK support facilities.

Op GRANBY – First Gulf War 1990

Eight years later, following Iraq's invasion of Kuwait, desert operations in Iraq began. The First Gulf War differed from previous operations in the Falklands due to the chemical, biological, radiological and nuclear (CBRN) threat posed to British and Allied troops by Saddam Hussain's Iraqi forces. The personal terror of the threat of Scud missiles and potential chemical warfare focused the attentions of the medical services. The need for non-inhalational anaesthesia brought developments in TIVA, and the need to include CBRN filters into anaesthetic systems brought one of the major modifications to the Tri-service Anaesthetic Apparatus, introduced into service by Brigadier Houghton before the Falklands Campaign. It showed the improvisatory spirit of Military Anaesthesia with plenty of black sticky tape and modified tubing! The introduction of Colpro (collective protection) and CBRN protective equipment to minimise the impact of the anticipated chemical and biological attacks made the entire anaesthetic process challenging.

When the Gulf War began, 32 Field Hospital was a collection of stores, freight containers and tents. Intensive efforts were required over the initial four days of the conflict to set up the hospital for operational readiness. Led by the Army, the fixed location of the Field Hospital allowed lessons from the Second World War to be applied. Other than the new threat of direct

Scud attack with chemical and biological warfare, the ever present temperature swings and sand storms brought many challenges.

Op GRAPPLE/RESOLUTE – Bosnian Conflict in Former Yugoslavia

Hot on the heels of operations in the Gulf, UK forces entered Croatia in 1992 to provide field ambulances for Peace Support Operations under the UN banner. The conflict in Yugoslavia brought different challenges to military anaesthesia. Gone were the issues of burns care and huge distances, desert geography and climates and the threat of chemical and biological warfare to be replaced by the problems of a conflict closer to home and with a much larger local population of Europeans to consider. The multi-national nature of the UN operation allowed the UK to experience the modular field hospitals of allied nations, and to reconsider the tented field hospitals of previous conflicts. Medical illness far outweighed battle injuries, and lessons were learnt about planning for surgical requirements during high intensity operations. Anaesthesia and Intensive Care experienced casualties largely from road traffic accidents, and were challenged less by resupply and more by the challenges of infection control with large numbers of soldiers housed in close quarters.

Op TELIC – Gulf War 2 2003

Op TELIC was the first opportunity to put into action all the lessons that had been learnt from Gulf War 1. However, this op. was different. It was the rebirth of expeditionary warfare. Operations were launched on many fronts, and the pace of advancement of the frontline was frighteningly fast. Medical facilities had to be easily and quickly constructed and taken down as the coalition forces moved rapidly into Iraq. This was the start of modular medical facilities and the introduction of DRASH – deployable rapid assembly shelters. It was also the era of collaborative working with multi-national forces and medical services within one medical facility, bringing with it many learning experiences and challenges, from language barriers, to major differences in clinical practices.

The problem with Iraq was that we had difficult relationships with many of their neighbouring states. Iraq was also landlocked, so support from naval assets was made potentially more difficult. In this situation, a small group of RAF anaesthetists undertook the onerous task of developing a service for the transfer of critically ill patients back to the UK. The Critical Care Aeromedical Support Team or CCAST as it is commonly known was born. This facility was initially as an adjunct to the routine aeromedical service, and reduced the need for regular resupply of the field hospital ITU, the

carriage of huge quantities of medical supplies and moving of sick casualties during the expeditionary warfare phase. It was effectively an "emptying of the backdoor of the ITU". The task was enormous – over 4000 casualties were treated through the field hospital between 2006 and 2009, of which over 50% were transferred by aeromedical teams back to the UK, with a significant proportion of these requiring CCAST care. Development of CCAST was rapid and driven by patient need. It also facilitated a huge expansion in the training lines for RAF trainee anaesthetists. The ambition was to increase the number of consultant anaesthetists by three fold.

Op HERRICK Afghanistan

UK forces have operated in support of two large-scale operations for the last 10 years. This has forced the military to the forefront of worldwide research and development of trauma care. The establishment of the Department of Military Anaesthesia, Critical Care and Pain and the appointment of the first Defence Professor have been pivotal in centralising these developments.

Safely transferring wounded personnel from the dangers of the battlefield is not a new problem, but the introduction of rotary wing aircraft for battlefield extractions and intra-theatre transfers has revolutionised the care to the wounded soldier over the last 25 years. The dangers of travelling on the ground in Afghanistan are particularly problematic in an era of improvised explosive devices, which cannot be underestimated. Op HERRICK has seen some of the most important advances in trauma care. The introduction of MERT (medical emergency response team) consisting of an anaesthetist or emergency medicine doctor, emergency medicine nurse, medic and paramedic, has brought the emergency resuscitation room directly to the soldier at the point of wounding, so optimising the provision of golden hour care.

Damage Control Resuscitation and the management of trauma coagulopathy has revolutionised the resuscitation of trauma patients on operations and is changing the processes of care back home. World-class research and publications with the collaboration of Defence Science and Technology Laboratory at Porton Down have resulted in an ever increasing number of unexpected survivors. Advanced imaging facilities and Damage Control Surgery techniques have dramatically changed the surgical outcomes of our patients. This has facilitated the unique, early rehabilitation of our soldiers, together with the expert rehabilitation facilities provided by the Defence Medical Rehabilitation Unit at RAF Headley Court. This has enabled military medical services to provide expert care to our wounded troops at all stages of the patient journey. Anaesthesia, critical care and pain medicine are

central to the provision of this world-class trauma care, and it is a service that we are all very proud to provide for our individual services.

Summary

From the Falklands conflict, through Bosnia and Iraq, to the present day conflicts in Afghanistan and Libya, provision of gold standard medical care to wounded and sick soldiers, sailors and airmen has remained a military and medical priority. The nature of conflict and the geographical complexities of operating in auspicious conditions place specific demands on the medical services. Anaesthetists within the Royal Navy, Army and Royal Air Force have continuously delivered medical care in floating, flying and flapping canvas locations with minimal facilities and resources and complex re-supply chains. The patient journey remains at the centre of our mission and the return to definitive care at the Royal Centre for Defence Medicine in Birmingham is our primary aim. Anaesthetists are present at start, middle and end of this journey. It remains to be seen what developments and challenges the next 25 years will bring.

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ASSESSING OUR FOOTPRINT. A BRIEF HISTORIOGRAPHY OF ANAESTHESIA WITH SPECIAL REFERENCE TO THE HISTORY OF ANAESTHESIA SOCIETY.

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History/hist( )ri/ n. A narration of incidents (in early use true or imaginary; later only those professedly true). A continuous chrono-logical record of important or public events.That branch of knowledge that deals with past events, as recorded in writings or otherwise ascertained.

v. To relate in a history or narrative; to record, narrate, recount.[1]

What is history? Whilst the dictionary provides a succinct and pragmatic solution, a succession of academic historians have spent decades embroiled in a heated philosophical debate surrounding the complex theoretical nature of the subject.2-9 At the same time a vast body of work has accumulated regarding the history of anaesthesia, contributed largely by clinicians involved in, or retired from its practice. The past thirty years have been a particularly industrious period for clinician-historians of our specialty, catalysed by the First International Symposium on the History of Modern Anaesthesia and the subsequent formation of specialist societies such as the Anesthesia History Association and the History of Anaesthesia Society. Comprising mainly enthusiastic amateurs, clinician-historians have mostly avoided the seemingly abstract and metaphysical debate surrounding the nature of history, preferring to get on with the job. In the case of the History of Anaesthesia Society alone, 44 volumes of Proceedings, numerous books and a vast array of peer-reviewed journal articles stand in evidence of our member's prodigious activities. Notably however, clinicians began contributing to the history of anaesthesia long before the 1980s. Read at meetings of Medico-Chirurgical Societies and published in a variety of journals, papers concerning historical aspects of anaesthesia emerged within 12 months of the first successful public demonstration of ether in Boston, Massachusetts.[10] Histories outlining the scientific and technical development of the specialty subsequently appeared in major textbooks of anaesthesia and so began a tradition of historical writing that clinicians have maintained for 165 years. Throughout this period both individual anaesthetists and collective societies have made additional historical contributions that extend beyond the production of the written word. Antiquarians and bibliophiles began the vast collections which exist today as world-class heritage resources whilst others have been responsible for the preservation of individual texts of great historical value. Specialist societies meanwhile have promoted recognition of the importance of historical study through the institution of prizes and fellowships and at the same time fostered international links and lasting friendships. Though we

should be justifiably proud of this legacy, the number of active clinician-historians is now declining and the history of our specialty faces an uncertain future.

This paper provides a thumbnail sketch of the history of historical writing concerning anaesthesia with particular reference to the changing interests, methods and interpretations of those who have produced it – an approach known as historiography.[11] In doing so, it sketches the parallel evolution of history as an independent academic discipline and the subsequent rise of professional medical historians. Separated from their clinician counterparts by fundamental differences in their research interests and methodologies, these academics now dominate proceedings in the wider field of the history of medicine. Closer collaboration with this research community has been proposed as a strategy to foster new interest in the history of anaesthesia, but to do, clinician-historians will first have to understand 'what history is' from a different perspective.

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Abstract of a paper to be read at the 8th International Symposium on the History of Anaesthesia in Sydney January 2013.

POSTER PRESENTATION

Dr. Otto Roth (1863-1944)
Re-assessing the wide spectrum of his pioneering contributions

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The surgeon Dr. Otto Roth (1863-1944) was born in 1863 in Ilsenburg /Harz, Germany. He studied Medicine in Tübingen and received his surgical specialty training in Berlin and Lübeck. In 1897 he was appointed head of the surgical department of the Lübeck municipal hospital, which he led until his retirement in 1933. He died in Lübeck in 1944.[1]

From 1901 until his retirement he was one of the most important clinical partners of the firm "Drägerwerk" (est. 1889). These co-operations famously lead to the "Roth-Dräger-anaesthesia apparatus" (1901/02), an important and well-recognized "milestone" in the development of modern anaesthesia devices, as we know them today.

Our latest research conducted in the Dräger-archives[2] further confirms earlier findings, which suggest that remembering Roth for the "Roth-Dräger apparatus" only does not remotely do justice to the wide spectrum of his notable contributions: Roth was clearly also among the most important scientific contributors to the early research conducted with - and by Dräger during the first three decades of the 20th century. Internationally this, for example, led to

- a better and more accurate understanding of the physiology of respiration,
- the first international "breakthrough" of modern respirator and mining rescue technology,
- the "technology transfer" of the "closed circuit" from respirators into anaesthesia devices,
- and to the global breakthrough of modern "oxygen therapy" and rescue medicine in general.[3]

Additionally, our latest findings also prove Roth´s exceptional contributions to the development of early positive pressure ventilation (notably in the Dräger emergency respirator and resuscitation device "Pulmotor"; since

1908). Finally, on the field of airway management, he in 1911 became the true modern "re-discoverer" of the manoeuvre to apply cricoid pressure to prevent gastric regurgitation and implemented this into widespread international practice[3], 50 years before the British anaesthetist Brian Arthur Sellick (1918-96).

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POSTER PRESENTATION

Re-assessing the history of cricoid pressure for the prevention of regurgitation and aspiration – Time to rename a "classic"!

New evidence why "Sellick's manoeuvre" is an inappropriate eponym

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The application of cricoid pressure to prevent aspiration of gastric content is commonly known as "Sellick's manoeuvre". It is named after the British anaesthetist Brian Arthur Sellick (1918 – 1996), who described this technique in 1961.[1] In 1974 Sellick acknowledged that from a historic perspective he could not claim to have first "invented" this manoeuvre.[2] Instead, there is ample[2] and further emerging evidence[3] that on the fields of emergency ventilation and resuscitation cricoid pressure was relatively commonly used and widely publicized almost two centuries earlier: It was probably first recommended by Scottish anatomist Alexander Monro Secundus (1733-1817) in 1774 and the Scottish surgeon John Hunter (1728-1793) in 1776. From there it found its´ way into numerous early "resuscitation guidelines".[3] Our latest research has found compelling evidence that even the claim that Sellick made a "modern re-discovery" is historically inaccurate.[3] Positive-/alternate pressure ventilation had a "renaissance" from the beginning of the last century. It spread from the fields of emergency medicine and resuscitation to anaesthesia and medicine – and so did the need to prevent aspiration. One of the earliest and the initially most successful emergency ventilator in modern times was the "Pulmotor". Developed and built by the German firm "Dräger", Lübeck, Germany, this device enjoyed an exceptional international "success story". This lasted from 1908 to well into the 1980s.[3] During the use of this device also the routine application of cricoid pressure was recommended: The "Handgriff nach Otto Roth" ("Roth manoeuvre") was named after the German surgeon Otto Roth (1863-1944). Roth systematically researched and validated the manoeuvre. His findings and recommendations were published[4] and immediately adopted by Dräger in 1911. They were still deemed mandatory when using "Pulmotor"-style devices, by the time Sellick published his study. Considering that already by 1948 more than 12000 "Pulmotor" devices had internationally been sold, that many ten thousand rescue workers and health care professionals had internationally been trained with them and had widely used them in practice, it can safely be

argued that it was Otto Roth who actually "rediscovered" the technique of cricoid pressure and successfully implemented it internationally – half a century before Sellick. Potential links between Sellick, the "Pulmotor" and "Roth´s manoeuvre" do exist and may require further investigation.

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GAH Barton

A follow up to my paper in Vol. 36 p.87-91 Great Malvern 2006.

Dr Adrian Padfield.

Retired Consultant Anaesthetist, Sheffield & Past President HAS

Sometime last Autumn (2011) I had a phone call from a Dr Anthony Barton. His aunt, Rosemary Murray, in researching their family history, had come across my paper at Malvern. He telephoned to point out that the assertion in my paper that GAH Barton died childless was wrong. Rosemary Murray was a granddaughter of Barton and Anthony, a great grandson. He supplied me with obituaries of GAHB I hadn't found, details of his children with their images and a good photograph of the man himself (below).

It seems that at the time of Barton's fatal accident in Rotten Row he was riding an unfamiliar horse.

Dr George Alexander Heaton Barton **m.** Mary Matilda Goold

Roderick | Reginald | Lancelot Alexander | Francis Valentine | Marjorie

CHARLES DARWIN (1809-1882) – ANAESTHETIST?

Aileen K Adams

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In 2011 the Cambridge University Library held an exhibition entitled; "Books and Babies: communicating reproduction". Amongst the exhibits was an autograph letter from Charles Darwin to his friend and mentor John Henslow dated 17 January 1850. After the usual greetings it read:

"My said wife has been occupied these two days past in producing a fourth boy Darwin & seventh child! He is to be called Leonard – a name I hold in affection from Cambridge & other associations. I was so bold during my wife's confinement which are always rapid, as to administer Chloroform, before the Dr. came & kept her in a state of insensibility of 1 & ½ hours & she knew nothing from first pain till she heard that the child was born – it is the grandest & most blessed of discoveries."[1]

Although numerous volumes of Darwin's letters have been published, I could not find this one amongst them. However a similar letter written a couple of weeks later has been published[2] addressed to another close friend Dr Joseph Dalton Hooker, and reads:

"My dear Hooker.

. . . .My wife desires her kindest remembrances to you; she has lately produced our fourth Boy and seventh child! – a precious lot of young beggars we are rearing. – I was very bold & administered myself, before the Doctor came, Chloroform to my wife with admirable success. - …"

The caption to the Henslow letter in the showcase in the exhibition stated:

"Charles Darwin was an early adopter of obstetric anaesthesia. The Edinburgh Professor of Midwifery James Young Simpson had discovered the properties of Chloroform in 1847 but its employment in childbirth was controversial at first. Queen Victoria's use in 1853 promoted general acceptance."

This raises several questions. First, how had Darwin learnt a technique of administering chloroform in child-birth soon after James Young Simpson had used it in Edinburgh and at a time when the practice was not in general use throughout the medical profession? Second, why if he was so impressed did he choose to write to Henslow and Hooker, his scientific friends, rather than to address the medical profession who were, apart from Simpson, very slow to take up the use of anaesthesia in childbirth? Third, was the caption in the exhibition correct to describe Darwin as an early adopter of obstetric anaesthesia? How widely did he advocate it?

How did he learn how to do it?

Darwin himself had been a medical student at Edinburgh University, but had opted out after two years. As a young man he was surprisingly indecisive about his future and it seems that his chief reason for going to Edinburgh to study medicine was because his elder brother Erasmus was already there doing just that. However Charles soon found himself disgusted with anatomical dissection and even more disgusted – indeed quite horrified – to witness surgical operations carried out in the days before anaesthesia, and it was this that caused him to walk out not only of the operating theatre but out of medicine altogether. It is clear that he did not learn about anaesthesia from his medical studies.

Coming from an influential family he had no difficulty in transferring to another university, and he was accepted by Christ's College, Cambridge where, again for want of any better ideas, he started to study theology. He also led a sporting life, as was not uncommon amongst wealthy undergraduates, hunting, shooting and enjoying himself, although what was less common, he developed a passion for studying beetles.

His account of anaesthetising his wife is reminiscent of how Prince Albert administered chloroform to his wife Queen Victoria in 1857 – seven years after Darwin - for the birth of her 9th child Beatrice, on the occasion when her anaesthetist Dr John Snow was late in arriving. The Prince however had some idea of how to do this because he had been present during the Queen's previous confinement 4 years earlier, when Snow had administered chloroform to her for her 8th child Leopold, for some 53 minutes, using the technique of pouring small amounts onto a handkerchief held over the patient's face.[3] Prince Albert thus had had the opportunity of observing Snow at work.

There is no mention in any of Darwin's published letters that chloroform had been used at the birth of Francis two years earlier in 1848. If indeed it had, and Darwin had been so impressed, why did he not write to his friends two years earlier? However I did find a report on the Internet[4] that reads:

"Emma is believed to have received chloroform during the birth of their son Frances"

However, no primary source is quoted and I have been unable to find any reference to chloroform having been used at Francis' birth. Actually it would have been surprising if it had as Simpson's work in Edinburgh had barely had time to become known by then. My confidence in this report is also diminished because whoever wrote it spelt his name in the feminine form *Frances* rather than the masculine *Francis*. So I have found no indisputable evidence of whether Darwin had observed the use of chloroform before.

Why did he choose to write to these particular two people?

Both were long-standing close friends and colleagues. It was Darwin's tutor Henslow who rescued him in Cambridge from a slightly dissolute life as an undergraduate and persuaded him into serious study.

John Stevens Henslow (1796-1861) had himself gone up to Cambridge, studying mathematics and geology, and becoming an ordained priest at the same time as following an academic career. He developed a passion for botany and amongst other things he is particularly remembered for moving the University Botanic Garden from a small site off Downing Street to its present large site on Trumpington Road. Largely due to Henslow the period of about 1825-32 became a golden period for botany in Cambridge.[5] Darwin fell under its spell and thus started a life-long friendship with Henslow. It was Henslow who obtained the post on HMS Beagle for Darwin that proved to be the most important event in his life. Darwin sent all his specimens from around the world back to Henslow and he also consulted and informed him of all his theories. It was natural therefore that he wrote to him concerning the discovery of the pain-relieving effects of chloroform in childbirth.

The recipient of his second letter was Dr Joseph Dalton Hooker (1817-1911). He was 8 years younger than Darwin, a graduate in medicine from Glasgow University. He had travelled with James Clark Ross as assistant surgeon on HMS Erebus on the pioneering voyage around Antarctica and to Australia and New Zealand. Hooker too had a passion for botany and it seems that his acquaintance with Darwin was because, on his return from the Erebus voyage, he was asked by Ross to classify the plants of the Galapagos Islands that Darwin had accumulated.6 This, as with Henslow, resulted in a life-long friendship and extensive correspondence. Hooker later followed his father as director of the Royal Botanic Garden at Kew. So here again, was an obvious person for Darwin to confide in about his exploits with chloroform.

