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# DENTAL HISTORIAN

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**THE LINDSAY SOCIETY**
The History of Dentistry

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## Dental Historian

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The *Dental Historian* is sent free to members of the Lindsay Society.

## Editorial

### The BDA Conference in Manchester

The BDA Museum had an exhibition stand at the conference. The theme for this year was to challenge 21st century dentists to see if they could have been dentists in the years: 1750, 1871 and 1922.


This involved being able to extract a tooth with a pelican and key, to achieve at least 2000rpm on the Morrison Treadle Drill and to identify three skulls: human, old world monkey and new world monkey as part of an 1922 LDS examination paper. Many thanks to the Royal College of Surgeons Hunterian Museum for generously providing us with the animal skulls.

The competition to score the highest number of "revs" on the treadle drill was intense. Speed was reduced by requiring the dentist to wear an authentic frock coat whilst attempting to prepare a cavity in a plastic tooth in a hand held model. The revolutions were measured using a laser beam and counter. A leader board was produced over the three days of the conference. This event was very popular, particularly with the younger dentists who returned several times a day to discover if they had been dislodged from the top of the leader board. Even the Chief Executive of the BDA, Peter Ward took the Museum Challenge, but unfortunately did not top the leader board.

The museum challenges certainly made modern day dentists realize how their profession has evolved over the years in terms of knowledge, equipment and skills.

**New museum project**

The conference marked the launch of a museum project to record how dentists work in 2016. The museum has very few images of dentists in their surgeries, or even the outside appearance of the surgery. By taking a "selfie" and sending it to the museum, along with a donation, the museum will build an archive record of dentists in 2016 and the donations will contribute to the museum funds.

**The Lindsay Memorial Lecture** at the BDA Conference in Manchester was given by Professor Iain Chapple. The title of his lecture was, "Periodontology, the last 50 years or so". .He gave a review of research and rationale for the treatment of periodontal diseases. The lecture attracted one of the largest audiences we have seen at the memorial lecture.

Also at the BDA conference, Stuart Geddes, one of the Lindsay Society's committee members, was awarded Life Membership for his long and valuable service to the BDA. Amongst his many posts, Stuart was the BDA National Director for Wales from 1994 until he retired and he is currently the chairman of the Welsh Council. Please accept the congratulations of the Lindsay Society.

**History in the making** In October 2016 the Lindsay Society is holding a joint meeting in London with the American Academy of the History of Dentistry. This is the first time the Lindsay Society has hosted an international conference.

Please see the full page advert on page 102.

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# From Pulling Teeth to Promoting Oral Health: Pharmacy and Dentistry 1815-2015

**Stuart Anderson**

**Abstract:** Two hundred years ago the occupational boundaries between different medical practitioners were blurred and unspecified, with many practicing in several fields. However the 1815 Apothecaries Act had a major impact on both the emerging pharmaceutical and dental professions. The 1878 and 1921 Dentists Acts enabled pharmacists who did some dentistry to continue practicing dentistry. Changes proposed by the British Dental Association (BDA) resulted in the formation of a Chemists Dental Association in 1910 to defend the interests of this group, which continued in existence until 1951. This paper explores the changing relationship between chemists and dentists from the early nineteenth century through to the early twenty-first century. Sources used include the published work of both dental and pharmaceutical historians, documentary sources, and quotations from oral history interviews.[1]
**Key Words:** Pharmacy, dentistry, chemists, mouthwash, toothpaste, drill, apothecaries, tooth pulling.

## Pharmacy and Dentistry before the Apothecaries Act 1815

For both the emerging pharmaceutical and dental professions the period before the Apothecaries Act of 1815 was a somewhat chaotic one.[2] At the start of the eighteenth century apothecaries were diagnosing ailments and supplying medicines in their shops, and they were one of the three pillars of the medical profession, along with the physicians and surgeons.[3] But by the end of the eighteenth century a group of unqualified individuals, the chemists and druggists, were already well established as purveyors of medicines to the poor.[4] The 1704 Rose Case allowed the apothecaries to prescribe, though not to charge for advice. Rising social status led to the ascendancy of medically practising apothecaries, and eventually to the exclusion of pharmaceutically practising apothecaries from the Livery of the Society of Apothecaries after 1774.[5]

The Apothecaries Act of 1815 enabled most apothecaries to focus on medical practice and to become general medical practitioners, largely abandoning the compounding and dispensing of medicines in the process.[6] The space created was quickly filled by increasing numbers of chemists and druggists. The apothecaries began to press for legislation to defend themselves from encroachment by the chemists and druggists, whose businesses were diverse.[7] The preparation and sale of items for ailments of the teeth and gums had long been a part of it, as had been, for many of them, the practice of dentistry, ranging from tooth pulling to more complex fillings and replacements.

If pharmaceutical activities before 1815 were in the hands of the apothecaries, who had undertaken an apprenticeship, and the chemists and druggists, who had no formal training, then dental activities were undertaken by an even more diverse group. Both apothecaries and chemists and druggists undertook tooth-drawing and other dental services, but so too did many others. While some surgeons specialised in dental work, there were many totally unqualified practitioners who undertook tooth pulling. There was nothing to stop anyone calling themselves a dentist or dental surgeon, and many chemists and druggists did so. One chemist in 1835 was making £200 a year from tooth-drawing alone at the rate of 1shilling (s) per tooth. However, it has been suggested that, as all chemists and druggists undertook tooth extraction as part of the job, those who went to the trouble of calling themselves dentists were usually offering something extra.[8]



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In the late eighteenth century, chemists made up their own products in the dispensary at the back of the shop. Many of their formulas have survived. The range of dental products made included: mouthwashes, breath sweeteners, dentifrices and toothpastes. A typical toothpaste formula of the time is shown below.[9] Rhatany contained tannins and was astringent. Orris yielded a sweet violet odour, but the calcium oxalate it contained could scratch enamel. Chalk provided an alkaline abrasive, myrrh was antiseptic, and the honey of roses permitted paste formation.

| **18th century formula for toothpaste** | |
|---|---|
| Precipitated chalk | 1 ounce |
| Powdered myrrh | 2 drachms |
| Powdered rhatany root | 2 drachms |
| Powdered orris root | 1 drachm |
| Honey of roses sufficient to form a paste | |

Mouthwashes too were in common use. Typically, they contained familiar herbs and flowers; items used included tincture of myrrh, arnica, bilberry berries, bayberry leaf or chamomile flowers. These were mainly disinfectants, although bilberry and bayberry contained tannins and were astringent; they helped in hardening the gums. Other items used to sweeten the breath included aniseed, cardamom, clove, mastic, mint, orris and parsley. Items used in dentifrices included alder bark, charcoal, nutmeg, sage, thyme and wintergreen.[10]

**Apothecaries Act 1815 to Dentists Act 1878**

The period between the Apothecaries Act of 1815 and the Dentists Act of 1878 was one of rapid change in Britain, and medicine and related professions were no exception. Several factors helped shape the relationship between pharmacy and dentistry; the impact of the Apothecaries Act of 1815 on both professions; the impact of the foundation of the Pharmaceutical Society of Great Britain in 1841 on other groups of practitioners; developments in medicine and surgery, particularly the impact of the discovery of anaesthesia in 1846, and for dentistry the patenting of vulcanite in 1855 by Charles Goodyear; and finally the passage of the Dentists Act itself in 1878.

***Impact of Apothecaries Act 1815***

The 1815 Apothecaries Act required the examination of new entrants to the profession of apothecary, awarding them a licence from the Society of Apothecaries. The Act specifically excluded chemists and druggists, allowing them to prosper unregulated. But dentistry too was not mentioned, so the dental profession also remained free to develop in its own way at its own pace. Apothecaries were free to provide dental services if they so wished, but so too were the chemists and druggists, and indeed anybody else. Between 1823 and 1833 over 4,000 candidates were examined by the Society of Apothecaries, becoming general medical practitioners, and withdrawing from the field of dentistry in the process.[11] Pharmacy and dentistry shared a common origin, in the emergence of practitioners to fill the space created by the transition of apothecaries into general medical practitioners, and their withdrawal from both pharmaceutical and dental activities.

***Impact of foundation of Pharmaceutical Society of Great Britain 1841***

The 70 years following the Apothecaries Act were ones of transition for all the medically related professions. The Pharmaceutical Society of Great Britain was founded in 1841, 26 years after the Act. Its founders were mainly apothecaries who had chosen to stay with pharmaceutical practice, and some of the chemists and druggists. The Society grew rapidly; within a year it had more than 2,000 members. Eleven years later in 1852 the Pharmacy Act established the first Register of Pharmaceutical Chemists, receiving royal assent on 30 June. The titles of 'pharmaceutical chemist' and 'pharmaceutist' were

restricted to members of the Society. A year earlier, the 1851 Arsenic Act had given chemists exclusive rights to the sale of arsenic, presaging the wider control of poisons. The Pharmacy and Poisons Act 1868 extended registration to chemists and druggists.[12]

The Medical Act, described as 'An Act to Regulate the Qualifications of Practitioners in Medicine and Surgery', was passed six years after the first Pharmacy Act, in 1858. It regulated medical education, created the post of Registrar of the General Medical Council, and established the Medical Register. The first Dentists Act came only in 1878, some 63 years after the Apothecaries Act, and 37 years after the foundation of the Pharmaceutical Society. The first Dentists Register followed in 1879, and the British Dental Association was formed in 1880.

***Impact of discovery of anaesthesia 1846***

There were other developments relevant to dentistry during this period in which pharmacists played a part. In 1846 a method was introduced for producing insensibility to pain during surgical operations. William Hooper, a chemist and druggist of Pall Mall in London, constructed the apparatus for the first anaesthetic use of ether in this country, and the extraction of a firmly fixed molar tooth followed in December 1846. Two days later Robert Liston at University College Hospital amputated a thigh, and the ether vapour was administered by means of an apparatus devised by Peter Squire of Oxford Street. Following its use in labour by Queen Victoria Squire was designated the 'Queen's pharmacist' in January 1847.