Was the caption in the library correct to describe Darwin as an early adopter of obstetric anaesthesia?

The news of Morton's demonstration of ether anaesthesia in Boston in October 1846 came to England in a letter written to Dr Francis Boott (1792-1863), who practised in Gower Street and he spread this news amongst colleagues who went on to use ether during the following months. There was a clue on the Internet that Charles Darwin had written to Boott in August 1848[4], suggesting that Darwin had heard of Boott's role in spreading the news of painless surgery. The letter ends:

". . .with true thanks for all your sympathy and assistance about chloriform *(sic)* – pray believe me.

Yours very sincerely C Darwin."

However, in this letter it seems that Darwin had enquired about the use of chloroform in connection with specimens of Cirrepedia, a family of marine crustaceans. His letter does however mention an experiment in a plant in a glass bell jar whose tentacles curled inwards after the addition of three drops of chloroform and also to certain insectivorous plants which behaved similarly with ether. It is not clear what Darwin was doing with these experiments but clearly surgical anaesthesia in humans was not what he was writing to Boott about.

However Darwin, as a scientist who followed other people's work extensively, could hardly have missed the news of anaesthesia. Chloroform was first used in childbirth by James Young Simpson (1811-1870) on 8 November 1847. He published a number of pamphlets culminating in his book in 1849 "Anaesthesia or the employment of chloroform and ether in surgery, midwifery, etc". It was reported extensively in both London and regional newspapers.[7]

There was an additional reason for Darwin being actively interested, for his squeamishness about medical matters, particularly childbirth, was carried through into his later life. In various letters he comments that labour is "a horrid affair at best" and that his wife's pregnancies "knocked me up as much as it did Emma herself."[8] He commented "I was perfectly convinced that the chloroform was very composing to oneself as well as to the patient."[9]

Henry Connor in his paper given at the Simpson centenary meeting in 2011 reviewed how much knowledge the lay public had acquired about the use of chloroform in childbirth at this time.[10] He found that there was a big difference between Edinburgh and London. In Edinburgh Simpson was almost too enthusiastic in its use, he was prepared to use it on all occasions, in both normal and abnormal labours, and would not admit that there could be complications. Even the death of Hannah Greener did not deter him; he claimed this was a due to failure of resuscitation, although many felt at the time and since, that it was due to ventricular fibrillation under light chloroform anaesthesia.

In London attitudes were different. Physician-accoucheurs were notoriously conservative and saw no reason to alter their usual practices. Dr John Snow, at that time the only specialist anaesthetist in London, used it only for prolonged or abnormal labours. Connor points out that Snow's casebook shows he had used it on some 13 occasions during the same period that Simpson had used it for over 300. It is noteworthy that Queen Victoria

herself got interested in anaesthesia the moment Simpson published his pamphlets in late 1847. This was through her Lady-in-waiting the Duchess of Sutherland, who was an early enthusiast, though it was not until 1853 that the Queen persuaded her doctors to allow Snow to administer it to her, and thereafter she referred to it as "that blessed chloroform". She was not alone, many women of course welcomed it, indeed Connor described how some titled ladies in London actually rented mansions in Edinburgh when they were approaching full-term, so that they could have the benefit of Simpson's ministrations, and furthermore, he points out that during 1848 an increasing number of birth announcements in The Times recorded that chloroform had been used.[10]

It would seem therefore that from 1847 when Simpson first used it, to at least 1850 when Darwin used it, it was in the news and a scientist such as Darwin would surely not have missed it. It seems too that Darwin was aware of its wider use in surgery and did advocate its use. In a letter to his cousin William Darwin Fox[4] on 24 October 1852, referring to the treatment of Fox's carbuncle he wrote:

"I suppose the pain is dreadfull *(sic)* I agree most entirely, what a blessed discovery is chloroform."

Again, some years later Hooker seems to have taken it up at Darwin's suggestion, for he too administered it to his wife, writing:

"I did give chloroform as before with the best effects, though the Doctor was horribly prejudiced against it and he having delv'd *(sic)* 3-4000 women without it that perhaps is not to be wondered at."[2]

In answer therefore to the three questions:

First, I have not been able to trace how Darwin learnt of the details of how to administer chloroform. Second, he chose to write to his two old friends because it was his practice to write to them to them about everything that interested him. Third, there is certainly evidence to support the caption in the Library exhibition that Darwin was an early advocate of anaesthesia. However the Darwin archive is enormous and it is not yet fully catalogued. Some 15 000 letters have been published in 18 volumes to date, stacks of his notebooks have survived and several large biographies have been written. The indexers of these do not include the words chloroform or anaesthesia in their indices of the volumes containing the letters I have quoted, although his wife Emma's labours are sometimes referred to. There may therefore be more information to come to light.

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CHLOROFORM BEFORE SIMPSON

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Those of us who were at the James Young Simpson bicentenary celebrations in Edinburgh last year will remember some of the extravagant claims made for Simpson by some of the organizing bodies. The plaque in St. Giles Cathedral commemorates 'Simpson's discovery of chloroform anaesthesia.' In this paper the accuracy of that claim is explored.

The story of Simpson's discovery of the anaesthetising powers of chloroform while sitting round his dining table with some colleagues on 4th November 1847, having been nudged in that direction by David Waldie, has acquired mythic status, and like all myths the story has collected layers of elaboration, interpretation, and disputation; but the basic outline remains that Waldie, who was a doctor and manufacturing chemist, suggested the trial of a compound that Simpson knew nothing about. Simpson got hold of some but initially thought it was too heavy to vaporize usefully, but then tried it, with the spectacular result that we know. But subsidiary to this is the muted claim by one of his assistants, James Matthews Duncan, that he had tried chloroform a day or two earlier, and had brought it to Simpson's attention. This was to have consequences some twenty years later.

Additionally in the history of anaesthesia there has for a long time been an undercurrent of rumour that chloroform had been used sporadically at St. Bartholomew's Hospital, London, during 1847, by the surgeon William Lawrence, starting quite soon after the introduction of ether anaesthesia in December 1846, many months before Simpson burst into the picture. My interest was aroused last year while working on the story of the first Caesarean section under general anaesthesia, by a hitherto unnoticed postscript to a letter in the *London Medical Gazette* from S.J. Tracy, who had administered the ether in the case.[1] The letter was concerned mainly with the design of his hookah-shaped ether inhaler, but the postscript indicated that other liquids, including chloroform, had been tried as early as January 1847. The problem was one of nomenclature; in those early days chloroform was known by a number of other names, chloroformyl, formyl-chloride, terchloride of formyl, trichloromethane, and chloric ether. The preparation used at Bart's was chloroform in alcohol, which was called chloric ether, but unfortunately the name chloric ether had already been attached to another compound first discovered some fifty years earlier.

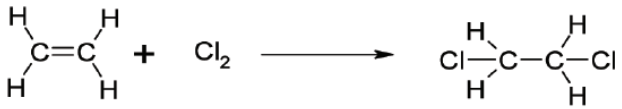
Dutch Liquid

The Society of Dutch Chemists was an informal group of five friends, set up in Amsterdam in late 1790 or early 1791. There were three physicians, a

pharmacist, and a merchant. Their original purpose was to oppose the teaching of the phlogiston theory and promote the new chemistry of Lavoisier, but they soon embarked on chemical research, publishing the results of their studies of the oxides of nitrogen in 1793.[2] By reacting alcohol with concentrated sulphuric acid they produced 'olefiant' gas, now known as ethylene.

$$C_2H_5OH\ (+\ H_2SO_4\ ) \longrightarrow C2H4 + H_2O\ (+\ H_2SO_4)$$

In 1794, by reacting olefiant gas with chlorine they produced a thin colourless volatile liquid with sweetish taste and pleasant odour which became known as Dutch liquid or chloric ether,[4] and is now known as ethylene dichloride, or dichloroethane.



ethylene

Dutch liquid
"ethylene dichloride"
1,2-dichloroethane

This found a use among the medicaments of the period as a stimulant, and for the control of diarrhoea. Somehow it became better known and more popular in the New England states of America, and Professor Benjamin Silliman of Yale, the leading American academic chemist, and the founder and Editor of the American Journal of Science, (Silliman's Journal), was certainly acquainted with it. In 1826 he described the conditions in which the usually quiet reaction between chlorine and olefiant gas, which produces a 'peculiar aromatic, oily looking substance, since called chloric ether,' suddenly exploded.[4] His explanation was that instead of mingling the reactants, they were introduced separately and formed two layers, with the reaction proceeding at the interface, which became so heated that it triggered a sudden general combustion. From about 1830 Silliman was promoting a preparation of chloric ether in alcohol as a useful and pleasant general purpose medicament, and this interested Dr Samuel Guthrie of Sackets Harbour, Lake Ontario, in finding an improved and cheaper method of preparing it.

Guthrie's 'Chloric Ether'

Samuel Guthrie was born in Massachusetts in1782, the son of a small town general practitioner.[5] He was trained by his father, attended Columbia

Medical College, and attained an M.D. qualification. In 1817 he settled at the large village of Sacket's Harbour, on the American shore of Lake Ontario. Sacket's Harbour had been of great strategic importance during the 1812 war between the U.S.A. and Great Britain, the bicentenary of which was commemorated recently, and had fortifications, a large barracks, and a shipyard. Guthrie had served there as an army surgeon, and had been impressed by the potential of the area. So in 1817 he bought a large tract of land and built a house, barns, workshops, a laboratory, and a powder house, where he developed and manufactured a much improved gunpowder and percussion caps, which became used by sportsmen throughout the U.S. and Canada. During 1830 and 1831 he experimented with the manufacture of chloric ether, keeping Silliman informed of his progress, and gaining a number of complimentary paragraphs in *Silliman's Journal*. His definitive method was described in a letter published on page 64 of Volume 21, on 1st July 1831.[6] He wrote:

'Mr Editor:- As the usual process for obtaining chloric ether for solution in alcohol is both troublesome and expensive and from its lively and invigorating effect may become an article of some value in the Materia Medica, I have thought a portion of your readers might be gratified with the communication of a cheap and easy process for preparing it. I have therefore given one below, combining these advantages with unerring certainty in the result.

Into a clean copper still put three pounds of chloride of lime and two gallons of well flavored alcohol of specific gravity 0.844, and distil. Watch the process and when the product ceases to come highly sweet and aromatic remove and cork it up closely in glass vessels. The remainder of the spirit should be distilled off for a new operation. … From the above quantity I have usually obtained about one gallon of the ethereal spirit.'

He continued, 'that by re-distilling it a greatly concentrated solution will be obtained; this new product is caustic and intensely sweet and aromatic. By distilling it again with carbonate of potash the product will be further concentrated and refined'. Although he, and Silliman, continued to refer to the product as chloric ether, there is no doubt that Guthrie had produced pure chloroform ($CHCl_3$). The publication date of Guthrie's letter has been worked out to be 1st July 1831, giving him a clear six months priority over his nearest rival. The reaction between alcohol and chloride of lime is shown below.

$$4C_2H_5OH + 16CaOCl_2 \rightarrow 13CaCl_2 + 3(H{\cdot}CO_2)_2Ca + 8H_2O + 2CHCl_3$$

Guthrie continued that 'During the last six months a great number of persons have drunk of the solution of chloric ether in my laboratory, not only freely but frequently to the point of intoxication; and so far as I have observed, it appeared to be singularly grateful, both to the palate and stomach, producing promptly a lively flow of animal spirit and consequent loquacity, and leaving after its operation little of that depression consequent to the use of ardent spirits.' He had allowed the free use of the preparation to ascertain its effect on healthy subjects in full doses, and so discover its probable value as a medicine. 'From the invariably agreeable effect of it on persons in health, and the deliciousness of its flavour, it would seem to promise much as a safe, quick, energetic and palatable stimulant.' As was his custom he sent Silliman some samples to try out and distribute; and Silliman promoted it, and published reports on its beneficial use by inhalation in pulmonary disease. It is surprising that although Guthrie used one different reagent, Silliman did not consider that the product might be chemically different also.

Chloroform

Chloroform was produced by the French chemist Soubeiran and the German Liebig some months later, and its chemical formula was established by Dumas in 1834, who gave it the name chloroform; but arguments about priority are not part of this paper. All I wish to establish is that a sweet aromatic liquid called chloric ether was well known and in use in the New England States from some time in 1831; but not in the U.K. As Anne Florence told us at the Liverpool meeting in 1997,[7] when in the late 1830s a prescription containing it was presented at the Liverpool Apothecaries Hall, probably by an American visitor, Liverpool being the principal U.K. port for the arrival of transatlantic shipping, the chief chemist, Dr. Brett, had to search the literature, ultimately finding it and the method of preparation in the United States Dispensatory.[8] By following the instructions he produced a 'spirituous solution,' which rapidly became known and popular among the physicians of Liverpool and their patients as chloric ether.

Soon afterwards, David Waldie, who had qualified as a surgeon and apothecary but whose interests were in chemistry, joined the staff of the Liverpool Apothecaries Hall and learned of the rather impure but popular chloric ether being prepared by Dr Brett. When Brett left some time afterwards Waldie succeeded him as chief chemist, and started to investigate chloric ether. He found that it varied in strength, usually containing excess alcohol and other impurities, so he gradually refined the method of preparation, eventually producing pure chloroform liquid, which he washed and dissolved in a little spirit, and this was offered to the Liverpool physicians, still as chloric ether. Waldie subsequently reported that

it had displaced sulphuric ether in the treatment of neuralgia, providing rapid and pleasant relief when inhaled; and it was used also for hysteria. Unfortunately the Apothecaries Hall laboratories and storehouse were destroyed by fire on 17th July 1846, and Waldie lost his research and manufacturing facilities.

Inhalation Anaesthesia

Now the story moves to London, where at University College Hospital on Monday 21st December 1846 the senior surgeon, Robert Liston, painlessly amputated a leg under ether anaesthesia, something that in 1840 the eminent French surgeon Alfred Velpeau said would never be possible. The demonstration that it was possible safely and reversibly to remove consciousness was a most important example of what today would be called a Kuhnian paradigm switch.[9] At a meeting at the Pharmaceutical Society in mid-January 1847, less than a month after Liston's operation, some twenty different ether vaporizers were exhibited, and as can be seen from Tracy's postscript, the search for other agents was on. It would be natural to assume that the substances mentioned by Tracy had been tested at Bart's, but this was not so. There is evidence, set out in two papers by the late Peter Dinnick, a distinguished founder member of this Society, that chloric ether had been administered at the Middlesex Hospital by the pharmacist Jacob Bell for dental extractions, that it had worked satisfactorily, but chloric ether being much more expensive to produce than sulphuric ether, the experiment had been abandoned.[10] From here on it becomes difficult to give a coherent account of subsequent developments because the information came out partly contemporaneously, but largely in response to enquiries launched more than twenty years later by Robert Christison (later Sir Robert) (1797-1882), one of the great men of Scottish medicine.[11]

Christison's Enquiry

Christison, while preparing a revised course of Materia Medica lectures towards the end of the 1860s, became interested in unravelling the early history of chloroform, and in particular he appears to have become concerned that justice may not have been done to James Matthews Duncan for the part he had played in the early days of November 1847. In his Journal entry of June 29 1868 he wrote that 'the "chloroform discovery" has been wrapped in a mist which is becoming denser and denser,' and that among the educated circles of society Sir James Simpson is thought to have discovered chloroform itself, and also the state of the body called anaesthesia; and he devoted some pages to a review of developments from

1832 to 1847. His rather jaundiced view of Simpson can be seen from entries in his journal that are reproduced in his biography.[12] He returned to the topic on July 25 1870, when he reported Matthews Duncan's account in his journal, as told personally to him[13]; and having heard vaguely of Lawrence's trials at Bart's he found out that a junior surgeon, James Holmes Coote, had been Lawrence's assistant, and wrote to him for details. Coote's reply, which he received on 8th November 1870, went as follows:

'In the summer of 1847, Sir Wm. Lawrence operated on a lady in Essex for scirrus in the breast, and I accompanied him, to assist him, and to give the patient sulphuric ether. She coughed so violently, that I had great difficulty in obtaining the necessary anaesthetic effect. Some week or so afterwards I was talking about this inconvenience in the hospital (St. Bartholomew's), when a Mr. Furnell now in the Bengal (an editorial footnote says 'should have been Madras') Army, told me he had a milder anaesthetic, commonly called chloric ether, which he advised me to try. With Sir Wm. Lawrence's assent, I used it several times in his private practice, and once upon the very lady who had such trouble with sulphuric ether; and we invariably found that the effect, though slow, was free from other inconveniences. Sir William and I were endeavouring to reduce the amount of spirit and water, so as to condense the preparation, when Sir James Simpson made known his important discovery. I cannot say that we knew the word "chloroform," but we knew that chloric ether consisted of spirit, water, and a base.'[14]

During 1847 Coote had been assiduously sending accounts of operations performed under ether anaesthesia at Bart's to The Lancet, and only five or six days after Simpson's announcement he reported three cases under chloroform, administered by Mr Tracy using a thin flat piece of sponge to cover the mouth and nostrils.[15] The results were very satisfactory. Then he continued: 'Without wishing in any way to detract from the very great merit of Professor Simpson, in introducing this valuable agent, I may observe that for some considerable time Mr. Lawrence has used, in his private practice, the chloric ether, which is chloroform in spirit and water.' (Coote's memory let him down when he replied to Christison's enquiry some twenty years later – he did know the word chloroform). 'The less irritating effect of the chloric ether was noticed by Mr. Taylor, and by myself, in some experiments (reported in this journal) performed upon animals; their efforts to escape were most violent, when immersed in the vapour of sulphuric ether.[16] … Mr. Lawrence has, however, performed many most severe operations upon patients rendered perfectly insensible to pain by the inhalation of the chloric ether, and he is now in the habit of directing (requesting) its administration.'[17]

'So far Mr. Holmes Coote,' wrote Christison in 1870, after receiving his reply.[18] He continued, 'Sir James Paget, at that time Warden of the Medical College of St. Bartholomew's, informs me further that Sir William Lawrence repeatedly used this chloric ether in his hospital operations also.' Christison incorporated all this information into a lecture on Materia Medica in December 1870, and there the matter rested until four years later. Then in December 1874, while convalescing from a severe attack of influenza, he decided to relieve the tedium by trying to follow up the Furnell branch of the story. He could not find a Furnell in the Bengal Army List, but there was a Michael Cudmore Furnell, surgeon, in the Madras Army, so he wrote to an old friend, an eminent retired member of the Madras Medical Service, Dr James Sanderson. 'There is no doubt whatever that Lawrence, in the summer of 1847, four or five months before Simpson, used, at Furnell's suggestion, chloroform disguised in the impure state, under the misnomer of 'chloric ether.' There never was, and there is not now, any such substance. The name put Lawrence and Holmes Coote on the wrong scent. Had it been called 'spirit of chloroform,' which it really was, they would have got at its base in a moment. Now I want you to find out Mr. Furnell for me, and to learn from him where he got his information, and whether he had himself used this miscalled chloric ether. Simpson's investigations were in November of the same year, 1847.'