Most of the leading metropolitan chemists and druggists quickly became involved in the introduction of anaesthesia. Their focus was on the design of inhalers for the administration of ether, and the search for volatile liquids. The first operation at the Middlesex Hospital was carried out by J. Moncrieff Arnott on 25 January 1847. Arnott was a close friend of a pharmacist, Jacob Bell. He performed a long and difficult lithotomy, removing stones from a 68 year old Irishman. Bell acted as anaesthetist, along with Sir John Tomes, surgeon-dentist at the hospital and doyen of British dentists. Chloroform was used on this occasion.[13]

**Jacob Bell (1810-1859, shown)** was a key link between pharmacy and dentistry in the mid-nineteenth century. He was born into a world of pharmacy and Quakerism. His mother was the eldest daughter of Frederick Smith, a chemist and druggist of Haymarket, to whom his father John Bell had been apprenticed. Jacob himself was apprenticed in his father's business. Bell's wide range of interests, encompassing both science and arts, enabled him to acquire a large and illustrious circle of friends, including the painter Edwin Landseer. Bell is considered to be the founder of the Pharmaceutical Society of Great Britain. He became the editor of its *Transactions* in 1842, and was its president between 1856 and 1859. His wisdom and advice were available to all who requested it, and amongst those who asked were the leading dentists of the day.

### *Patenting of vulcanite 1855*

There was another development in which pharmacists played no part, but which provided a means of extending the services offered by dentists, including chemist-dentists. Before the mid-1880s there were no suitable materials for making dentures. Porcelain, gold and carved ivory were all used, but they were expensive and only affordable by the rich. There was no durable or affordable denture material available. But in 1843 Charles Goodyear discovered how to make flexible rubber, or vulcanite. In 1851 his brother patented a process to produce hard rubber.[14]

Vulcanite found instant use in the fabrication of denture bases world-wide, and quickly replaced previously-used materials as it was much cheaper. Vulcanite dentures became available just after the introduction of anaesthesia. People who had preferred toothache to the pain of extraction were now prepared to have their rotten teeth removed, creating a demand not only for tooth pulling but also for vulcanite dentures. The process for making these was not difficult, and many chemists invested in the new vulcanising equipment.


**Vulcanite denture**

### Pharmacy and the Dentists Act 1878

Dentists as a distinct group finally gained some professional recognition with passage of the Dentists Act in 1878, 63 years after the Apothecaries Act. According to Jacob Bell, dentists in this country had until the 1870s occupied a position similar to that of the chemists and druggists prior to 1840. They were not recognised by the medical profession, and as they had no distinct separate existence it was difficult to define precisely what their occupation and qualifications consisted of or involved. There were men amongst them, he noted, who possessed the requisite qualifications, surgical, medical and mechanical, to enable them to deal with the teeth under all conditions. But, he continued, there were also some with little or no qualification.[15]

Bell observed at close quarters the attempts made to introduce some organisation in this heterogeneous body, to sift the good from the bad, to establish a regular system of education and examination, and to indicate qualification by means of a title. He noted that some of the leading men amongst those engaged in the practice of dentistry formed an association called the Odontological Society. When Sir John Tomes set it up in 1855 he drew heavily on the advice and experience of his friend Jacob Bell.

**Sir John Tomes 1815-1895**

Tomes and his associates were led to the conclusion that two things were required to progress the professionalization of dentistry: an Act of Parliament to create a register of qualified men, who alone would be empowered to practice; and the formation of a voluntary association of those registered. But unlike Bell, Tomes was unable to unite the disparate group of practitioners under a single umbrella. Another more numerous group of dental practitioners established the College of Dentists, on principles less exclusive than those of the Odontological Society.

But the chemists and druggists who practice dentistry were ineligible for membership of either body because they practised another trade. It was another 55 years before they established their own dental organisation. Both the Odontological Society and the College of Dentists had the same aim, 'to secure for the public the services of men, recognisable by certain titles, qualified to perform the various operations connected with the treatment, extraction and supply of teeth'. But the leaders of the two societies could not agree on how to amalgamate them, and both continued to work independently.

The attempts to create a separate profession of dentistry followed very closely the pattern set by the Pharmaceutical Society.[16] But the chemists and druggists, although not wholly a united body, were not divided in the same way as the dentists either. Jacob Bell concluded that the dentists were fifteen years behind the chemists and druggists in commencing this movement, and it was almost forty years after the pharmacists that the dentists had a single representative body. But the dentists' initiatives could potentially have a significant impact on the business of chemists and druggists, because many of the latter still extracted teeth and performed other dental operations.[17]

When the Dentists Act was being drafted it was modelled on the Pharmacy Acts of 1852 and 1868, and on the 1858 Medical Act.[18] To ensure the subjection of the dental profession to the medical profession, the administration of the Act was to be placed in the hands of the General Medical Council. A register of dentists was to be compiled and kept by the General Medical Council, which also had responsibility for supervising examinations in dentistry and for erasing names from the Register. This was in marked contrast to the pharmacists; under the Pharmacy Acts the Pharmaceutical Society, not the General Medical Council, was given the task of keeping the Registers of Pharmaceutical Chemists, and later that for the Chemists and Druggists. The proposed Dentists Act was introduced as a private members bill by Sir John Lubbock MP in 1877.

When the Dental Practitioners Bill was first introduced, it contained a clause which might easily have been construed to exclude from the Register those who practised dentistry in conjunction with pharmacy. It decreed that all entering the dental profession after 1 August 1879 should possess a 'diploma or licence to practise from one or other of the licensing bodies'. John Williams, the then president of the Pharmaceutical Society, wrote to Sir John Lubbock calling his attention to this possible construction of the clause, and suggesting a modification.
Lubbock replied that he had no intention of excluding chemists and druggists from the Register, and the clause was re-written with a provisional concession, enabling admission to the Dentists Register of 'all licentiates in dental surgery or dentistry, and any person who is, at the passing of this Act, bona fide engaged in the practice of dentistry or dental surgery, either separately or in conjunction with the practice of medicine, surgery or pharmacy'. All those who had been 'in practice before 22 July 1878' were permitted to apply to have their names entered in the Dentists Register.

It was in this form that the bill became law on 22 July 1878. When the first edition of the Register appeared in 1879 it contained the names of 5,289 persons. Of these some 2,049, or well over one third, were registered as combining the practice of dentistry with that of pharmacy.


The Act did not prohibit practice by the unregistered, and there were probably many other chemists and druggists who practiced dentistry but did not consider it necessary or worthwhile to join the Register. What the Act did was to give the registered certain privileges: 'A person shall not be entitled to take or use the name or title of 'dentist' (either alone or in combination with any other word or words) or of 'dental practitioner,' or any name, title, addition or description implying that he is registered under this Act, or that he is a person specially qualified to practise dentistry, unless he is registered under this Act'.
Existing chemist-dentists could thus join the Dentists Register as of right. New entrants to the profession who also engaged in dental practice could enter their names on both the pharmaceutical and dental registers. Since they were registered under the Act they could call themselves chemist-dentists. And if they wished to practice solely as dentists they could of course do so.

But ultimately the 1878 Act failed to give dentists the protection they needed or expected. Dental schools were opened and lecturers were appointed, and increasing numbers of candidates took the examinations to become licentiates in dental surgery or dentistry. But unregistered persons could also practice as dentists, although they could not call themselves dentists. The statutory defences of the Act proved to be worthless, and the privileges it gave the registered turned out to be useless.[19] The number of unqualified practitioners continued to rise until 1921, but amongst the qualified were large numbers of chemists and druggists. Some abandoned pharmacy altogether for their new profession, joining the reform societies, obtaining dental surgery licences, and joining the British Dental Association.[20]

For all chemists, whether practicing dentistry or not, care of the teeth offered a useful source of income. Before mass production most chemists, or rather their apprentices, made up a wide range of products which included dentifrices and mouth washes. To help them the weekly trade journal, the *Chemist and Druggist,* published formulas that could be made up in any pharmacy. One popular item was a liquid dentifrice to freshen the breath, with the formula shown below.[21] The soap was cut into fine shreds and dissolved in water over gentle heat. The oils were dissolved in the spirit and added to the soap solution, stirring constantly. Colouring with cochineal was added as desired.

| **19th century formula for liquid dentifrice** | |
|---|---|
| White castille soap | 2 ounces |
| Distilled water | 8 ounces |
| Oil of cinnamon | 10 drops |
| Oil of orange | 10 drops |
| Rectified spirit (such as vodka) | 8 ounces |

Even more common than the breath fresheners was something to relieve toothache. A large number of formulas was suggested, including one called 'instantaneous toothache-cure'. It involved first making a mastic solution, made by mixing together 6 drachms of finest mastic, 1 oz. of extract of Indian Hemp, and 10 oz. of chloroform. These were shaken together until dissolved. The mastic solution was added to the six further ingredients, and the whole filtered. A few drops of 'instantaneous toothache-cure' were to be applied using cotton-wool. The preparation was claimed to be very efficient, and not surprisingly, it became very popular.

**Chemist-Dentists between the 1878 and 1921 Dentists Acts**

The fact that significant numbers of chemists and druggists entered their names on the Dentists Register, and continued to practice dentistry of some kind is hardly surprising, since one of the most profitable parts of thousands of chemists businesses in late Victorian Britain was the extraction and adaptation of teeth and the supply of artificial ones. The pharmacy journals of the time carried large numbers of advertisements for dental equipment and materials. In fact many chemists and druggists maintained a substantial dental practice after the 1921 Dentists Act, and some carried on into the 1950s.