Michael Cudmore Furnell[19]

Furnell had already set out his story briefly in a letter published in the Lancet on 25 March 1871.[20] The decision to write was triggered by the news of the death Simpson on 6 May 1870, which, travelling by sea, did not reach India for some two months. Furnell disclaimed any intention to 'detract from the fame of the great physician (Sir James Simpson) who has just left us.' However it seemed to him, and to many of his friends, that it should be placed on record that chloric ether, 'which is almost chloroform,' being 'chloroform plus spirits of wine,' was first used as an anaesthetic at St. Bartholomew's Hospital in the spring of 1847. He gave a short account of the background to this claim, and there things rested, but he was stimulated to elaborated it into a much longer account some six years later by the enquiry being pursued by Sir Robert Christison.[21]

Furnell had commenced his medical studies in 1846, and needing to attend a course of practical pharmacy he signed up with the distinguished pharmaceutical chemist Jacob Bell.[22] The introduction of ether anaesthesia in December of that year had a great effect on him; he described a horrendous operation, one of the first that he had witnessed as a student

some months earlier. 'It was on a girl who had in childhood been desperately burnt on the neck and shoulders by falling into a fire. The cicatrix had gradually contracted, so as to draw the unfortunate creature's head down on her breast and her lower lip away from the mouth, exposing the lower row of teeth and allowing the saliva to dribble continually from her mouth. She was a repulsive spectacle, and had gladly consented to Mr. Skey's suggestion of an operation, which, by transplanting a piece of skin from her arm and dissecting up the cicatrix, appeared to afford some chance of mitigating her unfortunate appearance. The patient was tied to the operating table, as was customary in those days, but before many minutes of the operation had elapsed, her cries and entreaties to be untied and allowed to remain as she was were the most frightful that can be imagined. As the operation, which was necessarily a lengthy and slow one, proceeded, her cries became more terrible; first one and then another student fainted, and ultimately all but a determined few had left the theatre unable to stand the distressing scene. I have since that time assisted, as the French say, at some painful sights. I have seen a strong man flogged for gross insubordination in the field, but his sufferings were light as air compared with the agonies this poor girl must have undergone. These terrible scenes in the operating theatre of a hospital were of weekly, almost daily, occurrence, when Dr. Morton's merciful discovery, like the wand of a beneficent fairy, swept them for ever from the world. Has the enormous and priceless benefit of his discovery ever been rightly appreciated by mankind? I am afraid not.'

After the successful demonstration of ether anaesthesia Bell and many others had devised ether inhalers, and some of these were offered for sale at the Bell pharmacy. Furnell used to amuse himself by trying and passing judgement on them, and Bell, alarmed by the possibility of an accident, gave orders that these experiments must stop. Being denied access to ether, Furnell, wanting to try a new inhaler, searched the shelves in Bell's storeroom, and came across a covered and seemingly neglected bottle labelled chloric ether. 'Its contents smelled pleasant, and I, with the audacity of seventeen, put some into the instrument and commenced its inhalation. I soon discovered it was a much more pleasant substance than sulphuric ether. It had a sweetish, agreeable taste, and did not cause that irritative, suffocative cough which made the inhalation of sulphuric ether so unpleasant and to some patients so impossible. It soon also began to produce insensibility. I drew Mr. Bell's attention to this new discovery, and he recommended me to take it down to St. Bartholomew's Hospital and bring it to the notice of the surgeons there.[23] Furnell's recollection was that he showed the bottle to Holmes Coote. 'He was at that time demonstrator of

anatomy, a great favourite with us all from his kindly, genial manner, just the man a young student would have gone to, to communicate such a matter.' Coote asked about safety, and Furnell replied that he had taken it himself and was no worse for it. He thought this was in the spring of 1847, probably in May. For what happened next Furnell referred the reader to Coote's account as given to Christison.

Furnell continued that while in India he had by no means forgotten that he had used chloric ether and had brought it to the attention of Holmes Coote and Sir William Lawrence, and often mentioned it in conversation with medical friends. Then while on home leave in 1869 he had bumped into Holmes Coote in the street in Belgravia, and introduced himself. Coote immediately remembered him as the man who 'gave me the chloroform many years ago ... what simpletons we were not to have proclaimed our discovery. Why, we had chloroform some months before Sir James Simpson.' Coote invited him to his house, where they enjoyed luncheon and a pleasant chat about old times. After returning to India Furnell thought nothing more about it until he received Christison's letter, forwarded by Sanderson, to which he replied. Then, shortly before returning to England in 1876 the subject came up again in correspondence in the Madras Times, and he resolved to try to settle all the uncertainties raised by it and by Christison and others about the exact relation between chloric ether and chloroform, and their anaesthetic properties. So Surgeon-major Michael Cudmore Furnell, FRCS, of HM Indian Army, and Professor of Physiology at the Madras Medical College, while on home leave, launched enquiries into exactly what chloric ether was, and whether it was an effective anaesthetic. From Professor Theophilus Redwood of the Pharmaceutical Society he learned that chloric ether was a name synonymous with chloroform, and also for a spirituous solution of chloroform. He then persuaded his friend and former fellow student Mr George Callender, the distinguished Bart's surgeon and unsung hero of antisepsis, to see whether a solution of one part chloroform in six parts spirits of wine, would produce general anaesthesia. The test was delegated to the Bart's chloroformist, Mr Joseph Mills (in-correctly spelled Miles), who reported that the solution had worked perfectly on three patients. Subsequently Callender wrote a note supporting Furnell's account that was published as an appendix to his article.[24] 'I have heard the facts you allude to more than once narrated, and they are well known in the school.'

Simpson, Snow, and others

Contrary to the general impression, Simpson, in fact, did know about chloric ether. In a communication to the *London Medical Gazette* towards the end

of November 1847 he said that he had tried 'the chloride of olefiant gas, (Dutch liquid or the chloric ether of Thomson),' and had found it wholly unfit for inhalation. It had produced constriction of the throat and headache, which effects had lasted for twenty four hours and impaired his ability to lecture. Unfortunately he had tried the wrong chloric ether.[25] A well-informed paper was read at the meeting of the Medical Society of London on 6th December 1847 by Dr Cogswell, reviewing all the relevant literature, but Guthrie's letter to Silliman is mis-dated. It appears that chloric ether was not unknown to London Pharmacists.[26] An editorial in the *London Medical Gazette* reported the use of chloroform 'in the Parisian hospitals with perfect success in the performance of minor operations.' The writer rejected the French claim to priority on the grounds that Flourens had used it first on animals, since Jacob Bell had used it two months earlier on the human subject.[27] *The Lancet* reported that Waldie had published a pamphlet on the early history of chloroform (as chloric ether).[28]

John Snow, who appears to have been well-informed about the use of general anaesthesia in London during the early days, evidently knew about the Bart's experience. At the end of a long letter published in *The Lancet,*[29] a reply to an attack on the English technique for the administration of chloroform made in a lecture by Syme, he wrote, 'When chloroform was first administered in London in 1847, it was inhaled from its solution, in about seven parts of spirit, under the name of chloric ether. It produces no irritation whatever, and was only left off on account of the uncertainty of its action in such a diluted form, and its expense.' He continued that a rather stronger and more effective version of this preparation would be safer than the way undiluted chloroform was used in Scotland.

Following the publication of Christison's conclusions, an editorial in the Medical Times and Gazette in 1875 considered all the evidence and attributed priority to Furnell, Lawrence, and Holmes Coote. The writer concludes that 'This is a good illustration of the progress of discovery. It is seldom that a great invention has arisen in the mind of one man only … the flower is there to be gathered, many grasp at it and let it go; at last one seizes it … knows what he has got … and established his claim to it, as Simpson did to the discovery of chloroform.'[30] These are a small number only of the references to the early use of chloroform as chloric ether.[31]

Conclusion

John Snow must have been content to administer sulphuric (diethyl) ether, regardless of its disadvantages, because until Simpson's announcement there is no evidence that he had tested any other potential agents. Jacob Bell did not proceed with the use of chloric ether, perhaps because of cost,

and also lack of interest; his future did not lie in anaesthesia. Furnell recognized its potential, and if Lawrence and Holmes Coote had been more inquisitive about what they were administering they may well have got to chloroform first. But surgical operations were few and far between, and once the induction phase was over the patient settled down, so freedom from irritation of the respiratory passages did not have high enough priority.

For Simpson, on the other hand, the patient's comfort was paramount. During labour inhalation was intermittent, so that laryngeal and tracheal irritation, coughing and wheezing, were an additional repetitive ordeal, not a relief, and an interference with the mother's ability to cooperate with the midwife's instructions. It is no wonder that Simpson was looking for an agent that would be pleasant to inhale.

Acknowledgements

I am most grateful to Professor Alan Dronsfield for his support, instruction in the use of the IsisDraw software, patient assistance with the production of the structural formulae, and for checking the chemical information in general. I must thank also the archivists at Bart's, and Jo Clark and Eric Howard at the Library of the Royal College of Surgeons of England; and Dr. Henry Connor for additional information about Furnell.

References and Notes

1 Tracy, S.J. The use of ether vapour in surgical operations. *London Medical Gazette* 1847; **39**: 258. The postscript stated that 'the most recent experiments have proved that the above effects are not confined exclusively to the vapour of sulphuric ether, but are capable of being produced by ethers in general, more especially by the chloric ether, which has the additional advantage of a pleasant taste.'

2 Rupreht, J. Dutch Chemists of the late Eighteenth Century. *Proc. HAS* 1994; **16**: 16-19.

3 Defalque, R.J. and Wright, A.J. From Amsterdam to Leeds: the travels of Dutch Liquid. *Bulletin of Anesthesia History* 2011; **29**: 29-31. According to Defalque and Wright, Dutch liquid was named 'chloric ether' by Thomas Thomson (1773-1852), professor of chemistry in the University of Glasgow, in the 6th edition of his *System of Chemistry,* Edinburgh, Blackwood, 1820, 237-238. However, John Snow who described Dutch Liquid at some length in part 4 of the first series of his essays On Narcotism by the Inhalation of Vapours, *London Medical Gazette* 1848, 330-335, dated the name back to the 1810 edition.

4 *American Journal of Science* 1826;**10**: 365-6.

5 Guthrie, O. *Memoirs of Dr. Samuel Guthrie, and the history of the discovery of chloroform.* Chicago. Hazlitt, 1887.

6 *American Journal of Science* 1831; **21**: 64.

7 Florence, A. David Waldie and the chloroform scene in Liverpool. *Proc. HAS.* 1997; **21**: 30-34. See also Dundee, J.W. David Waldie – facts and fiction. *Anaesthesia* 1953; **8**: 218-229.

8 Defalque, R.J. and Wright, A.J. From Amsterdam to Leeds: the travels of Dutch Liquid. *Bulletin of Anesthesia History* 2011; **29**: 29-31.

9 Kuhn, T.S. *The Structure of Scientific Revolutions.* University of Chicago Press, 2nd edition, 1970; see also, Zuck, D. A Kuhnian Revolution in Anaesthetics. *Proc. HAS.* 2000; **27**: 21-26.

10 Dinnick, O.P. My Victorian predecessors at the Middlesex Hospital. *Proc. HAS.*1989; **5**: 13 – 21; and Dinnick, O.P. John Tomes (1815-1895) – Anaesthetist 1847: In Atkinson, R.S. and Boulton, T.B. Eds. *The History of Anaesthesia* (Proceedings of the Second International Symposium, London 1987). London, RSM Services Ltd. 1989.

11 After studying and qualifying in Edinburgh Christison signed on as a physician's pupil at Bart's in London, where he claimed to have learned nothing, then travelled to Paris, where he enrolled on a course of practical chemistry and analysis, and attended several lectures by Orfila, the pioneer of toxicology. Returning home, he was appointed Professor of Medical Jurisprudence. He wrote a standard textbook on poisons, and a 'Dispensatory,' a large commentary on the pharmacopoeias in use in the British Isles. The second edition, of 1848, contains a very full article on chloroform. Christison pioneered the science of medical jurisprudence in the United Kingdom, being the Crown's expert witness in Scotland in virtually every prosecution for murder during several decades.

12 Christison, R. *The life of Sir Robert Christison, Bart.* Edited by his sons. Edinburgh, Blackwood, 1885.

13 Christison, R. *The life of Sir Robert Christison, Bart.* Edited by his sons. Edinburgh, Blackwood, 1885, Vol. 2, 352-353. 'On asking Dr Matthews Duncan to repeat a remarkable statement he made to me a few months ago, relative to his concern with the discovery of the anaesthetic virtues of chloroform, he gave it to me thus. One day when Sir James Simpson and he were in Dr Gregory's laboratory at the College, he (Dr Duncan) got possession of every liquid in the laboratory which he imagined 'would breathe.' Four or five bottles were thus carried off, and chloroform was one. At this time, the correspondence with Mr Waldie about anaesthetics, and the suggestion by that gentleman to try chloroform, had not been heard of by Dr Duncan. One forenoon Dr Duncan made

trial of the chloroform. He had previously experimented on himself with various substances, but found none suitable. On trying chloroform, he was convinced that the article sought for was found. The same or next evening the trial was repeated by Dr Keith, Sir James, and himself. This is the trial which is now a matter of history; but the previous trial has never been noticed.' Dr Duncan was at that time assistant to Sir J. Simpson in his scientific work, and undertook this special inquiry under his general guidance.

14 For biographical information about Holmes Coote see *Plarr's Lives of the Fellows of the Royal College of Surgeons,* available on the World Wide Web.

15 Coote, J.H. Hospital Notes – St. Bartholomew's Hospital – Surgical cases treated at this hospital. *Lancet* 1847; **ii**: 571-572.

16 Coote, J.H. Coote and Taylor published an account of experiments using sulphuric ether, Lancet 1847; **i**: 644-645, which was to be *continued,* the continuation presumably dealing with chloric ether, but it is not indexed, and I have searched every succeeding page of the journal for 1847 twice without finding it.

17 Examination of Lawrence's case notes in the archives of St. Bartholomew's Hospital and the Lawrence papers at the Royal College of Surgeons did not disclose any information about the use of chloric ether. Few of the notes are later than about 1826, and there are none in the anaesthetics era. Lawrence's textbook of surgery was equally disappointing. However, a hitherto unnoticed letter from Lawrence to Simpson dated 8th December 1847 is reproduced in Duns's biography (Duns, J. *Memoir of Sir James Y. Simpson, Bart.* Edinburgh, Edmonston and Douglas, 1873, 219). After his introductory compliments Lawrence continued, 'We tried chloric ether at St. Bartholomew's, and found that although it possessed the advantage of being unirritating to the respiratory passages, it was not sufficiently powerful. Mixed with sulphuric ether in equal quantities, it answered very well. As soon as we heard of the chloroform, which I suppose to be the active part of chloric ether, we immediately made trial of it. The result of our experience is that it is preferable to sulphuric ether, although there is no considerable difference in effect. It does not irritate the bronchial membrane; it acts more quickly, and the effect is more lasting than that of the sulphuric ether.'

18 Christison's researches are reported and evaluated in an editorial: The Discoverer of Chloroform. *Medical Times and Gazette* 1875; **i**: 586-587.

19 For biographical information about Furnell see *Plarr's Lives of the Fellows of the Royal College of Surgeons,* available on the World Wide Web.

20 Furnell, M.C. The use of anaesthetics. *Lancet* 1871; **i**: 433.

21 Furnell, M.C. Some remarks on the discovery of the anaesthetic effects of chloroform, and its first exhibition in England. *Lancet* 1877; **i**: 934-936. The whole of Furnell's letter is reproduced in Sykes, S. *Essays on the first hundred years of Anaesthesia.* Vol. 2. Edinburgh, Livingstone, 1961, 168-177.

22 Jacob Bell (1810-1859) was born into a Quaker family of chemists, and joined his father's business at 225 Oxford Street (later renumbered 338), now the site of Oxford Circus Underground Station. He attended lectures at the Royal Institution, and at King's College, London, after which he set up his own course on practical pharmacy for medical students. In 1841 he called the public meeting which resulted in the founding of the Pharmaceutical Society of Great Britain. He also founded and edited the Pharmaceutical Journal. On the death of his father, John Bell, in 1849, he took over the business. He became MP for St.Alban's in 1850, with the intention of furthering the interests of the pharmaceutical profession. The firm of John Bell amalgamated with that of Charles Croyden of Wigmore Street in 1908, moving to its present premises in 1912.

23 Because we know that Jacob Bell had already used chloric ether successfully this advice is not as surprising as it would appear.

24 Callender, G.W. Appendix. *Lancet* 1847; **ii**: 936.

25 Medical Intelligence – Effects of olefiant gas, formerly called chloric ether. *London Medical Gazette* 1847; **ii**: 996.

26 Medical Society of London – The story of chloroform, and its use as an anaesthetic agent. *Lancet* 1847; **ii**: 631.

27 Editorial, *London Medical Gazette* 1847; **ii**: 983-985.

28 Reports, Medical History of Chloroform. Lancet 1847; ii: 687-688.

29 Snow, J. Chloroform in London and Edinburgh. *Lancet* 1855; **i**: 108-109.

30 The Discoverer of Chloroform. *Medical Times and Gazette* 1875; **i**: 586-587.

31 A Google search by Alan Dronsfield for 'chloric ether 'came up with more than 9,000 hits.

Sadly there is no room for most of these, but the very number shows that the subject was not unknown to Simpson's contemporaries.

THE FIRST ETHER ANAESTHESIA IN BELGIUM.

De Turck Bruno, MD. AZ St Lucas, Groenebriel 1, 9000 Ghent, Belgium

Whereas the news about ether anaesthesia reached England by correspondence and was demonstrated by Dr Fisher in Paris, this novelty was published in Belgium in a newspaper.

A patient (with initials M.L.) came on 8th January 1847 to see Doctor Joseph Bosch in Brussels for an anal problem. He told Dr Bosch he had read an article in the 'Moniteur Belge'. The article of the 1st January 1847 reported ether anaesthesia in England and America. The patient asked his doctor whether he could perform a similar anaesthesia for his operation. Dr Bosch decided to consider this request and asked his patient to come back the next day. During those 24 hours Bosch read the article, got in touch with a famous instrument maker (Bonneels) to build an inhaler and invited three colleagues (Dr Bourson, Bastings and Moens) to witness the first ether anaesthesia in Belgium. The identity of the patient is still unknown but because the inhalation and the operation took place at the patient's home and not at the nearby recently renovated Saint Jean Hospital, we can assume he was of higher social rank. (It was some time before people of good standing would allow themselves to be treated in public hospitals).

9th January 1847

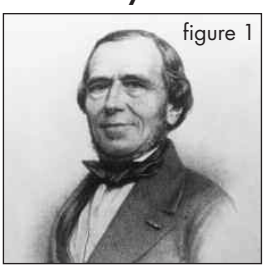


figure 1

Joseph Bosch (Royal Academy of Medicine of Belgium)

Doctor Joseph Bosch *(figure 1)* described what happened on that day as follows:

The patient was lying on his left side. His nostrils were filled with cotton gauze. He placed his lips around the mouthpiece of the tin tube that had a valve in the middle and was connected to a dried pig bladder. The patient was calm and easily tolerated the introduction of an anal speculum. One ounce of ether was then poured in the vessel and this bladder was gently squeezed before the patient inhaled the gas. The first attempt seemed unsuccessful as the patient became red with injected eyes, felt oppressed and asphyxiated and coughed continuously. Joseph Bosch remarked that one of his assistants squeezed the bladder too firmly so that too much ether was given at once. He let the patient recover for a quarter of an hour and then started again. After 2 to 3 minutes the patient fell asleep and his muscles relaxed. An anal fistula on the left side was incised and the patient did not react. He even

remained immobile for 2 minutes after which he regained consciousness and asked if the operation was finished. The 3 doctors who witnessed the anaesthesia were impressed. Immediately the patient asked to continue with the incision of another anal fistula on the right side. Bosch waited about 15 minutes. This time the patient was restless, apprehensive and obviously still not fully unconscious. Bosch inspected the apparatus and found the ether was completely vaporized.