But in late Victorian Britain community pharmacy in Great Britain itself was changing. Two years after the Dentists Act, in 1880, a legal case was heard in the High Court which was to play a major part in shaping retail pharmacy. The case tested whether a company rather than an individual could own a pharmacy. [22] The Law Lords finally decided that it could, provided that the part dealing with medicines and poisons was in the charge of a qualified pharmacist. The case led to the creation of pharmacy chains, the most notable of which was that founded by Jesse Boot.

By 1900 Boot had opened 181 shops, and by 1920 he had 618 branches.[23] Boot could have recruited chemists with dental experience, and developed joint chemist-dental businesses. But he chose not to. The basis of his business was price cutting. He opened his first dispensary in one of his shops in 1884, and he looked for pharmacists with dispensing experience rather than dental or optical skills. With Boots and other multiples opting not to provide dental services, an opportunity existed for the small independent chemist to do so, and many were keen to take on this additional, profitable, role.

As a result of dissatisfaction with the consequences of the Dentists Act of 1878 the British Dental Association in 1910 drafted a Bill to amend it, so that dental practice would be reserved to those who had attended dental school and passed the examinations.[24] Amongst those who were not to be allowed to practice dentistry was 'anyone combining that practice with any other occupation or calling'. Clearly this applied to all those chemists who also practiced dentistry. Although there were a few pharmacists who had been practicing dentistry in their shops since before 1878, most of the chemist-dentists practicing in 1910 were people who had learnt their dentistry from older chemist-dentists during their apprenticeship, and some had only recently qualified. For many chemists in 1910 dentistry was still a substantial part of their business.

Not surprisingly the chemist-dentists felt threatened by the British Dental Association proposal. Prompt opposition took the form of a letter to the editor of the *Chemist and Druggist*, the weekly trade journal, in July 1910. Further letters followed, then editorial support, and then a suggestion was made in the correspondence columns to form an association. A large number of letters were published in support of this proposal, following which the editor wrote to all those likely to be interested, inviting them to attend an inaugural meeting. If they could not attend they were invited to send in their views. Eighty did so, and many of the letters were read out at the meeting.

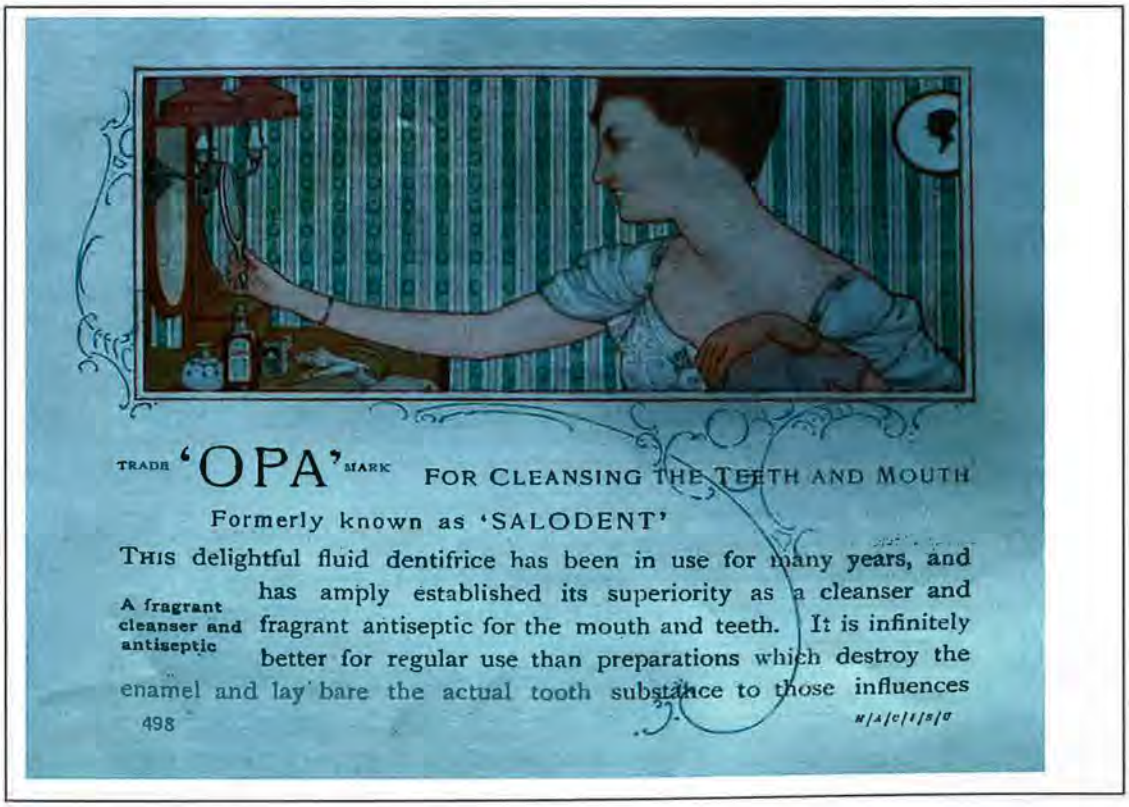
The Chemists' Dental Society was founded on 8 September 1910, 32 years after passage of the first Dentists Act. It was formed with the aim of protecting the interests of the chemist-dentists at a time when plans were being made to tighten the registration of dentistry, by restricting its practice to those possessing a registerable qualification. However, the First World War halted any progress, but at its end the Society renewed its activities, before the Dentists Act was finally passed in 1921.[25]

The activities of some of these Edwardian chemist-dentists have been described in oral history recordings. Ronald Benz was born into a pharmaceutical family in 1910.

As a child he visited his maternal grandfather, who had a pharmacy in Eastbourne.

'*My grandfather also did optics and dentistry. He had a dental surgery at the back of the shop. He did fillings. He had a treadle operated drill. It was a corner shop, and the family lived upstairs. Dental work was mainly done in the evenings. Working people had to come in their own time from 7pm onwards. I don't think my grandfather had any qualifications whatsoever in dentistry or optics. He had qualified in pharmacy at one of the London schools of pharmacy.*'[26]

Whilst chemists actually engaging in dentistry at this time remained a minority, all of them continued to have thriving businesses selling toothbrushes, dentifrices and related products. Liquid dentifrices remained very popular throughout the late nineteenth and early twentieth centuries. But by this stage more and more manufacturers were targeting the dental and oral hygiene markets. In many cases chemists' shops were the exclusive outlet for them, along with toiletries and cosmetics, in the days before supermarkets and general stores which sold almost everything. Calvert's Dento-phenoline was aimed at smokers, and it was, claimed the manufacturers, 'unequalled for sweetening the breath and preserving the teeth'. It could be ordered through any chemists.



The late Victorian period saw a significant shift towards mass production of a wide range of items including dental products. Emerging drug companies were not slow to identify the opportunities. By the start of the twentieth century Burroughs Wellcome were already producing a range of toilet and cosmetic products, and marketed an antiseptic mouth wash under the brand name SALODENT.[27]

Retail chemists were not always keen to sell these manufactured products, as making their own was much more profitable. Well-come's senior salesman complained that the chemists he visited '*manifested too much passion for selling their own stuff*'. The Burroughs Wellcome archive includes a note from its chief salesman to one of his salesmen, in which he reminds him that his objective is to persuade chemists in Ipswich to stock SALODENT. '*The principal object we have in sending our representatives to chemists is to create a demand for our preparations. We are quite confident that you will in no way be deterred from pushing and creating a sale for SALODENT, by the pessimistic remarks of grasping chemists*'.[28]

Wellcome later changed the product's name to OPA. They found that patients were strongly influenced by what their dentist told them and what products they recommended. The trick was to get the product stocked in the pharmacy, and then to get the pharmacist to tell the dentist what he was stocking. Wellcome pressed for the attractive display of goods such as OPA at the premises of so-called 'progressive' chemists, who should, they implored, be asked to circulate dentists, telling them that they were now stocking the product. All this was supported by strong advertising.


There were many other manufacturers keen to get a share of this market. In 1906 Arthur Cox & Co. bought up the rights to three proprietary preparations including *Barton's Dentrifricium*, a dentifrice recommended, they claimed, by eminent-surgeon dentists and members of the medical profession. Cox's advertised heavily in the 1920s and 30s, highlighting their new *Formalin Tooth Powder* and their *Thymol Toothpaste*.[29] The market for toothpastes and powders was a huge but crowded one, with manufacturers usually having very similar product ranges, such as for cherry and areca nut toothpastes. Areca nut toothpaste became very popular, and again every manufacturer had their own version, and did their utmost to have their product stocked by the local chemist. The areca nut tree was widely cultivated in India for its seeds, which were chewed by the locals. The nuts contained several alkaloids and tannin, which acted as astringents for hardening of the gums.

**Chemist-Dentists between 1921 and the start of the NHS in 1948**

The Chemists Dental Society were a surprisingly powerful and effective group, for when the Dentists Act of 1921 was finally passed, Section 3(3) confirmed that those 'registered pharmaceutical chemists, or duly registered chemists and druggists, who could prove, to the satisfaction of the specially created Dental Board, that they had had, immediately prior to July 28 1921, a substantial practice as a dentist, including all usual dental operations, would be allowed to continue in practice, and their names would appear on the Dentists Register'. The Act thus provided full admission to the Dentists Register of the chemists-dentists who met these conditions.

In practice this usually meant producing evidence that their principal means of livelihood for some years before the passing of the Act had been the practice of dentistry; in certain cases, it was subject to taking a modified examination. These people were both pharmacists and dentists, and their names appeared on both registers. Exact numbers have been difficult to establish, but clearly there were a lot of them, because the Chemists Dental Society continued in existence for a further 30 years.