Joseph Bosch presented his story to the Royal Belgian Academy of Medicine and concluded with: "le sujet est grave, d'une portée humanitaire et scientifique immense…" ("This topic is important with an immense humanitarian and scientific scope.") The Journal de Médecine, de Chirurgie et de Pharmacologie proposed experimentation with ether on shoulder luxation, bone fractures and caesareans.

Biography

Who is this Doctor Bosch? He has been thoroughly described in the notices of Dr N Warlomont and in a recent book by Prof Dr J van Engelshoven:

(Johannes Franciscus) Joseph(us) Bosch (junior) was born in Maastricht, just some days before the battle of Fleurus (between the French and the Austro-Dutch army and during the siege of this city) on June 4th 1794. He was the oldest of 4. His father, Jan Hendrik Bosch, was a well-known physician in the region of Maastricht. Joseph followed school and studied philosophy at the lyceum in Douai, France. He got his baccalaureate in literature on August 7th 1811. Afterwards he went to Strasbourg to study medicine. During the siege of Strasbourg (between the French and the Allied army) in 1814 he voluntarily treated the victims of the typhoid epidemic in the citadel hospital. For this, he received the 'Decoration du Lys' (a French distinction) from the Duke of Valmy. To get good theoretical and practical training he joined the medical faculty in Paris and got his medical degree in Leyden, in the Netherlands, on October 11th 1815, two months after the battle of Waterloo. His thesis on obstetrics, defended in public, was entitled "de utilitate et usu explorationis obstetriciae". In January 1817 he settled in Maastricht like his father as a general practitioner. Probably because Bosch found his knowledge and skills still unsatisfactory, he went on to study at the University of Liège, where he got his degree in surgery and obstetrics on September 30th 1818.

Back in Maastricht he took an appointment as surgeon of the "infirmenhuis voor zieken en gebrekkigen ". The infirmary was located in a former monastery. The mayor of Maastricht sent him (or his father) to Paris to get information on the building of a new hospital. (Because he and his father

had the same initials, it is now difficult to know who went to France in March/April 1819). Nevertheless, in December 1822 Joseph Bosch became the head of the surgical department of the newly-built Calvariënberg-Hospital in Maastricht. From 1820 he also gave free lectures to the midwives and by doing so he became by a Royal Decree of May 19 1825; "lecturer in obstetrics" at the school of midwifery in this town. He also became member of the Maastricht scientific society "société des amis des sciences, lettres et arts". Thanks to his thriving practice he could afford to buy a magnificent house (refugie van Hocht) in 1824. He married on 17th September 1825 Elisabeth Francisca Frederica Lamberts and she gave birth to their first child a year later (Amélie 1st July 1826). Soon after, in August 1826, he travelled to Sneek to fight a typhoid epidemic. Joseph wanted to do this only to serve the poor and he asked to do this for free. He set up a pharmacy and two hospitals. By evacuating the houses of patients and isolating them, he managed to control the disease. He became ill himself but recovered under the care of an English doctor Schout. Joseph returned to Maastricht in 1828. The municipalities of Groningen and Sneek honoured him with several medals. The Brussels newspaper " Argus" published an acclaiming column and he received the "croix de Chevalier de l'ordre du Lion Néerlandais", sometimes mistakenly called "Belgian Lion".

In Maastricht his practice flourished. No surgery took place without him. He became the "Dupuytren of Limburg" (after Guillaume Dupuytren 1777-1835, the famous contemporary French doctor). His second daughter Mathilde (29/11/1829) and first son Eduard (22/10/1831) were born. During the Belgian Independency of 1830-1831 and the second siege of Maastricht (1830-1839) Joseph Bosch had problems because his brothers joined the Belgian side. It is said that Joseph smuggled his brother Henri out of the Dutch-minded city of Maastricht. His brother Adolf persuaded him to start a sugar factory at Visé, Belgium, near Liège. He settled with his family in the magnificent castle of Eijsden *(figure 2)*, he rented from the Count of Geloes. With his knowledge of chemistry and his kindness he turned out to be a good employer and entrepreneur, but due to poor sugarcane harvest he rapidly lost his fortune and even got in debt. He started again as a medical practitioner, this time in Brussels. Joseph Bosch became member of the

Castle at Eijsden, residence of Joseph Bosch from 1832 until 1845. (VVD Linburg)

Humble tombstone of Joseph Bosch in the Seffenter cemetery (Vaals, the Netherlands)

Belgian Academy of Medicine in 1843. His family moved in 1845 to Broeckstraat 32 in the centre of the city in the neighbourhood of the newly refurbished Hôpital Saint Jean. The Brabant institute for ophthalmology appointed him in 1846 as a medical assistant. Bosch was very innovative in different branches of medicine: he invented a new way of lithotripsy and also performed rhinoplasties. With his sense for innovation, it was not a complete surprise that he performed the first ether narcosis in Belgium in January 1847. In May of that year he returned to treating the poor and helpless for which he received the very low fee of a mere 400 francs per year. His wife died on 5th July 1848. He bravely carried on practicing and soon repaid his debts. After 15 years of hard work for the poor he went to Valkensburg in the Grand Duchy of Luxembourg, where he continued working. Due to gout he had to stop his practice after 2 years. He lived in Vaals with his daughter and son in law (the mayor of that town). He passed away in 1874, at the age of 80, and was buried on the Seffenter cemetery. A humble tombstone *(figure 3)* and 40 scientific papers are the remaining souvenirs to Joseph Bosch. In the biography on Dr Bosch colleague Warlomont proposed, too late, a more appropriate epitaph: " ici repose le docteur Joseph Bosch. Le meilleur, le plus vaillant et le plus intègre des hommes." (Here lies doctor Joseph Bosch. The best, the bravest and most upright of men).

Some questions on the ether demonstration in Belgium still remain:

The Newspaper

What was the role of the "Moniteur Belge"?

At this time it was almost the only news journal covering the whole territory of the newly (since 1830) independent State of Belgium. It was the best means of communication, Belgian science journals then being scarce. The 'Moniteur' later evolved to the official public channel for the publication of legal texts and laws. The first Belgian journal to mention Morton's ether demonstration in Boston was the "Journal de Bruges". In the edition of 29th December 1846 there is a very small article on what happened a few months before in the Massachusetts General Hospital in Boston and the use of ether anaesthesia in London.

What stimulated Joseph Bosch to use Ether anaesthesia?

Joseph Bosch was almost unknown when he settled in Brussels. Although honoured with several medals he was not the head of the Brabant Ophthalmologic Institute. He became a member of the Belgian Academy of Medicine in 1843. Maybe he just felt the need for some publicity, obviously heard of the properties of ether and was lucky enough to find a willing patient to test it on?

Did he hear about the problems of claiming the discovery in America?

Anyway, Bosch felt indeed the need of having important witnesses; amongst them doctor Bourson as a chief-editor of the "Moniteur Belge". Probably he wanted to be sure to have his story published. When he published the story of his ether anaesthesia on 12th January 1847, Bosch was indeed the first on the European continent to do so. Immediately after his article in the Moniteur there were several other doctors claiming to have been the first one to use ether in Belgium. There was a lot of controversy on this matter in the journals of January, February and March 1847.

The first demonstration of anaesthetic properties of ether on the continent took place in Paris on December 22nd 1846 in the theatre of Dr De Lamballe where Dr Fisher, an American practitioner demonstrated ether anaesthesia. The latter could well have travelled through Belgium and have met Joseph Bosch, but we cannot be sure of that.

Did Joseph Bosch travel to London to assist demonstrations of Francis Boott and James Robinson, who used ether on December 19th? A trip to London by train took more than a day.

Isaha Alex, dentist of his Majesty King Leopold 1, also living in Brussels at walking distance from Bosch's home, went regularly abroad to the United Kingdom. Maybe he could have told Joseph about the new discovery. This Dr Alex also claimed to be the first to perform anaesthesia in Belgium, just some days after Joseph Bosch.

The inhaler

How did Dr Bosch find information on what inhaler to use?

The simplicity of the inhaler he used leads to suspect that there was lack of time. Blowing a glass bowl is more time-consuming than creating an inhaler from a simple tin tube and a pig vessel. As instrument-maker Bonneels, Rue de l' Hôpital 20, lived just around the corner - he was obviously the man for the job. The Bonneels family had a high reputation as instrument manufacturers, winning the gold medal on the Industrial Exposition of 1835.

Political engagement

Whether Joseph Bosch was political involved is unknown. He lived in a very turbulent political period. The emperor Napoleon reigned till 1815. After him Louis XVIII took power and was succeeded by King Charles X. This "Roi de France" fled in 1830 to be replaced by Louis Philippe who became 'Roi des Francais' from 1830 to 1848. In the Netherlands it was king Willem I who ruled from 1815 to 1840 followed by his son Willem II.

During the Belgian independency of 1830 his brothers, especially Henry, joined the Belgian side against the Netherlands. That is probably the reason why Joseph decided to settle in Eijsden and later on in Brussels. Nevertheless Josephs' priority was for the poor and helpless regardless of their political commitment.

Remarks

In the newspaper "Gazette Médicale Belge" of 1847 there was a complaint of Dr Bastings against a colleague Bosch in Schaerbeek (suburb north of Brussels). Hopefully it was another doctor Bosch. It would be very strange that doctor Bastings, who witnessed the demonstration of Joseph Bosch, would afterwards criticise him of being incompetent and not collegial.

Conclusion

Doctor Joseph Bosch was a famous practitioner in Maastricht, but living politically turbulent times he had to move to Brussels, where he was barely known. Being inventive and in somewhat in need of a way to establish his reputation he was very early (9th January 1847) to use ether anaesthesia as demonstrated in Boston three months before. By publishing the report of his operation three days later he became the first one on the continent to write about the anaesthetic properties of ether.

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The Origin of the Goldman Vapouriser?

'Rumour has it that Victor Goldman derived his vapouriser from a lorry petrol pump. If so would the AC petrol pump shown be the origin?'

AC Petrol Pump Bowl

The Goldman Vapouriser

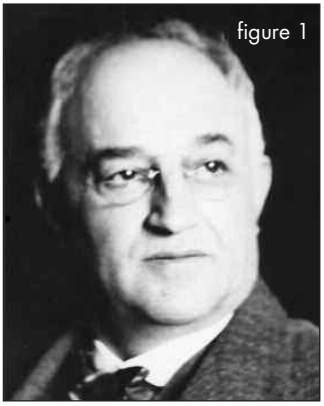
The McKesson Vaporiser

SIDNEY YANKAUER 1872-1932 – the man behind the mask

Dr Tim Smith. Retired Consultant Anaesthetist, Reading

Since the Yankauer sucker (c.1907) and the Yankauer ether/chloroform mask (c.1904) are so well known, it is surprising that original descriptions do not appear to have been published. Neither does there seem to be a description of the 'Yankauer suction and pressure anesthesia pump' (c.1920). The Royal Berkshire Medical Museum has an excellent example of this ingenious electrically powered device. It pumped air through an ether bottle for delivery to the patient and simultaneously could provide powerful suction to maintain a clear surgical field during tonsillectomy. Yankauer was a prolific inventor and although his interests were predominantly surgical he nevertheless made important contributions to anaesthesia.

Early life



Sidney Yankauer (1872-1932). Courtesy of the Archives & Management Records Div. of The Mount Sinai Medical Centre, New York.

Sidney Yankauer *(Figure 1)* was the son of German Jewish immigrants. His parents came to the USA from Bavaria in the mid-nineteenth century. At this time up to fifty percent of the Jewish population of Bavaria emigrated following restrictive anti-Jewish legislation. Sidney was born in New York, one of six children and from an early age showed great academic promise. He graduated from the City College of New York in 1890.[1] This was the first free public institution for higher education in the United States and provided the children of immigrants and the poor access to free higher education based on academic merit alone. Sidney went on to the College of Physicians and Surgeons in New York (later part of Columbia University) and obtained his medical degree in 1893. His education was a fine example of the 'American Dream'……opportunity for each according to ability regardless of social class or circumstances of birth.[2] He served his internship at Mount Sinai Hospital where he spent almost all his subsequent surgical career.

Surgical career

For a number of years he worked in the Out-patient Department of the Department of Surgery of Mount Sinai Hospital. Then from the early 1900s he increasingly specialised in diseases of the ear, nose and throat (ENT) and was appointed first Associate Adjunct Laryngologist, then Associate

Laryngologist and in 1917 Attending Laryngologist. He remained in post at Mount Sinai till the end of his life. Mount Sinai Hospital provided an exciting and stimulating environment for Yankauer's inventive nature. One colleague in particular shared his interest in anaesthesia: in 1910 Charles Elsberg had been the first to use tracheal insufflation in clinical practice.

During World War I Yankauer served as a major in France with the United States Army Base Hospital No. 3, Allied Expeditionary Force at Vauclair (1918-19). This unit consisted largely of personnel from Mount Sinai Hospital including 24 physicians and 50 nurses. They treated some nine thousand patients, with 54 surgical deaths and 118 medical deaths (the latter largely from influenza). There is an anecdote from that time when the Quartermaster who was about to pay several thousand members of staff inadvertently locked the keys inside his self-locking safe. Disaster and potential court martial loomed. Yankauer examined the keyhole with his head-mirror; retired to his well-equipped workshop he had brought to France, and emerged with a key that fitted perfectly.[3] This episode clearly demonstrated his engineering skills and his inventive initiative.

Yankauer went on to have an illustrious career in his chosen specialty. At the start of his clinical career, ENT was in its infancy and Yankauer played a hugely important part in its development. He was an active member of many learned medical societies including the American Bronchoscopic Society, the American Thoracic Surgical Society and the American Broncho-esophagological Association. He was President of the latter in 1928.

Family life

In 1909 he married Grace Greenwood Prior. She had qualified from the Women's Medical Dispensary in New York in 1898 (the Dispensary had been founded by Elizabeth Blackwell in 1868 when it was then only institution in the world to offer medical training to women). Grace had also gone on to specialise in ENT and she and Sidney had shared consulting rooms in Madison Avenue. In 1914 at the age of 40 she tragically fell to her death from the tenth floor of their home while trying to secure a loose blind. They had no children. In 1919 Sidney married Margaret Kearns, Assistant Superintendent of Nurses at Mount Sinai. It is tempting to speculate that he and Margaret formed their attachment at Base Hospital Number 3 in France but there is no evidence that Margaret Kearns went to France.[4] There was one daughter from the marriage.

Literature

In the early twentieth century Yankauer established his reputation as a pioneer per-oral endoscopist. His first paper on bronchoscopy appeared in 1905[5] (some eight years after Gustav Killian's first description of the

technique). He contributed more than 100 papers to the surgical literature on a wide range of ENT topics. A number of these were in German, presumably a language he had learnt as a child. Some topics were esoteric such as his report of two cases of leeches in the trachea[6] and his description of the Eustachian tube of the ant-eater.[7] Others became classic descriptions of surgical procedures, such as his depiction of the complete spheno-ethmoid operation[8] which is still performed today. His description of bronchoscopy in the treatment of lung abscess[9] was ground-breaking as was his method of applying radium to carcinoma of the oesophagus[10] (an early use of brachytherapy).

Instrumentation

He was a prolific inventor of ENT instruments of which at least fifteen were described in the literature. However descriptions have not so far been found for his eponymous sucker, his eponymous mask and his 'suction and pressure anesthesia pump'.

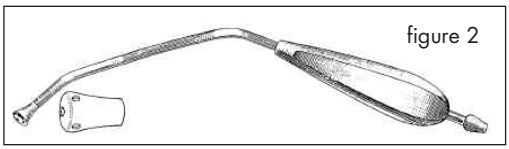


figure 2

Yankauer sucker , showing detail of suction tip (c.1907).

His sucker *(Figure 2)* was a masterpiece of design and is still in universal use today. It was initially intended for keeping the surgical field clear during tonsillectomy. Its 'rose' end prevented soft tissue damage and the design of its elegant handle and angles has never been surpassed.

The Yankauer ether/chloroform mask *(Figure 3)* also demonstrated a simple and practical approach to design. The wire-mesh evenly supported gauze or lint which was readily secured by the attachment spring. Like the Schimmelbusch mask it had a gutter to catch surplus liquid anaesthetic. The earliest reference that can be found is in the form of an advertising flyer by George Tiemann & Co entitled 'A New Chloroform Mask by Sidney Yankauer M.D.'[11] It consists of an image of the mask and a brief description by Yankauer himself. This advertisement was published in the New York Medical Journal and the Philadelphia Medical Journal in June 1904. In his classic book 'Anesthesia' published in 1914 Gwathmey praised Yankauer's mask and it went on to become the most popular mask of its type in the United States; although Gwathmey himself modified the design to allow for the administration of oxygen. Various other modifications of the standard mask appeared including a 'folding' Yankauer. In this version the gutter and retaining spring are retained but the wire mesh is replaced by two bars which can be folded down. In the United Kingdom and the rest of Europe the Schimmelbusch mask remained dominant.


figure 3

Yankauer mask, simple form (c. 1904).

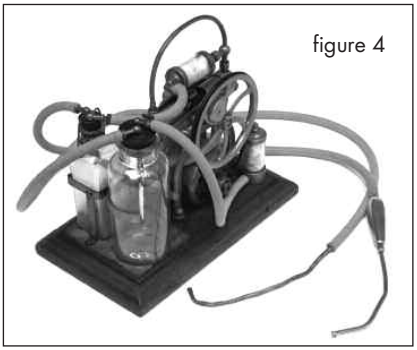


figure 4

Yankauer 'Suction and ether pressure anaesthesia pump' (c. 1920). From the collection of the Royal Berkshire Medical Centre Museum.

Yankauer's 'suction and pressure anesthesia pump' *(Figure 4)* permitted the simultaneous delivery of ether vapour and powerful suction for use in tonsillectomy. A pliable lead tube delivered ether in air to the patient's mouth and suction was provided via a Yankauer sucker. It was manufactured by S N Sorensen Co Inc of New York. The earliest reference to the device is an advertisement in 'The American Year-Book of Anesthesia and Analgesia 1917-1918' published in 1920.[12] There are also unreferenced accounts of the device in identical form being used as an 'electric embalming pump'. Bodily fluids were apparently aspirated and at the same time embalming fluids injected. If such accounts are true it is not clear whether the device was used initially for embalming purposes and later adopted for anaesthesia or vice versa. . In 1924 Langton Hewer in the United Kingdom had developed a broadly similar device which he called 'A combined endo-tracheal pump and suction apparatus'.[13] It contained two vapourising bottles, one each for chloroform and ether whereas the Yankauer had a single relatively small vapourising bottle for ether alone. It shows that on either side of the Atlantic people were thinking along broadly similar lines.

Patent records exist for several of his inventions including 'A clinical thermometer that could be sterilised by boiling' 1899 [14] – a useful attribute in the days of diphtheria and other contagious diseases. Some of his later inventions were unrelated to medicine; for example, 'A resilient wheel' 1920[15] – a car wheel which incorporated internal coiled springs/shock-absorbers, and 'An electric pipe lighter' 1929[16] – a prototype of the hot-wire cigarette lighter used in cars today.

Conclusion

Yankauer was a pioneer endoscopist who made very important contributions to ENT surgery. He was a prolific inventor of surgical and anaesthetic equipment. He died in 1932 and is buried in Arlington Cemetery.

Acknowledgements

I am deeply indebted to Judith Robins of the Wood Library-Museum of Anesthesiology and to Barbara Niss of the Archives & Management Records Division of The Mount Sinai Medical Centre, New York for their unstinting help and encouragement.

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EARLY DEVELOPMENT OF THE INTUBATING LARYNGEAL MASK AIRWAY.

A Kapila, C Verghese and AIJ Brain.
Royal Berkshire NHS Foundation Trust, Reading (Abstract)

When Dr AIJ Brain was developing the concept of the laryngeal mask airway (LMA) he had already thought of a range of possible applications. From a mask with a very flexible tube, that if manipulated would not alter the position of the mask over the larynx, to a mask with a rigid tube that if manipulated would change the position of the mask relative to the laryngeal inlet[1]. Such a prototype was used in the second of three case reports to successfully intubate a patient who had previously been difficult to intubate with a laryngoscope[2]. The logic of this is that a correctly placed LMA is a direct guide route to intubation and was trialled as such from very early after the first reusable LMA became available in 1988[3-5]. There were limitations to the success of these attempts and it was to overcome the size and length of endotracheal tube (ETT) that could be used as well as the degree of manipulation that the relatively flexible airway tube allowed that lead to a prototype intubating (I)LMA[6].

This device was used in 100 patients in theatres at the Royal Berkshire Hospital and was successful in 93 for the passage of a conventional polyvinyl chloride (PVC) ETT. A scoring system was devised to describe the view obtained via a fibreoptic laryngoscope positioned at the outlet of the ILMA tube prior to the intubation attempt. The findings were that as the view score deteriorated increasing number of attempts at intubation were needed.

As this trial was proceeding Dr Brain was already developing modifications to the device. From measurements taken from a series of MRI scans the angle of radius of the guide tube was tightened. Realising that passing a PVC tube through a curved metal tube retained the curve a straight silicone armoured tube was developed that eventually had a soft silicone tip in a conical configuration akin to the Huber tip of an epidural Touhy needle. Finally the grill bars of the LMA were replaced with an epiglottic elevator bar and a ramp placed in the outlet of the guide tube to further optimise the angle of alignment with the laryngeal inlet of the emerging ETT[7]. This ILMA device was further trialled in 150 patients with one failure[8]. The unique and principal advantage of this method of endotracheal intubation was that oxygenation and ventilation of the patient was possible through the intubation attempt and that it was now possible to trial the device in patients known to be difficult to intubate.

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Despite numerous attempts by the meeting organiser Dr Adams, by a fellow author and others, the Editor regrets that Dr Kapila has supplied only the abstract and not his full paper.

THE COLCHESTER MEDICAL SOCIETY

Dr. F.F.Casale FRCA Archivist

The Colchester Medical Society (CMS), founded in August 1774 by Robert Richardson Newell (1750-1814), a 24 year old surgeon and apothecary practising in the town, is the oldest Provincial Medical Society in Britain*, only the London Medical Society is older, founded in1773 (the year of the Boston tea party, to give us temporal perspective). Our minutes go back to 1833, the earliest minute books have sadly been lost however the foundation date is confirmed by Dr Newell's obituary notice in the Ipswich Journal of 28 May 1914 and by Medical Register of 1779 which states: Colchester- in our Medical Tour through several Counties it gives us a real pleasure to notice any institution that bid fair, not only to improve and extend knowledge of medicine, and to diffuse an useful spirit of enquiry, but likewise to promote a state of harmony among Medical Practitioners....we are therefore happy to inform our readers that with the laudable views a MEDICAL SOCIETY was established at Colchester in 1774....Newell was the CMS's first secretary- treasurer and remained so for the rest of his life. He was the son of Robert Newell (1705-1766), a surgeon and apothecary practising in Harwich, and of Susannah, daughter of John Richardson an apothecary in Colchester. His mother died in1764 followed by his father two years later, so at the age of 16, he was adopted by his grandfather Richardson and acted as his apprentice in the apothecary shop which he then inherited when the old man died in 1776. In 1773 he had married Sally Hasell of Hadleigh, Suffolk by whom he had six boys and six girls, and in 1780 they moved to the larger Woodroffe House in Head St. It says much of Newell's tact, diplomacy and enthusiasm that at the age of twenty four he was able to persuade his medical colleagues, all older than himself, to found the CMS. He was also instrumental in calling a meeting in Chelmsford on 30 October 1786 which resulted in the foundation of the Essex and Hertfordshire Medical Benevolent Society (amalgamated with the Royal Medical Benevolent Fund in 1951) "for the relief of distressed medical men, their wives, children and orphans". Its first president was Dr Thomas Dimsdale (1720-1800) who had been given the title of Baron and a pension by Empress Catherine II of Russia for vaccinating her and her court against smallpox in 1768. In 1813 Dr Newell was presented with a silver cup by his Colchester colleagues in recognition of his services to the medical profession. This was subsequently donated to the Colchester Corporation by his grandson Maj. F H Newell and now forms part of the town's plate as the Newell Cup, but his silhouette portrait also gifted, has been lost. Also lost is a blue plaque in his memory, unveiled by the then mayor in 1929 at

the instigation of Dr Philip Laver, which was to have been placed at the site of his Head St residence but this never occurred, however a new one has been ordered which will soon be erected.. Newell died on 24 May 1814 and is buried in the churchyard of St Mary-at-the-Walls, a memorial plaque inside the church describes him as Doctor of Medicine, but none of the British universities has any record of him taking this degree.

The other six founder members were: Henry Topping (1747-1819) King's Scholar at Eton, elected Life Fellow at King's College, Cambridge where he took his M.D.in 1782, then came to practice in Colchester. He died aged 72 following a fall from his horse. Colin Hossack (d 1782) graduated M.D. at Edinburgh and had been personal physician to Fredrick, Prince of Wales; father of George III. When the Prince died in 1751 Dr Hossack left London, to practice in Colchester. Jordan Harris Lisle (d 1788) was a descendant of Sir George Lisle one of the garrison commanders shot at the end of the Colchester siege in 1648. He practiced as an apothecary in Colchester and became its mayor in1769. Cater Day (d 1799) had been apprenticed to Robert Courthope Sims of Dunmow in1754 for the sum of £105.He was a leading member of the Quaker community, a keen sportsman, and an enthusiastic inoculator against smallpox. In 1782 he was adjudged bankrupt. In 1799 he died when he… accidentally fell into the river at Hythe bridge and drowned. Robert Sterling (1724-1787) practiced as a surgeon and man-midwife from the High St. He was elected Fellow of the Royal Society for his knowledge of mathematics, at the recommendation of Charles Gray, then MP for Colchester. Joseph Stapleton (1740-1797) graduated M.D. Edinburgh in 1767, practiced as a surgeon and apothecary in Colchester. He was a leading non-conformist.

It will be seen that only three members of this fledgling society had medical degrees, the majority had served apprenticeships with surgeons or apothecaries, or had joined the Navy or Army to so do, as was the custom then. The CMS flourished and soon attracted members from outside the town, the most distinguished of whom was Dr John Coakley Lettsom (1744-1815) the founder of the London Medical Society which may have been the model for Newell's CMS. He was a leading Quaker, a supporter of prison reform and enthusiastic advocate of vaccination rather than inoculation which he introduced to the United States.

What were Newell's probable aims in forming this Society of doctors?

1. Cooperation

In the eighteenth century doctors competed for fees and patients, therefore were very careful not to expose themselves to criticism or ridicule, so it says much for Newell's confidence and connections to ignore such conservatism.

Meetings were held four times a year in a local hotel during the summer months (April to October) lasting several hours with dinner, the bill being called for at 9pm, thus the participants were committing time and money, as they were also liable to fines if they did not send apologies for absence. Officers were elected annually at the "Anniversary" August meeting at which a President, was also elected (after Newell's long period of secretary-treasurer) the first being Dr Richard Macintosh. Only in 1900, when the incumbent president conveniently died in December, did the presidency start in January for that calendar year. In 1776 Newell applied for the CMS to join the newly formed Humane Society for the Recovery of the Apparently Drowned, raising twenty guineas towards it. A "resuscitation apparatus" was dispatched and soon put to good use when Newell's maidservant fell down a well. Assisted by fellow members Cater Day and Robert Sterling, this "fumigator" (a pair of bellows and tube with which to blow tobacco smoke into the rectum) proved successful, but the next day she complained of great weight and fullness in the intestines, relieved by a gentle purge. Dr William Fairclough of the nearby village Nayland was one of the early recipients of the Humane Society medal for his resuscitation of the 15 month old child of James and Elizabeth Bacon on 24 March 1777. In 1820 the Colchester and Essex Charitable Hospital (later renamed the Essex County Hospital) was built, initially funded by a group of local affluent men who ran it and who appointed, by election, two Honorary Physicians and three Honorary Surgeons who had to be locally practicing doctors. (Ronnie Reid FRCS an outstanding fully trained young surgeon from St Thomas' who settled in Colchester in 1929, could only be elected as hon. Surgeon to the hospital until he had joined a local practice and worked as a GP). While the establishment of the hospital did not ensure medical harmony, it provided an arena where they could observe, experiment and compare their patients, now hospitalised and rule bound, unhindered by having to consider fees as the honorary consultants gave their services free to the hospital.

2. Education

Thomas Cromwell's History of Colchester published in 1825 states: the Medical Society holds four meetings a year at which patients are presented for discussion. The subscription is one guinea to join and half guinea per annum, a proportion of the funds is appropriated to the purchase of books which circulate through the membership which is circa 30 to 40 doctors.

The formation of a Library was an early object of the Society. It started as a circulating book club, for some years situated in a room above a bookseller on the High St. In1843 a more permanent collection was started by subscribing to the Sydenham Society for its reprints of medical classics.

In 1855 the library committee was started, with an Honorary Librarian, whose title was changed in 1907 to "Librarian and Keeper of the Archives" The library expanded with donations of books and important personal libraries. Originally kept in the Doctors' room at the Essex County Hospital, it was later proudly displayed in the Postgraduate Medical Centre, built there in 1965 funded by members of the CMS. Space again became a problem when it had to follow the hospital at its new location in 1986. This was resolved by the CMS placing its collection of circa 500 books on permanent loan to the Essex University Library where it is now archived.

Lectures, discussions and demonstrations were arranged: in 1835 of Baron Heurteloup was invited to the hospital to demonstrate "the then minimally invasive technique" using his lithotrite for bladder stone, which was attended by all the local doctors (as well as the lay committee). Likewise well attended, was the first operation performed under ether anaesthesia by Mr Roger S. Nunn on 12 February 1847, (sadly the patient died the next day, stimulating the surgeon to go to the press giving an account of the event stating that he was supported by most of the medical gentlemen of the town and neighbourhood and that he was writing for the benefit of his medical brethren warning of the danger of suppressing the beneficial effect of pain during surgery).The event gave Colchester an unfortunate place in the history of anaesthesia.

In 1849 Dr Peter Duncan, (archaeologist and scientist who later became professor of Geology at King's College and elected Fellow of the Royal Society) read a paper on chronic pneumonia which was recorded in detail, for the first time, in the minutes and marked the start of case presentations and learned lectures given to the members being recorded . Because" no opinion could be given on a lady with impaired vision as she was seen by candlelight" the rules were amended to ensure that presentations were done before dinner. Mr Meadowcroft brought a case of schirrus of the breast: the sum of the meeting taken on the propriety of an operation for its removal was: seven were favourable and four adverse to it." In 1850 Mr Taylor presented a case of suspected mischief in the chest suggesting that the more obscure medical terms had not yet become standard parlance for doctors as they were often called to give evidence in coroners' courts or to respond to questions on public health and thus used terms understood by all; a few years later the CMS amended its rules allowing Army Medical Officers to be considered members while stationed here, as Colchester had resumed its status as a garrison town.

3. Organisation

Because doctors were essentially working in competition with each other while attempting to set up a cooperative professional union, there were

plenty of opportunities for fallings out. The CMS tried to ensure that individual decisions were kept as uncontroversial as possible and that quarrels were kept private. When in 1861 Mr. William Waylen resigned because he felt he had been insulted by Dr Charles Bree, (ornithologist and virulent opponent of Darwinism), the committee refused to accept the resignation but persuaded Bree to resign because of his ungentlemanly and offensive behaviour thus allowing Waylen to remain, then serenely re-electing Bree a few years later. The same ideals still lingered on in the1970s when the incumbent President invited David Ennals MP, a personal friend and the then Minister for Health, to address the CMS at its dinner. Two well lubricated members made disparaging remarks about him at question time but being a politician, well-versed at being got-at, Ennals took it his stride; not so the President who saw it as a personal affront and went to the press to apologise, vowing to expel the uncouth members, whereupon the CMS rounded on the President for going public on an internal matter, to which he replied: (possibly being an Edith Piaf fan) "je ne regrette rien". Fortunately this having been the last function of his year as president, the matter came to rest on a discordant note.

Before the 1858 Medical Act, doctors were to some extent regulated by the licensing system of the Royal Colleges but the CMS also played a role: in 1843 it decided that Dr Edward Williams (four-times Colchester mayor) had acted unprofessionally by making an annual contract with a patient and also with an apothecary for dispensing all his prescriptions however he did not lose his membership, indeed he became president in 1849. It seems that the CMS was more concerned to establish ethical guidelines rather than pillory on individual who had been caught out.

In1867 it supported the Obstetrical Society's decision to dismiss Mr Isaac Baker Brown from their list of Fellows. He had practised in the nearby town of Halstead before enjoying a lucrative London practice but became notorious for claiming that stimulation of the genital nerve caused mental illness, going on to perform clitoridectomies on women of unsound mind without their or their families' consent. In the face of such scandalous misdemeanours the CMS swiftly closed professional ranks.

The CMS also moved to protect the interests of its members: the cost-cutting efforts of the Poor Law Guardians of the District, in attempting to lure some doctors with contracts at lower fees, met with a stern response from the CMS, the President stating considering their property and education, doctors should not submit to trades' rates of pay but should unite to secure better rates. Similarly a Dr Palmer was asked to explain himself when he offered to attend the local labouring poor for 3d or 6d for home visit (both including

medicine). In 1852 it passed a resolution condemning the practice of homeopathy and any association with it, as unprofessional. In 1858 about 50 of the medical men of Colchester and its neighbourhood were called to an extraordinary meeting to respond to the new Medical Act and they set up a group to take responsibility for checking the qualifications of practitioners. In May 1910 the CMS strongly protested to Mr H.G. Elwes, the Coroner, for his recent attitude towards several medical men in Colchester and even consulted WE Hempson of King St, Cheapside, for legal advice. The correspondence between the two sides was leaked to the Press forcing both parties to meet up to resolve any differences which may have existed.

Conclusion

It would appear that the CMS strove to turn its members into a professional body by improving medical knowledge through reading, discussion and case presentation, thus forming a group of practitioners rather than a collection of competing individuals.

Today the CMS is still thriving with 200 members although, like many similar societies, attracting younger members is not easy. Since 1948 the presidency alternates between consultants and GPs, while changes in postgraduate medical training have relieved the CMS of its educational role. By 1990 all meetings became open (no longer closed to non medical persons), so that spouses and guests can now attend the four annual social events which gives all local doctors opportunities to meet. Dinners are still traditional with a guest speaker, grace at the start and the loyal toast and port at the end, but lounge suits are now permitted!

You are invited to look at our newly-created:
www.colchestermedicalsociety.weebly.com.

*A. Batty Shaw: Medical History 1968.12 P232-244

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Lecturer, University of Essex

CHARLES EGERTON JENNINGS AND HIS CONTRIBUTION TO INTRAVENOUS FLUID RESUSCITATION

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> 'Students, with smiling faces, are rapidly leaving the theatre of one of our metropolitan hospitals. The most brilliant operator of the day has just performed immediate transfusion with the greatest success. By means of a very beautiful instrument, the most complex and ingenious that modern science has as yet produced, a skilful surgeon has transfused half a pint, or perhaps a pint, of blood from a healthy individual to a fellow-creature profoundly collapsed from the effects of severe haemorrhage. Some little difficulty was experienced prior to the operation, as one of the many stop-cocks of the transfusion apparatus was found to work stiffly; but this error was quickly rectified by a mechanic in attendance. Towards the close of the operation the blood-donor, a powerful and heavy young man, swooned. Two porters carried him on a stretcher into an adjoining room, his wounded arm being bandaged up, secundum artem, by energetic dressers. Diffusible stimuli were exhibited by the mouth, nostrils, rectum and skin. The man rallied in due course, being well cared for by a group of students and nurses, deputed to look after him.[1]'

This is the introduction to Charles Egerton Jennings's essay titled *Transfusion: Its History, Indication, and Modes of Application,* first published in January 1883. He describes the operation of directly transfusing blood from one human being to another. Reading through those first few paragraphs, the operation seems to be a complete success and Dr Jennings seems to be very enthusiastic about it. Or maybe not? On reading further the first doubts become apparent:

What would happen if a spectator of this operation finds himself in a remote house in the country on his own, confronted with a case of severe post-partum haemorrhage? He might not possess the required apparatus, or if he does, he might not have it with him. There is little time to find a donor and it is difficult to exclude the presence of communicable diseases. If there is no skilled assistant, the operator has to deal with the many possible untoward events by himself, which jeopardises the success of the operation. This particular situation was one that Dr Jennings was familiar with, as he was frequently dealing with obstetric cases. Charles Egerton Jennings was one of several physicians/surgeons in the 19th century to make a significant contribution to the early development of intravenous fluid resuscitation, but who were largely forgotten later on.

Biography

Charles Egerton Jennings was born in 1859 at Abbey House, Malmesbury in Wiltshire. He was the son of Joseph Cave Spicer Jennings, a general practitioner, and his wife Catherine Jennings. There is no mention of any offspring in the 1861 census; both parents were already 43 years old at that time.[2] Ten years later his parents still live at Abbey House, but Charles is not on the census; he might have been away at school.[3] He followed his father into medicine, as the 1881 census lists him as a surgeon at the London Hospital at the age of 22.[4] Records of the Obstetrical Society of London show that he was elected a fellow of that society in 1882; he is also documented as an MD of the University of Durham and a Fellow of the Royal College of Surgeons of England[5] as well as a Licentiate of the Royal College of Physicians[1]; in the1880s he worked as house physician, resident accoucheur and assistant surgeon in several London hospitals.[1, 5] During these years he published several short articles in the Lancet, all titled: The intravenous injection of fluid for severe haemorrhage[6,7] which are amalgamated in the treatise mentioned above[1] first published in 1883. In this first edition he merely points out the many dangers and complications of blood transfusion and suggests the possible alternative of saline infusions. Furthermore, he also introduces a new and simplified version of an infusion transfusion apparatus, made according to his own specifications. At the end of the same year he published the second edition of his treatise, in which he is more outspoken, suggesting that the use of blood transfusion should be limited to very few cases and an artificial substitute be found for all other patients.[8] A few years later he publishes an article regarding the treatment of cancer, but after that no other publications or evidence regarding his further career can be found.

The records show that he married Mary Jane Dibble at St Marylebone Parish Church on 9th March 1901 at the age of 42. In the 1911 census he is living at Great Somerton, Wilts with his wife; they have no children. He is recorded as retired consulting surgeon, but is stated as employed. No further information regarding his career is available. A second marriage in 1923 to Florence Emma Hutchins is recorded at Malmesbury. C.E. Jennings died on 13th March 1930. His effects go to his wife Florence: £94 9s 9d, which seems very little for a retired surgeon.