One person who remembered the activities of the Society was Leslie Matthews. He was born in 1897, and began his apprenticeship in a small chemist's shop in Norwich in 1911. His boss was a chemist-dentist, and he himself learned some dentistry during his apprenticeship. Matthews gave a detailed description of the dental activities of his boss.

> *He did his dentistry in a room above the shop. He had a chair, but that was what most of the chaps had, not very much. I used to take out people's teeth when I was an apprentice. Dentistry at that time was [little more than] extracting teeth. That [was certainly true] for a large number of people. What training I got in extracting teeth was from my boss. I watched him do it, and then I did it myself. My boss would be doing this once or twice a week. It was always pulling teeth. He didn't do any fillings, and he didn't do any optics.*[30]

Matthews later recalled what the chemist-dentists had to do in order to get themselves onto the Dentists Register in 1921. '*My chap did a little dentistry, but not much. He didn't cultivate it as much as some of them did. A number of chemists made half their business out of dentistry. When the 1921 Dentists Act came in they were able to demonstrate by their figures and their records that they had earned half their living, or a good slice of their living, from dentistry, and they got onto the Dental Register'.*

But some of those chemists and druggists not admitted to the Dental Register in this way continued to provide a tooth pulling service. Les Flatters, born in 1918, did his apprenticeship with Boots in Lincoln in the early 1930s. Boots of course did not engage in dental activities, so for the small private chemist doing so was a useful additional source of income. Les remembers:

> *'There was another chemists straight across the road. It was a very small shop. The chemist used to take out teeth. One day I had toothache. The manager said 'go and see Mr Walk'. So I went across and saw him, and he took my tooth out for sixpence. He did quite well with it. He also sold glasses, but I don't know if he was also an optician. He would have been in his sixties then. Dentistry was quick and painless; the dental surgery was the size of a kitchen table. It was at the back of the shop, and half the size of the Boots dispensary.*[31]

During the inter-war years the number of chemists practicing as dentists steadily diminished as people retired, and apprentices were no longer taught how to extract teeth. But it was still not uncommon for qualified dentists to operate within a chemist's shop, although sometimes there was a separate entrance to the dentist's premises. Alan Kendall, born in 1920, worked in old established pharmacy business in Shipley, Yorkshire, as an apprentice in the late 1930s. He recalls:

> *Within the shop there was a separate entrance to the dentists. You went up three steps at the back of the shop. In the same area staff did a little manufacturing, and the manager had his office. The shop had been a domestic premises at one time. There was a complete range with a fireplace. The dentist's surgery was completely separate, and the dentist himself was fully qualified.*[32]

Clive Murray was born into a pharmaceutical family in 1933. He undertook his apprenticeship under his father, who only practised as a pharmacist, in Dudley, West Midlands. His father told him that when he took over the drug store in 1920 there was a little upstairs outhouse, occupied by a dentist, who performed in this room. The arrangement continued for a number of years. The dentist had no connection with his father's business; he just rented the room.[33]

But for most chemists, the limit of their dental activity continued to be the sale of dental products, including large quantities of mouthwashes, toothbrushes and dentifrice. But there was also a wide range of other dental products to promote now, such denture fixative and denture sterilising solution, dental floss, and dental sticks. There were new innovations with regard to toothbrushes. Although nylon was first synthesized by DuPont in February


1935, it did not become available to the public until 1940. When it did, it was in the form of stockings. It was not long before it was being used in a range of products, including toothbrushes.

The increasing fashion for extracting all the teeth and replacing them with full dentures meant that the market for cleaning and storing dentures and dental plates was enormous. Christie's Per-De-Co, a dental fixative for Perfect Dental Confidence, was heavily advertised in the trade press. Special brushes were marketed for the cleaning of plates. The SPA Dental Plate Brush was specially designed to clean every part of the plate as well as the denture. Then there was DAYDENT, the dental powder for instantly cleaning and

polishing all types of dental plate. Immersion overnight was not required, clearly an important selling point.

**Pharmacy and Dentistry in the post-NHS Phase 1948-2015**

With the advent of the NHS in 1948 the landscape for both pharmacists and dentists changed dramatically. With free dental services available to all there was no call for chemists providing basic services as 'the poor man's dentist'. In any case, for retail chemists the great bonanza of the NHS was the massive increase in the number of prescriptions to be dispensed. They almost quadrupled, from around 70 million in 1946 to 250 million in 1949. The chemists were generously remunerated for their dispensing, and dispensing prescriptions was what they had been trained to do.[34]

There was little incentive for pharmacists to engage in non-pharmaceutical activities even if they were inclined to do so. But the chemist-dentists were not finished yet. The *Chemist and Druggist* reported on 27 March 1948 that 'at a meeting of the Council of the Chemists Dental Association held on 18 March, Mr G.C.C. Hinton, presiding, it was unanimously decided to revive the activities of the Society. Pharmacists who are also on the Dentists Register are invited to communicate with the secretary of the Society, Mr J.W. Roberts, 16 Tavistock Place London'.[35]

All of the members had of course joined the Dentists Register on or before 1921; so all had been on it for at least 27 years. Basil Trasler, born in 1922, undertook his apprenticeship in a small, long established pharmacy in Northampton in the late 1930s, and remembers one of the key figures.