History of transfusions and infusions

In the second chapter of his treatise, C.E. Jennings states that the first attempted blood transfusion goes as far back as 1492, when Pope Innocent VIII was transfused the blood of three boys on his deathbed. The operation was a complete failure: all three boys as well as the Pope died.[1]

After discovery of the circulation by Harvey in 1628, several people attempted transfusion: Lower successfully transfused blood between two dogs in 1665, a method that was previously conceived in France in 1651.[1] In France Denis, Emmerez, Des Gabets and Tardy tried similar experiments between 1658 and 1667: they transfused successfully between dogs with their purpose-built transfusion apparatus and also between calf and dog. Finally, in 1667 they attempted a transfusion from calf to human, which failed as the patient died after the second transfusion. This case led to court proceedings, which resulted in severe restriction of blood transfusion. In the same year transfusion between lamb and man was performed in England; the outcome is unclear.[1]

Infusions of fluids and drugs were first mentioned in 1615 and were performed by several physicians during the 17th century, amongst them Sir Christopher Wren; their effect seems to have been unreliable so they went out of fashion very quickly.[1]

Until the beginning of the 19th century the practice of transfusion as well as infusion remains erratic.

In 1818 the English obstetrician and physiologist James Blundell began advocating the use of human blood transfusion for the treatment of life-threatening collapse following (obstetric) haemorrhage. During the nineteenth century blood transfusions in England seem to be almost exclusively used in cases of obstetric haemorrhage and therefore research was mostly done by obstetricians in an empirical fashion, as interest in laboratory-based physiology research was very little in England until the latter part of the 19th century. It became obvious that transfusion of blood was fraught with many complications, some of them fatal. Amongst them were air embolism, blood clotting in the apparatus or the patient and donor-specific problems: finding a donor, disease transmission, fainting of the donor. Other problems were the complicated nature of the operation with the need for skilled assistance, the sometimes difficult venous cannulation and the limited amount of blood that could be taken from one donor.[1,8] Review of the available data shows that only about 47% cases were successfully treated with a blood transfusion, in 14% there was a temporary benefit and in 39% the operation was a complete failure. In a certain number of cases the treatment would lead to severe reactions such as haematuria and renal failure, rigors and pyrexia. These reaction were especially severe if animal blood was used this was therefore abandoned in England.[1] In this context it is important to note that the ABO blood classification was only described in 1901 by Karl Landsteiner.

All these difficulties lead to the search for alternatives to blood; in America milk was tried with little effect, in Germany, lamb's blood. In England experiments were done with defibrinated blood or with addition of sodium phosphate to prevent blood from clotting, but the results were not encouraging.[8] Others tried modifying the apparatus to make the transfusion easier and safer to perform. By the 1870s the rising number of options of fluids and apparatus led to confusion. Therefore the OSL commissioned a report to look into the evidence of transfusion with the view of making recommendations. E.A. Schaefer, a physiologist of University College was engaged to do this report. He performed studies with animal blood and milk, both of which he dismissed: milk as having little effect and carrying the risk of bacterial transmission and animal blood leading to dangerous reaction. He did not see the need to test saline solutions and dismissed them as being useless, as, in his opinion, it was the loss of nutritive function and not the loss of volume that lead to the collapse in haemorrhage, as the body itself was able to mobilise fluid from the tissues to restore the volume. When his report came out in 1879, he maintained that human blood was the best available fluid to be transfused in case of haemorrhage.8 Saline infusions had been successfully used for fluid resuscitation the first time during the cholera epidemic of 1831. William O'Shaughnessy, a 22-year old graduate from Edinburgh suggested treating the effects of cholera, as the cause was unknown. In the advanced stage of the disease there was universal stagnation of the venous system and cessation of arterialisation of the blood. He analysed the blood and faeces of cholera patients and found that the blood was unchanged in structure, but had lost a large proportion of its water and neutral saline ingredients, which could be found in the patient's faeces. He suggested giving a saline solution intravenously to replace what was lost. It was Thomas Latta (and not O'Shaughnessy), who first applied it to his patients; Lewins and others followed. The treatment was curative in only about one third of cases, because in many patients there was an initial improvement, but the patient died nonetheless. It was often given too late when the patient was already moribund and then the fluid boluses weren't repeated often enough to maintain fluid balance when the diarrhoea recurred.[8,10,11] The cholera epidemic subsided in 1832 and the interest in intravenous saline infusions vanished rapidly, as the main pioneers either died shortly after or turned their mind to other things. In England only W.J.Little continued to try saline infusions in various compositions during cholera outbreaks in 1848 and 1866.[8,12]

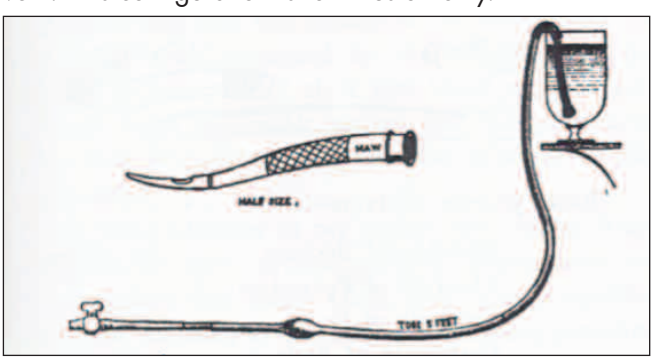
Other forms of fluid treatments used occasionally were proctoclysis, infusion into the rectum, and hypodermoclysis, subcutaneous infusion. These were obviously easier and quicker to perform and the fluid could be prepared

easily, usually a pint of water with a dram (teaspoon) of salt. Proctoclysis is mentioned more frequently in the literature, but its success seems to have been variable. Especially in cholera, for reasons obvious to us today, it failed to have any benefit.

Shift from blood transfusions to saline infusions

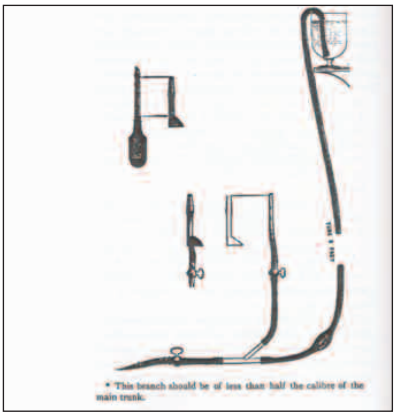
In 1882 C.E. Jennings was relatively new to transfusion, but he was at once struck with the complicated nature of the transfusion operation, which in his view made it unsuitable to be done in an emergency, in a remote location as a sole operator. He also realised, as others had on the continent, that it was the fluid loss and volume depletion of the circulation occurring in severe haemorrhage that lead to the life-threatening collapse of the patient and not the depletion of haemoglobin and loss of nutritive function as previously thought (in this he directly contradicts E.A. Schaefer's report of 1879).[1, 8] Therefore the limited amount of blood (about six ounces) one could transfuse from a single donor is not enough to compensate the volume loss and therefore would only have a temporary effect which he corroborates with a case report. It was his own clinical experience that made him realise that the timely infusion of a generous amount of saline-alcoholic solution (about 16 ounces) would resuscitate the patient well enough to achieve good uterine contraction leading to haemostasis. The easy preparation of the solution and the simpler technique made it suitable to be done by a single operator, at the same time avoiding many of the complications of blood transfusion.

On the last few pages of his treatise Jennings introduces a new combined infusion-transfusion apparatus made to his specifications. It consists of a five feet long tube leading from the receptacle to the patient with a rubber bulb for priming, a short glass tube for observing flow and a stopcock at the patient end. The cannula is also specially designed with a bent tip for ease of insertion and to reduce the risk of perforating the posterior wall of the vein. This configuration is for infusion only.[1,6]



Infusion apparatus developed by C.E. Jennings.[1]

If a Y-piece replaces the glass tube, the apparatus can be used for combined infusion and transfusion, should a donor be available. The donor can be connected through a short rubber tube fastened to one Y-arm with the view of giving saline and blood simultaneously, which reduces the clotting risk. In case of the donor fainting, the stopcock can be turned off at the patient end and saline be given to the donor to revive him.[1, 7]



Combined infusion-transfusion apparatus developed by C.E. Jennings[1]

The combination apparatus in action[1]: on the right the donor and on the left partially visible the patient.

Further development

C.E. Jennings' propositions were taken up fairly rapidly with several authors publishing case reports of successful resuscitations. Within a few years it became well recognised that blood transfusion was not routinely needed for resuscitation after haemorrhage.[13,14,15,16]

At the same time the search for an ideal saline solution began (and still goes on today).[8,17,18,19] It became obvious that none of the proposed solutions was ideal and that their volume effect was too short-lived. In the early 20th century severe trauma became more common due to the advent of the motorcar and the mass trauma of the First World War. Around the same time the research into infusions and transfusions moved away from clinicians to laboratory-based physiologists. Various alternative saline and glucose solutions were introduced and dismissed again. In 1916 William Bayliss, one of the prominent physiologists of his time, found, what was in his opinion, the ideal blood substitute: gum acacia in saline. However, the surgeons in the field hospitals in France did not use it, but reverted to blood transfusions. So blood transfusion had a renaissance, but this time with better success and at the same time much safer due to the more advanced understanding of physiology.

Appendix

C.E. Jennings's solution used for infusion[20]	In modern equivalents:
50 grains chloride of sodium	Na190mmol/l; Cl 101mmol/l
3 grains chloride of potassium	K 5 mmol/l
25 grains sulphate of soda	Sulphate 19 mmol/l
25 grains carbonate of soda	Carbonate 26 mmol/l
2 grains phosphate of soda	Phosphate 2 mmol/l
2 drachms absolute alcohol	Alcohol 12 ml/l
In 20 ounces of water	568 ml

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THE LIFE AND DEATH OF BLIND NASAL INTUBATION

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In my judgement the most useful "trick of the trade" for an anaesthetist is the ability to insert a tube in the trachea without recourse to laryngoscopy whenever this is desirable. (Gillespie) [1]

Introduction

Blind nasal intubation is a technique of intubating the trachea that was first described in the early twentieth century. It enjoyed much success during the mid-part of that century but its use was eclipsed by the changing face of anaesthesia. Indeed few anaesthetists in the UK use the technique now and in many departments the practice has already become one of legend.

The subject is interesting for several reasons. Firstly the technique itself; it requires little but an endotracheal tube and a skilled anaesthetist. Secondly the technique came hand in hand with several innovations which we use today such the Magill endotracheal tube and endotracheal to-fro anaesthesia. Lastly if we look at the lifetime of blind nasal intubation it gives quite an elegant overview of the development of twentieth century anaesthesia especially that of endotracheal intubation and anaesthetic agents.

Setting the scene

During the first quarter of the twentieth century open drop ether was the most common general anaesthetic.[2] Many anaesthetists and surgeons frowned upon any complicated form of anaesthesia and this especially pertained to endotracheal intubation. At the time laryngoscopes were straight bladed and were used to directly lift the epiglottis. This required very deep planes of anaesthesia which were often far greater than what the surgery required. The usual picture was a coughing, bucking patient wet with respiratory secretions, a frustrated anaesthetist and an exasperated surgeon. Many anaesthetists thought intubation was not necessary when open drop methods provided a much suitable and less fraught experience.[3]

There were however cases where intubation of the trachea was required. These included thoracic surgery, operations on the head and neck and as a form of artificial respiration. In 1909 Meltzer and Auer published their work on respiratory insufflation which paved the way to insufflation anaesthesia.[4-6] Insufflation anaesthesia involved the passage of a narrow

elastic catheter into the trachea via direct laryngoscopy through which a continuous stream of air-ether vapour was insufflated. The stream would drive air out of the alveoli and in turn provide ventilation without the need for respiratory movement.

The popularity of the insufflation technique was limited by the difficulty in placing the endotracheal tube via direct laryngoscopy[7], the catastrophic risk of death through lung rupture[8] and the infrequency of the aforementioned indications. However as a result of the First World War there was a surplus of patients who required insufflation anaesthesia.

Magill, Rowbotham and Gillies

In 1918 Ivan Whiteside Magill and Stanley Rowbotham were appointed as anaesthetists in Sidcup with the eminent plastic surgeon Sir Harold Gillies. The surgeon was working on many post war casualties and required unrestricted access to the airway. Gillies suggested that the two young anaesthetists made use of the endotracheal insufflation technique. It was soon noted however that insufflation anaesthesia proved to be incredibly messy with blood and anaesthetic vapour spilling back into the surgeon's view and face. Magill and Rowbotham countered this by passing a separate tube for passage of expiratory gas, the so called "two tube method of anaesthesia".[3]

Oral intubation was counterproductive to the type of surgery and in 1920 Rowbotham published his work on oral and nasal intubation alluding to blind nasal intubation[9]:

Occasionally, when the catheter is passed through the nose with a wire in it, as described above, and pushed on, the cough characteristic of its passage into the trachea occurs, and, on inspection, the fact that it has actually passed between the cords is confirmed.

The two tube method proved successful but was uneconomical with high flows required and nitrous oxide being a popular agent but frightfully expensive at a cost of eight shillings an hour! To help this Magill started using a widebore tube and bidirectional valves so that oxygen and gases could be inspired and expired through the same tube, otherwise known as to-fro endotracheal anaesthesia. The pharynx could be packed so that blood, secretions and gases would not bubble back and obscure the view point of the surgeon and aspiration was avoided.[10] In an interview with Cyril Scurr, Magill reflected on his endotracheal tube.[3]

... you take ordinary drainage tube which is soft, it hadn't got the necessary quality. But I found that commercial rubber tubing which is used for gas and that kind of thing had the necessary characteristics. It was thin in the wall and had a certain amount of resistance to external pressure ... the rubber was stored in coils which gave it a natural curve as you see which lent itself very well to the air passages. And to make a tube was a very simple matter. All you had to do was cut off the end at an angle of 45 degrees and take a piece of any old rough stuff like emery paper. Take of the edges like that. And when you've got it smoothed off, well, you had yourself an endotracheal tube.

These tubes proved to make the job of blind nasal intubation somewhat easier and Magill referred to his technique in the Royal Society of Medicine in 1928 and went onto describe it fully in 1930.[10-11] In both papers he describes the importance of pre-cocainization of the larynx and in 1930 during the Ninety-eighth Annual Meeting of the British Medical Association he said that he would not hesitate to employ CO_2 to widen the vocal cords.[12] In a film made in 1944[13], Magill described his technique of blind nasal intubation:

After induction of anaesthesia the tube is passed along the floor of the nose until the breath sounds are heard at maximum intensity. The tube is then advanced during inspiration.

The golden age

Blind nasal intubation became a popular technique especially in the UK. In the 1938 anaesthetic text book Modern anaesthetic practice blind nasal intubation was the preferred technique with oral intubation reserved for when the blind nasal approach had failed or was contraindicated because of the operative site.[14] Noel Gillespie was a particular advocate of blind nasal intubation. Between 1932 and 1939 of 660 intubations that he performed 441 were by blind nasal intubation.[1] In the same paper he also alluded to the early popularity of blind nasal intubation in the UK by citing that one of the reasons for the absorption technique failing to take off was because it makes blind nasal intubation more difficult. During this golden age Magill was of the opinion that when the choice of route was free, the nasal route was preferable owing to the ease with which the tube could be passed without opening the patient's mouth.[11]

This golden age of blind nasal intubation was short lived. Many new drugs and practices were introduced in the twentieth century. Some made blind nasal intubation a more difficult procedure; others made its rival, direct oral intubation easier.

The changing face of anaesthesia

In the 1930s cyclopropane was introduced into practice.[15] It became a popular inhalational anaesthetic because of its sweet smelling properties and reduced risk of nausea. It did however depress the respiratory drive making for poor blind nasal intubation conditions.[16] Coupled with this its expense warranted the use of closed anaesthetic circuits using Waters' and Guedel's cuffed endotracheal tubes, and Water's carbon dioxide absorption can. These cuffed tubes were more appropriately placed orally. Gillespie claimed that one of the reasons that blind nasal intubation did not take off in America was the popularity of cyclopropane.[16]

In 1934 Waters and Lundy – working independently – used the barbiturate thiopentone in man.[17] It was used in short peripheral procedures or as induction agent with maintenance by another agent. Unfortunately because of airway irritability laryngospasm was commonly encountered with blind nasal intubation under thiopentone anaesthesia.[18]

In the 1940s two developments made direct oral intubation somewhat easier. In 1943 Macintosh published his paper referring to his laryngoscope which lifted the epiglottis indirectly.[19] With this much lighter planes of anaesthesia could be used during intubation. Around the same time curare was introduced into practice.[20] It made for much easier laryngoscopy conditions and at the same time sabotaged the usual strategy for blind nasal intubation, namely listening to breath sounds.

Further difficulty with the technique came from the loss of both the red rubber tube and the conditions which would give suitable hyperpnoea. By the 1950s polyvinyl chloride (PVC) tubes had progressively started to replace red rubber tubes. Compared to the red rubber tubes PVC tubes were difficult to manoeuvre into the larynx via blind nasal intubation.[21] Early descriptions of blind nasal intubation refer to using ether and carbon dioxide to cause hyperpnoea making blind nasal intubation easier.[22] Both were phased out (the former with agents that depressed the respiratory system) and with it the traditional gold standard conditions.

With all of these innovations and developments the field changed for blind nasal intubation. Magill revised his original views and felt that blind nasal intubation should be reserved for cases where oral intubation is contraindicated.[13] The change in view amongst the anaesthetic community was best illustrated by looking at the core anaesthetic texts of the time and their subsequent editions. In Lee's third edition of *A Synopsis of Anaesthesia* he gives no preference to oral or nasal intubation stating that one should do whatever they deem to be easier.[18] In 1964 this had changed with direct oral being the method of choice.[23] In the 3rd edition of *Essentials of*

General Anaesthesia blind nasal intubation had been described first with direct oral intubation thereafter.[24] In the 4th edition, direct oral was described first.[25]

The difficult airway and other niche areas

Despite the above blind nasal intubation still endured well into the latter half of the twentieth century. It adapted to the changing times with it being used following thiopentone and suxamethonium induction,[26] as well as some forward thinking teams even modernising the technique using trans-lumination[27] and microphones[28] to help guide the tube in and doxapram to help improve conditions.[29]

Blind nasal intubation carved several niche areas for itself. It was used in paediatric dental cases where control of the airway and rapid case turn over leant itself to inhalational induction of the then popular agent halothane followed by blind nasal intubation. Where it really came in to its own however was in the management of the difficult airway with many descriptions of its use in this context especially in the awake patient.[30]

However the coming of two innovators soon hounded the technique out of use. In 1966 Murphy introduced fibreoptic intubation.[31] The popularity of the technique grew and it is now a core skill of training anaesthetists and for many it is the default procedure for managing the difficult airway. The advent of the laryngeal mask[32] soon meant that the practice of quickly popping in an endotracheal tube blindly for a dental list with no muscle relaxant was no longer required.

Today

Blind nasal intubation is still practiced in other countries, especially those which do not have ready access to fibreoptics.[33,34] However in the UK the skill, drugs and equipment favour other methods of airway maintenance. I recently interviewed several anaesthetists in my own hospital both practising and retired who were familiar with the technique. Not one said it had a place in modern anaesthesia. The same view was shared by the lead authors of the NAP4 audit.

I sent out a survey to trainees in the Anglia School of Anaesthesia asking about their experience of blind nasal intubation. Out of the 55 respondents three quarters had performed the technique but of that number half had done so on less than six occasions. As Gillespie put it you need to perform *thousands* of intubations to become proficient.[1] This is one of the last and arguably most brutal blows to blind nasal intubation; experience and training. In my own department it is a technique spoken of almost like it

were legend. How can blind nasal intubation endure if so few practice the technique commonly enough to pass on the necessary skills to the next generation of anaesthetists?

Interestingly in the aforementioned survey of trainees over half claimed that blind nasal intubation has a place in modern anaesthesia. Likewise a recent text on anaesthesia for oral surgery claims it is still an important skill since it may help secure an airway when other techniques have failed.[35]

But if we wanted to perform it more often could we? Blind nasal intubation has a variety of risks associated with it. Firstly it is blind with all of the inherent risks of a blind procedure. In this case damage to the larynx in rough hands. Secondly the tube is passed *nasally* with all of the risks of trauma and infection that that entails. Today how can one justify performing a procedure where several more suitable and arguably safer alternatives exist?

Conclusion

A century ago blind nasal intubation was the right technique at the right time that helped popularise intubation and came hand in hand with to-fro endotracheal anaesthesia and the forbear of our modern endotracheal tube. Through modernisation of anaesthetic practice the indications for blind nasal intubation has grown thin and the current environment has made the technique arguably harder to perform. In the UK it is a dying art that evokes much nostalgia.

However it must be noted that in some instances something that was once thought obsolete occasionally makes a comeback such as the use of nitrous oxide in the late 19th century.[36] A revival of blind nasal intubation may happen especially considering the technological advances in radiologically guided techniques. It would however have to lose the prefix and in doing surely its own identity.

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INSIGHT (anaesthetic) INTO NINETEEN EIGHTY-FOUR

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Read by Dr C N Adams in the enforced absence of Dr McKenzie

George Orwell's famous book *Nineteen eighty-four* was a landmark in English literature, introducing the now common expression "Big Brother". It seems that in writing this depressing novel, Orwell was influenced by a tragic anaesthetic death in 1945. This paper investigates the facts.

"George Orwell" was the pseudonym adopted by Eric Arthur Blair in 1933 for his first book. In 1936 he married Eileen Maud O'Shaughnessy, who accompanied him to Barcelona the following year to support the Republicans in the Spanish Civil War. Despite suffering from tuberculosis, Orwell was a respected journalist during the Second World War. While he was away in Europe as a war correspondent in 1945, Eileen became ill in England and was scheduled to have a hysterectomy in Newcastle. Sadly she died after induction of anaesthesia – the surgery did not even start.

Shocked to receive a telegram that she was dead, Orwell took a military flight back to London and thence travelled to Newcastle. Accounts reveal that he was inwardly devastated by Eileen's death. He arranged her funeral in Newcastle, then visited the cottage in Wallington where she had lived and came upon old letters which made him recall the poverty, suffering and danger he had put her through – filling him with guilt. After organizing temporary care for his adopted son Richard, he returned to work as a war correspondent in Occupied Europe. On returning to London he lived with Richard in a cramped flat in North London.

In August 1945 *Animal Farm* was published: the success of this satire made Orwell famous and transformed his life. He wanted a better environment for little Richard and a visit to the Hebridian island of Jura convinced him to move there. In 1946 he and Richard settled into a farmhouse at Barnhill at the north end of the island. Still in the aftermath of Eileen's death he began in the summer of 1946 to write another satire. He completed the first draft in 1947 and revised the whole novel in 1948. A transposition of two numbers in that date gave the title "1984". The book was published in 1949. Bearing in mind the profound blow of his wife's untimely demise, a number of passages seem to be the printout of Orwell's nightmares of her final moments before her "anaesthetic death", perhaps semi-conscious. These are examined in detail.

Orwell died of tuberculosis in January 1950. The standards of anaesthesia in the 1940s are reviewed and the implications on Orwell considered.

Abstract of a paper to be read at the 8th International Symposium on the History of Anaesthesia in Sydney January 2013

PROPOFOL – FOR MIGRAINE OR MURDER ?

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This Society has maintained an interest in cases in which anaesthetic agents, or other drugs in the anaesthetist's armoury, have been used for criminal purposes. This interest has been evident even if the cases are of comparatively recent origin. Thus our 2008 meeting included papers on multiple murders over the period 1965-6 using curare[1,2] and in 2009 we had two accounts: one of a succession of murder cases using succinylcholine (1962-2006)[3] and another of murder by pancuronium in a veterans' hospital in Michigan, USA, in 1975.[4]

The first part of this paper concerning a suspicious death in 2005 outlines the facts of the case and the second part reflects on the advances in forensic analytical chemistry over the period 1965-2005, with particular references to developments in the technique of mass spectroscopy. In 1965 its application failed to secure a conviction,[1,2] but in this present case, 40 years later, it did.

A case of murderThe facts of the case are easily put together from contemporary newspaper reports,[5] a scholarly paper[6] and a Channel 5 television documentary screened in 2009.[7] In November 2005 a healthy 24 year old Florida student named Michelle Herndon was found dead on her bed. At first sight there were no suspicious circumstances. There was no suicide note, no apparent evidence of a violent attack and no evidence of alcohol or drug abuse. However, a perceptive pathologist was intrigued that the corpse had been found face-downwards, with the arms curiously positioned beneath the body. She recollected that in the cases of "death by natural causes" occurring in bed, the patient dies either lying on his/her back, or on the side – never face downwards. Suspicions having been aroused, a painstaking examination of the body revealed a minute, fresh, puncture wound and slight associated bruising in the left antecubital fossa. A search of the victim's home showed no drug-taking paraphernalia but detectives explored further and found, bagged up in the rubbish bins associated with the housing complex, items that obviously connected to the victim. But alongside these were found two empty 20ml vials of 1% propofol together with a syringe and a child's IV line. The next two steps were firstly to connect the propofol to the victim's death and secondly to establish the circumstances of its administration. Mass spectroscopy, allied to gas chromatography, is a recent, powerful analytical tool and this soon confirmed the presence of the anaesthetic in the body. This aspect of the case will be amplified in the second part of this paper.

The vials of propofol bore bar-codes and batch numbers that enabled them to be traced back to the intensive care ward at Shands Hospital, Florida. Here drugs were obtained not from a cupboard on the wall, but from an automated drug dispenser, access to which required the nurse or physician to enter his/her fingerprint on the integral reader. The associated computer recorded the drug dispensation, the time, and the owner of the fingerprint. This was revealed to be a male nurse, Oliver O'Quinn, who worked at the hospital. Realising that the net was closing, he fled the country but was apprehended in June 2006. In May of 2008 he was tried for murder. His defence was that the victim, known to be a sufferer from migraines, had appealed to him for help. Propofol was, and remains, an experimental treatment for migraine and a Google search that connects both the drug and the disease presently comes up with almost 2.5 million hits. Typically the migraine is treated with a sub-anaesthetic dose of propofol (120mg) delivered intravenously over a period of 30 min.[8] Either due to an unwitting overdose, or due to an unanticipated reaction to the drug, the student had died. O'Quinn then panicked and sought refuge firstly in Ireland and secondly in Senegal. The jury rejected his defence. He was found guilty of first-degree murder and sentenced to life imprisonment without the possibility of parole. As for his motive, the prosecution alleged that he wanted to have a relationship with the victim, but when he heard that she was privately ridiculing him, he set upon his murderous plan to ensure that she would never have a relationship with anyone, ever again.

Developments in analysis

The victim had a blood propofol concentration of 4.3 g/ml,[6] almost certainly connecting her to the vials of the anaesthetic found in the trash-can. To put this in perspective, and to show the sensitivity of the method used in its determination, a single grain of granulated sugar has a mass of about 100 g. Kirby et al do not identify the technique they used, but the television documentary shows, fleetingly, a machine which we take to be a table-top gas chromatograph/mass spectrometer *(Figure 1)* and one of its associated output traces *(Figure 2)*.

Fig. 1 A table-top gas chromatograph/mass spectrometer

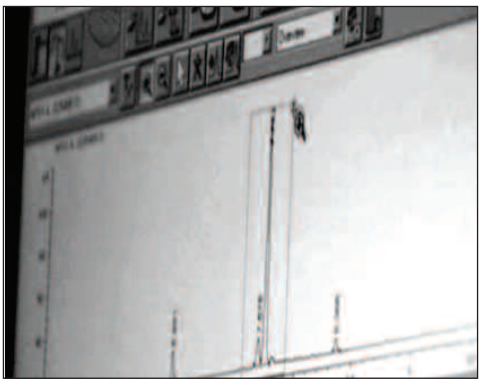

Fig. 2 The GC output trace from the GC/MS machine shown in Figure 1

One of us (AD) used mass-spectroscopy to identify molecules in the late 1960s. The machine took up most of a small room and gave inferior results compared to the miniaturised versions of the late 1990s. Both work by bombarding a molecule, usually with an electron beam, and breaking it up into numerous charged fragments. The relative masses of these positive ions (denoted on the m/ze axis), together with the relative intensity of each, give a fingerprint for the molecule. That for propofol, together with its formula, is shown in *(Figure 3)*.

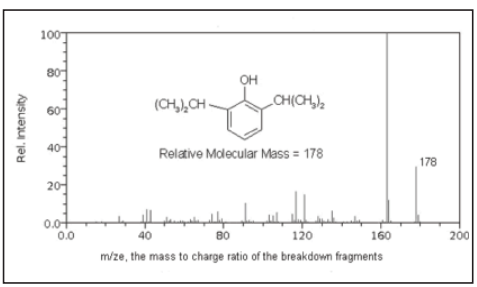

Fig. 3 Mass spectrum of propofol where m = the relative mass of a fragment and z is its charge. In most cases z = +1.

But is the fingerprint unique to a particular molecule, making an unambiguous connection ? The answer must be a *qualified "yes"*. However, in the cases of molecules similar to propofol, say having the groups located in different positions round the benzene ring, these species would give identical (or almost identical) mass spectra. Defence lawyers are well aware that qualification in a specialist's assertion can be used profitably to sow seeds of doubt in a jury's collective mind. Mass spectroscopy was used to analyse for curare in the Jascalevich case of 1965/6. The analyst called as a prosecution expert witness chose to err on the side of caution when asked by the defence counsel to comment on the helpfulness of his mass spectrometric technique. It would be unfair to connect the defendant's subsequent acquittal solely to this particular transparency (or "defect") in the prosecution's case, but nevertheless, acquitted he was.

By the late 1980s the mass spectrometer had become miniaturised. Earlier machines separated the ion fragments, made by bombarding the molecule, by exposing them to a magnetic field whilst travelling through an evacuated tube some 2m in length. They were deflected by the field and then recorded

on a galvanometer assembly, the mirror of which twisted under the ions' impacts. An ultra-violet pencil beam bounced off the mirror and on to a roll of sensitive paper 1-2m in length, producing a series of blips. These constituted the mass spectrum. The later bench-top machines, as typified in Figure 1, separated the ions by a different process. They were made to oscillate centrally along an electrical field within an assembly of four parallel electrodes (approximating in size to a student's pencil case).9 Developments in electronics, with miniature chips replacing valves, and computer displays of the spectrum rather than long light-sensitive photographic film records, added to the user-friendliness and the table-top nature of the machines. However the outcomes from both the earlier magnetic sector and the later quadrupole machines were essentially the same: a bar chart similar to Figure 3.

If the analyte mixture was volatile, even at elevated temperatures, then its vapour could be passed under the influence of a carrier gas (usually helium) down a fine capillary tube, typically 10-60m in length and 0.25mm bore. The inner surface to the tubing was coated with some form of gum or involatile oil. Some of the analyte molecules would have an affinity with the gum or oil and would be held back, whereas other would travel through relatively unmolested. This meant that, having been introduced to the column as a single "slug" or bolus, they would separate as they travelled the tube, appearing one by one at the exit at different retention times. Then, once they appeared, they would immediately enter the mass spectrometer for "finger print" recording. The retention time (for a particular gas chromatograph, with fixed parameters of temperature, helium pressure, column length etc) would be unique to the analyte molecule. So if you suspected the presence of propofol in a sample, you injected a small amount of genuine propofol into the machine and recorded the time (retention time) for it to elute to the mass spectrometer. If, within your analyte sample you had a species eluting with exactly the same retention time, then there was a good chance that it was propofol. Then, subsequently, if the two fingerprint mass spectra matched (that for propofol and the analyte species in the now-separated mixture) as well as the two retention times, then at least one of us would be prepared to assert in court that the two molecules were the same. Certainly, in the case here under review, the defence raised no challenge to the forensic evidence used to identify the propofol present in the victim's blood.

A fatal dose?

The blood concentration of propofol in the victim (4.3 g/ml) is that which would be expected typically from a bolus induction dose of 2.5 mg/kg of

body mass.[6] The victim weighed 60 kg and this would necessitate an induction dose of 150mg. This equates to 15 ml of the propofol emulsion that would have been earlier contained in one of the empty vials. The half-life of propofol in plasma is reported to be as short as 2 to 4 minutes.[10] It will be significantly longer once metabolism ceases or slows down on the patient's death. Now it is unlikely that an overdose of propofol will result in instantaneous death, so a dose in excess of the 15ml must have been administered and it seems reasonable to assume that the contents of both the 20 ml vials had been injected. Is a 40ml bolus injection of propofol a fatal dose ? This anaesthetic was developed because, in contrast to several of the substituted phenols tested for potential intravenous anaesthetic usage, it was recognised to have an attractive margin of safety.[11] Given the resources of an anaesthetics department, an overdose of this magnitude would have been survivable. However, apnoea is known to be fairly common consequence of induction using propofol even in the cases of "therapeutic" administrations. Airway obstruction is also a feature of induction by propofol. Naturally, *untreated* prolonged ventilatory cessation will have fatal consequences for the patient/individual.

A fair verdict?

These observations clearly link the victim's death to propofol and demonstrate the remarkable sensitivity of modern gas chromatography. However, they don't answer the key question for the court – was the propofol administered with murderous intent? Or, as in the Michael Jackson case, was it administered with perhaps misguided intent and inadequate care? If her death was accidental, one might have expected the accused to have attempted resuscitation – and thus the victim would have been on her back. We will never know how the jury reached their conclusion, but on 23rd May 2008 they determined that the killing was intentional, and the judge delivered a sentence of life imprisonment without parole.

Acknowledgement

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"NO PASARAN"

Who provided anaesthesia care for the wounded International Brigaders in Spain? (Abstract)

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Rowan Sill, BA. Columbia Presbyterian Hospital, New York, NY.

Sixty thousand young men and women from across the world joined the International Brigades in 1937 and selflessly fought alongside the Spanish people in a valiant attempt to defeat the forces of fascism. Like their Spanish comrades, many were injured and many died. This project seeks to understand the organization and nature of the anaesthesia care provided to internationalists who fought in Spain.

Currently, little is known of anaesthesia care, this information lying concealed within the dispersed Brigade archives, such as those held by New York University's Tamiment Library, the British Library, and Stanford University Library's Special Collections and at the Imperial War Museum.

The International Brigades medical endeavour was substantial and included as many as 240 doctors and 1200 nurses as well as stretcher bearers and ambulance drivers - all organized within the Service Sanitaire International. Spanish Medical Aid Committee charities provided 9 motorized operating theaters, 13 completely equipped surgical units, and equipment for hospitals such as that of the American Abraham Lincoln Battalion at Romerol. Teams were capable of conducting major surgery close to the front line.

The American Abraham Lincoln Battalions and the British Battalion – components of the legendary fifteenth International Brigade – first saw action at the Jarama River, a victory that saved Madrid from encirclement by fascist forces. Fractures, head and face injuries, vascular lacerations were common place. Within the abdomen, a bullet or piece of shrapnel might go 'twenty times through the coils of the small intestine'. The medical teams were never safe as hospitals attracted fascist bombers, including German Stukas. Although medical team members' memoirs provide modest accounts of their experiences, knowledge is limited and that of anaesthesia experience is seemingly unknown. Furthermore, George Orwell in *Homage to Catalonia* says nothing of anaesthesia and surgery for the fascist bullet wound to his neck.

An eminent Commonwealth anaesthetist, who by peculiar circumstance, briefly acted as consultant to the fascists, provided descriptions of anaesthesia for wounded Franco's military conscripts. Although ether and

ethyl chloride were administered by nurses using Ombreddanne modified Clover inhalers and an early barbiturate, Evipan, was available, anaesthesia machines and endotracheal tubes did not exist. In contrast oxygen cylinders, Boyle like anaesthesia machines, endotracheal tubes and modern techniques presumably accompanied the British and Americans to Spain. Furthermore, Norman Bethune and Spanish colleagues had developed a sophisticated and effective blood transfusion service.

It is intended that the current project will provide insight into the nature anaesthesia care provided by International Brigades and remove from obscurity those heroes who, in the worst of circumstances, provided anaesthesia in the face of fascism's tyranny.

Dr Sill regretted that pressure of work prevented him from supplying his interesting full paper.

CAPTAIN G T SMITH-CLARKE: ENGINEER EXTRAORDINARY

*(Reprise: HAS Proceedings Vol **1/2** p.6 July 1986)*

Dr Adrian Padfield, Past President,
and Retired Consultant Anaesthetist, Sheffield.

This is an update with additional details about a man who though primarily an automobile engineer was influential in medicine including anaesthesia. At shortish notice and briefly, I gave a paper at the inaugural meeting in Reading in 1986. Over the 26 years since I've discovered many facts about this talented engineer and my admiration for him has grown. I may have become an authority on Smith-Clarke but nonetheless I still get new information. Perhaps, because of his entry, which I wrote, in the Oxford Dictionary of National Biography[1], I've had queries from a number of disparate individuals, mainly about his involvement with astronomy but most recently from a descendant of one of his siblings (He had no children).

He was born on 23rd December 1884. His birth certificate shows 'Smith' as one of his forenames; without the hyphen which was added later. In the 1901 Census when he was 16 he is living at the same address; occupation 'Chemist Messenger'. He joined the Great Western Railway in Swindon the next year. *(Figure 1)* shows a small paragraph from the GWR Magazine in June 1911. I've looked at the Commercial Motor in the British Library Newspaper division at Colindale; each weekly issue had 'Contributions from Drivers and Mechanics' towards the back. A prize of ten shillings (50p) was awarded for the best entry. In 1910 Smith-Clarke won the prize seven times, a total of £3.50 and on 15th December won the 1910 Bonus award of two guineas = £2.10. I've no idea how much his weekly pay was but this would have been a useful amount just before Christmas.

Figure 1

Slough.

MR. G. SMITH CLARK, tester in the motor-car repair shops, has achieved the distinction of winning the prize offered by the "Commercial Motor" for the largest number of best mechanical suggestions sent in during the year 1910. As this competition was open to motor drivers and mechanics throughout the United Kingdom, it is a matter for congratulation that a Great Western employé should have won it.

(By kind permission of the Steam Museum, Swindon)

Figure 2

Figure 3

GREAT WESTERN RAILWAY MAGAZIN

106

War Items

REMARKABLY good work for the Government has been done by Captain G. T. Smith Clarke, formerly in the Motor Car Department at Slough. Early in 1915 he tried repeatedly to get into the Army, but for reasons of health was not accepted, and later he joined the Aeronautical Inspection Directorate. He was sent to the works of the Daimler Co., and placed in charge of the testing and subsequent inspection of the R.A.F. engines then being manufactured. Shortly afterwards he was promoted to the rank of chief examiner and given charge of the acceptance testing for the whole of the Midland District. In August, 1916, he was advanced to the rank of Assistant Inspector, given a commission as 1st Lieutenant, and placed in charge of the A.I.D. Coventry District (Engines). April, 1917, brought him promotion to Inspector of Engines, with rank of Captain. He was responsible for the materials, inspection, and testing of some 12,500 aero-engines of all types and varying in horse-power from 80 to 700. He installed metallurgical and chemical laboratories, designing his own apparatus. He was responsible for inspection at the works of 173 contractors. In one month the output of engines was 835, with equal to another 500 in "spares".

Captain Smith Clark was also responsible for the inspection of something over half the magnetos manufactured in this country; and has carried out a great deal of experimental work in connection with carburation. He introduced to the Government the G.W.R. system of jet calibration and measuring flowmeters, both of which have been adopted as standard.

Capt. G. T. Smith Clarke.

MR. S. A. BLACKALL Company's signal en resident engineer in t ment, has been com Camp Railway Co., R. ning of the year; and gazetted Acting-Capta

Enlisted in

A GREAT WESTERN of 23, Ilbert Street, the distinction of bein great war. He is a w spirit—a splendid typ He was born on July service at Paddington 1893, until his retirem man at Portobello J he was a man who wo and superior officers. to his having on one by the Superintende gratuity, for prompt serious accident when at West London.

So long ago as 1874 Volunteer Regiment afterwards the 18th M Regiment 23 years, re possessing the Long S

In January, 1912, which was formed jus who had seen service i

When he retired fr he was within two m of 68 years of age; b took the earliest opp unity of entering the re Army. Five weeks quitting his signal be was in khaki. In enl he gave his age as 50.

(By kind permission of the Steam Museum, Swindon)

Around April 1911 he was injured in an accident, said to be a boiler explosion. This may have been responsible for severe headaches he suffered for years. *(Figure 2)* shows his marriage certificate; now living in Coventry. Here's a curiosity, perhaps two. Married on Boxing Day! Well, it was war time. His wife was older but more than stated here on the certificate; Smith-Clarke was 31. A gallant gentleman; did she know?

(Figure 3) is the earliest photograph I know of Smith-Clarke; in RAF uniform. It is from the GWR Magazine, March 1919. The original is rather grainy so it won't enlarge. It was not long after this that he became assistant works manager at Daimler and a couple of years later joined the new Alvis Car and Engineering Company as Chief Engineer. I could go on for some time about his motor engineering successes; the 12/50 Alvis; a prototype of which won the 200 mile race at Brooklands in 1923 at an average speed of 93 mph - many 12/50 models were produced from sports cars to sedate tourers including a doctor's coupe and saloons - a Front Wheel Drive Alvis which won the 1½ litre class at Le Mans in 1928 and in the 1930s, handsome sports cars that competed with Aston Martin, Bentley, Lagonda and Talbot. In the mid 1930s, as war clouds gathered, Alvis started building tanks and aero engines and Smith-Clarke had also become involved with hospitals in Coventry.

In 1935 he became chairman of the Coventry & Warwickshire Hospital but he had already put his ingenious mind to solving medical problems and helping patients. In 1925 he had applied for and got a patent for a 'Loud Speaking Telephone'. A modification of this was used in a home for deaf children. The headaches that had troubled him so much (he thought he was going mad!) and because of which he had a sabbatical year in 1933, may have been cured by intra-nasal surgery. This was to be carried out under local anaesthesia but there were problems: the scissors being used by the

surgeon were ineffective. GTS-C took the scissors away, redesigned them like a tree pruner, and took them back to the surgeon to use successfully. He also contributed to a book: 'The Eye in Industry' by Dorothy Campbell, an eye surgeon.

When the war came, Coventry as one of Britain's main engineering centres, suffered very severe bombing. Both the main Alvis factory and the Coventry & Warwickshire hospital were seriously damaged. In a booklet, 'The Royal Family in the War', there's a photograph of King George VI and Queen Elizabeth meeting nurses with Smith-Clarke and inspecting the damage to the hospital. He organised the building of a small surgical block in the grounds of a convalescent home in Keresley nearby. In 1946 he made drawings for a new Coventry & Warwickshire Hospital but the coming of the NHS stopped it from being developed.

When Smith-Clarke retired from Alvis in 1950 he became more involved with health matters. He became vice chairman then chairman of the Coventry, Nuneaton and Rugby Group Hospital Management Committee. He had an extensive workshop of his own and designed, constructed and developed several pieces of equipment most notably an angio-cardiograph. Other items were a 'turnover' bed for burns patients, a hydraulic hoist for lifting patients out of baths and an extempore tool for removing a broken femoral pin. He made a stroboscopic device for eye testing and an electric trepanning cutter for neurosurgery with a pressure sensitive switch to switch it off when through the skull. In 1952 the Senior Administrative Officer of the Birmingham Regional Hospital Board was concerned about the breathing equipment available in the event of a polio epidemic. Smith-Clarke was co-opted onto a sub committee to study the problem and provide a solution. Birmingham Region had 48 Nuffield Both cabinet respirators, 2 Drinkers (the original 'iron lung') and some Bragg Paul pulsators. Smith-Clarke had been horrified when he witnessed the difficulties and unpleasantness a patient went through when nursed in the so called iron lung. It was decided modifications were needed to the 13 year old Both machines. *(Figure 4)* The five machines at the Coventry & Warwickshire hospital were selected for the preliminary alterations. The pump unit separate from the cabinet, was noisy and had impracticable speeds. Nurses complained that it was difficult to manage patients in the cabinet (only two

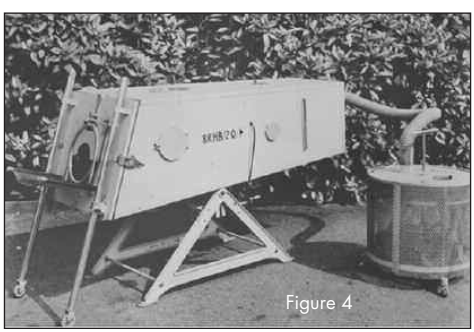
Figure 4

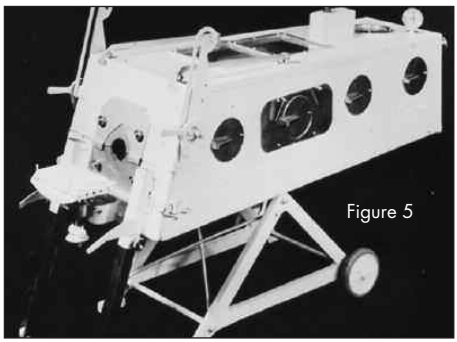
Figure 5

portholes too close to the patient's head and one small window) and there was no alarm. Together with the hospital senior physicist and others, a Both was completely dismantled and Smith-Clarke made drawings. Patterns were made and the managing director of Alvis (J J Parkes) had the larger castings made and machined in the factory while GTS-C machined smaller parts in his own workshop. The pump was made easier to work mechanically in the event of a power failure and the speeds were made more useful. Many modifications were made to the cabinet *(Figure 5):* large windows, multiple portholes and small cork holes for drips & catheters, tilting mechanism, heating by electric light bulbs, rubber wheels and a simple patient alarm. All this was completed by Smith-Clarke and his assistants between May and August 1952. The modified Both was inspected in mid August by members of the Ministry of Health. A MoH Working Party subsequently recommended that kits of parts to modify all UK Both respirators should be produced. Two former Alvis employees set up a company, Cape Engineering of Warwick to manufacture the kits. GTS-C acted as a consultant. He then completely redesigned the cabinet respirator and it was called 'The Alligator' *(Figure 6)*. Originally built using the new fibre glass, this proved unsuitable and they reverted to metal.

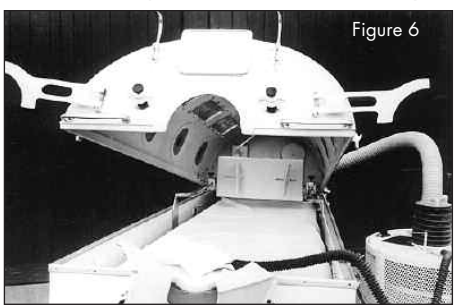
Figure 6

All this and later work on what GTS-C at first called a 'junior respirator' and other devices were presented as 'The James Clayton Lecture'[2] at the Institution of Mechanical Engineers in December 1956. Sadly because he was ill, Smith-Clarke never gave the lecture,. The hospital physicist JDF Williams, with whom he had worked on the Both modifications, read it for him. A few words about this paper: there is a historical summary of artificial respiration which at that time perhaps no one in medicine would have bettered. He mentions the Humane Society and Charles Kite's apparatus for inflating the lungs. He even reproduced his own drawing of what he imagined Woillez' 'Spirophore' would have looked like. There is a list of more modern equipment including Drinker's iron lung, pulsators, cuirasses

& Eve's rocking bed. The junior respirator, the Smith-Clarke, was an IPPV ventilator with positive and negative phases and a humidifier. It was developed by Cape Engineering and then modified into the Cape Waine anaesthetic machine.

Despite being held in high regard by all his peers, he was never honoured by his country. During the Great War he joined the Aeronautical Inspection Directorate, becoming responsible for inspection of all the aero engines produced in Coventry and elsewhere; setting calibration standards which lasted many years for carburettors and magnetos. This might have attracted recognition and honour but didn't. Subsequent work towards the war effort in World War II were more locally based but of importance. Two Astronomers Royal sought his engineering advice for the Royal Observatory, Hurstmonceux and Jodrell Bank (Smith-Clarke had built a succession of telescopes and a spectrohelioscope in his garden) and this resulted in him becoming Fellow of the Royal Astronomical Society. Today these efforts alone would have been recognised and honoured. Added to them is his life saving work with the 'Iron Lung' and with other medical equipment and a knighthood should have been a reasonable expectation. Rumour says he was to be recognised in the 1960 Birthday Honours but he died in February 1960. *(Figure 7)* A plaque has been placed on the house in which he was born 6 Lower Park, Bewdley.

Figure 7

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Postscript: A Memory of Coventry*

Brigadier Ivan Houghton; August 2012

In 1969, as the anaesthetic registrar on duty for Coventry, I was called to see a patient in the Accident and Emergency Department of Coventry and Warwickshire Hospital with a crushed chest. There was no intensive care unit and no ward ventilators. However I had remembered that the respiratory unit in the Whitley Hospital nearby had a Smith Clarke ventilator as well as their iron lungs. I insisted that the ventilator be sent to the Coventry and Warwickshire Hospital, much to the chagrin of the Respiratory Unit Sister who was concerned that they might need it.

The patient was duly ventilated successfully on a side ward with this prototype of the Smith Clarke ventilator, which was immediately recognisable as being different from the production model with differently shaped casing and a different control for the respiratory frequency. The bellows and diaphragm gas meter packed up after a day or two and I called in the engineer from Cape Engineering who serviced the ventilator and gas meter. He also mentioned that the ventilator had not been used for at least seven years.

This was probably the last time that a Smith Clarke ventilator was used in Coventry as the new Walsgrave Hospital opened shortly afterwards.

**A comment from the floor at the meeting.*

BLESSED CHLOROFORM LECTURER

by Dr Jean Horton: 'Heads for Medicine'

An Appreciation by Dr Neil Adams

It is an honour and a privilege to have Dr Jean Horton to deliver this year's Blessed Chloroform Lecture. Jean's interest in neurosurgical anaesthesia started at Great Ormond Street Hospital, continued at the London Hospital and then Edinburgh and culminated in Addenbrookes and Hong Kong. Jean served on Council of the Association of Anaesthetists from 1976 to 1980; she then became Honorary Secretary from 1980 to 1982 and then Vice President from 1985 to 1987. It is a measure of Jean's dedication that, in the days before the availability of email and the World Wide Web, she would personally travel to and from London with minutes and documents to make sure they were delivered on time. Her role was recognised by the AAGBI in 1996 by her election as an Honorary Member.

Already a distinguished United Kingdom anaesthetist, in 1983, Jean took the bold step of working in Hong Kong, alongside Andrew Thornton and Z. Lett. This new challenge established a modern anaesthetic department, the training of anaesthetists and the setting up of an examination system to assess those who had been developed through the system. After her retirement in 1989 it was now that Jean could concentrate on history. For the history of anaesthesia to be successful on the National and International stages, there are a number of requirements. There must be a tradition of academic study, there must be meetings and publications to disseminate such work, and there must be properly constituted societies to encourage and oversee the whole process. Jean has made outstanding contributions in all of these areas.

Jean can certainly make things happen. Not content with just being Honorary Treasurer and then President of the History of Anaesthesia Society, she brought her wealth of experience to the organisation of some of the best meetings of the Society. These are set out in her autobiography, but perhaps the History of Anaesthesia Satellite Meeting at the World Congress in Montreal in 2000 and the Sixth International Symposium on the History of Anaesthesia at Queens' College Cambridge in 2005 should be singled out. Jean worked tirelessly on the venue, the promotion of Cambridge through the Blue Badge Guides and the celebration of the 100th Anniversary of the American Society of Anesthesiologists held at the Imperial War Museum in Duxford. This would turn out to be the only such celebration during 2005.

Turning to the study of the history of anaesthesia, Jean's interests are wide. She has presented at every International Symposium on the History of

Anaesthesia sine the Third in Atlanta, at the Ralph Waters 75th Anniversary Meeting in Madison, Wisconsin in 2002 and most recently, in Hong Kong in 2011 at a combined meeting of the Hong Kong College of Anaesthesiologists and the Australian and New Zealand College of Anaesthetists. Jean should be justly proud of all of her work, but two pieces must be highlighted. The first is a 25000 word dissertation entitled "Sir James Young Simpson, obstetrician, gynaecologist and pioneer in anaesthesia. His life and work, with special reference to the introduction of chloroform, together with a study of his ancestry and the lives of his children." For this she was awarded a Certificate in Scottish Family History Studies and the thesis is deposited at the Scottish Genealogy Society in Edinburgh. Her second, most recent work, is "Heads for Medicine", an autobiography. This book gives a superb insight not only into Jean's life, but also anaesthesia and the organisations at which Jean has worked.

BOOK REVIEW:
The Anaesthetist 1890 – 1960.

A historical comparative study between Britain and Germany. JS (Hans) Pöll. ISBN: 978-90-5235-209-1. Erasmus Rotterdam, 2011 € 34.50.

This is a remarkable book. It makes a valuable contribution to furthering our understanding of the complexities of the more recent history of anaesthesia. It does so by openly challenging presently dominant international historiography - and many long held and much loved ideas, notably with regards to the frequently alleged supremacy of the Anglo-Saxon roots and traditions of modern anaesthesia. From a perspective of methodology and research strategy this book is to be highly lauded for a very comprehensive and innovative approach. It compares the development of our specialty in the UK and in Germany within three different phases of specialization and on three different bases:

- On the basis of historical literature (primary and secondary),
- on the basis of technological developments,
- and by empirically cross-referencing these with the contemporary practice in both nations.

The information on the last aspect is derived from a thorough analysis of surviving theatre log-books and registers. These can, with some justification, be assumed to reflect what was really going on at the time in comparable hospitals in similar (either metropolitan or provincial) surroundings. The author carefully considers and addresses the complex methodological requirements and problems of such a comparative research. His deductions and conclusions appear plausible and probably accurate.

The fact that all three approaches confirm his key theory - even independently from one another - adds considerable weight to his argument: which is that the role of the UK in the general historiography on 'modern' anaesthesia is disproportionally overrated in direct international comparison with many other countries, notably with Germany and its neighbouring nations in central and eastern Europe, many of which were - and still often are - to a considerable extent either German-speaking or influenced.

The author extensively scrutinizes the present status quo on the historiography on modern anaesthesia and its main feature, namely that it is far too UK (or more generally Anglo-American) orientated and dominated. Therefore it frequently appears to be incomplete or outright inaccurate. Also rather nationalistic influences can be identified. Among 'Anaesthesia-

Historians' this is an increasingly recognized problem. What makes this book stand out, however, is the comprehensiveness and the robustness of this critique. It makes this book and its remarkable findings potentially controversial. The courage and willingness of the author to touch this 'hot topic' none the less is commendable.

Early in the book he provides convincing arguments why many explanations, which have been proposed to explain the perceived British 'dominance' and German 'failure to thrive' in anaesthesia and its specialisation are insufficient, incomplete and biased. Certainly, his most original finding is, however, the empirical evidence from the theatre registers. These suggest that the phenomenon of professional or full time anaesthetists in the UK was, at least until after WW II, almost exclusively restricted to London. He also provides robust evidence that although the UK clearly took a leading role with regards to professionalization of anaesthesia care and qualification from early on, this was a well-recognized and promoted desideratum also elsewhere. In other words: In normal clinical surroundings, away from very few specialist centers, notably in the metropolis, the professional and clinical situation in the UK was actually not significantly different - or better – than the situation in Germany and elsewhere. This contrasts sharply with the much loved perception that – not least due to a leading role on the professionalism front - UK anaesthesia then perhaps saw 'its finest hour'.

The author identifies one, very plausible, main explanation for these misperceptions by a thorough analysis of the very process of professionalization itself: He argues that given altogether different healthcare systems; British surgeons were totally differently organized to their German counterparts. In consequence they were overall remarkably less interested in anaesthesia. This ties in with his other comparative evidence that from the early stage of modern anaesthesia until at least the end of WW I, there were probably more groundbreaking developments in anaesthesia practice and research occurring in Germany than in the UK.

In consequence professional anaesthesia in the UK took rather the route of a largely de novo development of a discipline, promoted by predominantly GP-anaesthetists, who quickly focused on specialization, training and professional politics to safeguard their interests. In Germany and – indeed – most other parts of Europe the discipline took much more the route of a gradual emancipation from surgery. There it was conducted by surgeon-anaesthetists, who understood, mostly accepted and embraced anaesthesia as an integral part of a large surgical domain and professional hierarchy. The author therefore argues that - certainly initially - many surgeons viewed

anaesthesia care in the sense of a holistic approach towards the needs of the patient. In comparison with the so far prevailing historiography this explanation does seem plausible to quite some extent: The author simultaneously manages to largely dismiss the most common alternative explanation - the effects of the two World Wars. On one hand his analysis confirms earlier findings that notably during WW II the need to maintain or restore physiologic homeostasis (notably shock treatment, fluid management and transfusion) and other advances in modern peri-operative medicine contributed significantly to the further development of specialized anaesthesia care.

On the professionalism front, however, his findings do indeed suggest that neither of the two World Wars really had an immediate, decisive influence neither in the UK nor Germany. Otherwise, and on a considerably more critical note, many of the author's excursions into military history and wartime medicine are contentious. Also his argument in favour of an integrated or holistic approach towards anaesthesia by German surgeons has to be taken with quite a pinch of salt: it will probably be particularly 'picked on' and criticized by many anaesthetists and historians alike – and not quite without justification – as a bit of too much of a euphemism for often really problematic attitudes of surgeons towards anaesthetists and anaesthesia. These had serious consequences, some of which can still be seen and felt by clinicians, even today. This is regrettable, as the author, himself an anaesthetist, has presented his point on this issue well. The way he develops his argument on the contemporary situation and perception in Germany is convincing and absolutely noteworthy as an additional perspective to be considered much more, when assessing inter-professional controversies surrounding sub-specialization and subsequent professionalization. However, using the term holistic in this specific historical context – notably without inverted commas - after it has also been widely corrupted as a euphemism to disguise - often quite cynically – a mere struggle for surgical power, influence and dominance, does nowadays seem a bit uncritical.

A similar critique applies to some of his descriptions of early British anaesthesia as a 'wilderness' and of UK anaesthetists as an 'amorphous group of administrators of anaesthetics'. The author has made his perfectly valid point on the overratedness of anaesthesia in the UK. However, as he likewise acknowledges, the UK was at that time clearly among the internationally leading nations. Employing such rather provocative wordings for describing the situation there is – to say the least - a bit harsh: Clear UK overratedness should not be replaced by swinging right across to the other extreme of underestimation and underrecognition.

Overall, however, the author develops and historically illustrates his arguments in a highly professional way, which is logically and chronologically entirely coherent. His historical comparative study between Britain and Germany is extremely rich in valuable detail and further resources. It is absolutely a pleasurable read and highly instructive and educational for anyone with an interest in the history of our specialty.

Dr. M. Wulf Strätling; Cardiff, UK/Lübeck, Germany