> *The boss was an elderly pharmacist. He had been practicing dentistry for many years before the advent of the Dentists Act 1921. He was fully qualified to register under the Act, and was still actively practicing as a dentist. He was one of the few remaining members of the Chemist Dental Society, and had been its President for three years, between 1927 and 1929.*[36]

Basil sometimes assisted him in his dental work, when an extra pair of hands was needed. He was often called upon to operate the foot treadle. The business itself was about half and half dentistry and pharmacy. The dental side involved extracting teeth, filling them, and supplying and fitting dentures.

> *He had a reasonably well-lit dental surgery, plus a small separate waiting room, directly alongside the shop. The dental surgery itself was traditional, nice and clean. Most dentistry was still done in the sitting position. The boss had a modern, cord-driven electric drill, but he retained the previous cast-iron treadle foot-drill. He was conscious that most of the pain was generated by heat. When he had trouble he turned used the slow foot-drill.*

Basil remembers the first acrylic powders for denture plates being introduced in the mid-1940s. His boss was still supplying vulcanised ones. He had a little vulcanizer which was heated by a Bunsen burner. It was on while Basil was having his lunch. He remembers being told to keep an eye on it, and to switch it off after 20 minutes. But with the introduction of acrylic dentures the boss started to use the services of a qualified dental mechanic.

**New opportunities for Pharmacists and Dentists**

Free dental care under the NHS created some unexpected benefits for retail chemists.

People started to take more interest in the care of their teeth, so the market for toothpastes and toothbrushes increased substantially. Chemists remained the principal outlet for them. Manufacturers flooded the pharmacy journals with advertisements for their products. If people were not having to pay for a visit to the dentist perhaps they would have more money for the care of their teeth. Fluorized toothpastes began to appear, like *Noxan*, advertised as being available only through chemists.

Pharmacy of R.J. Mellowes, Enfield, Middlesex, 1959. (RPS Museum)

Manufacturers were quick to seek celebrity endorsement for their products. Stanley Holloway was employed to promote the sale of *Kolynos dental cream*, which 'makes your teeth shine like the stars'. An advertisement for Gibbs SR toothpaste was the first to appear on television in 1955.

Attempts were made to enlist the help of science into the advertisements. *Ammi-Dent* was advertised as the ammonium ion tooth powder. It quoted research work which supposedly convinced the US dental profession that the release of ammonium ion into the saliva reduces the possibility of tooth decay. Selling dental products through pharmacies helped give them scientific credibility.

The impact of the NHS on dentists was almost as great as its impact on pharmacists. Within the first nine months of the NHS a staggering 33 million individual artificial teeth were made. But the dentists were not unanimous in their support for the NHS. A notice appeared in the *Pharmaceutical Journal* in 1949, informing readers that 'the Incorporated Dental Society and the Public Dental Service Association, together representing 6,000 dentists, have advised their members that they are free to take part in the National Health Service. The British Dental Association, representing 8,000 dentists, has advised its members not to take part. 'There are, in Great Britain', added the Journal helpfully, '12-13,000 practising dentists, some of whom belong to more than one dental organisation.'[37]

How many people contacted the secretary of the Chemists Dental Society about reviving its activities is not recorded, but it does not seem to have been very many. For on 22 December 1951 the *Chemist and Druggist* carried an announcement under the heading 'End of the Chemists Dental Society'. 'The Chemists Dental Society, founded in 1910, was dissolved at a meeting held in London on 1 November 1951.[38] At that meeting the

chairman, Mr Hinton, referred to the amalgamation with the British Dental Association of other dental organisations. It had, he said, been smoothly carried out. The Chemists Dental Society had justified its existence, and fully discharged the objects for which it had been formed. At the meeting a resolution was passed donating, out of the remaining bank balance, the sum of £100 to the British Dental Association's Benevolent Fund, and the remainder to the Pharmaceutical Society's Benevolent Fund.

Basil Trasler's boss was one of the people who went to the winding up meeting of the Chemists Dental Society, and he recalls that by that time its membership had dwindled to about 5 members.[39] But those chemists who were also on the Dentists Register could continue to practice dentistry, although it is not clear how many did so.

For most chemists, dental trade following the introduction of the NHS was usually a small part of the total. It consisted of the sale of toothbrushes and toothpaste, along with the denture adhesives, denture disinfectants, dental floss and vast quantities of mouthwashes. Since the end of the Second World War pharmacy has faced many challenges, although one consistent trend has been the annual increase in the number of prescriptions dispensed. In 2013 this figure exceeded 1 billion for the first time, and the reliance of a typical pharmacy on income from NHS dispensing reached almost 90% in 2014.

Since the 1980s pharmacists have been looking at ways of extending their roles and making greater use of their training. More recently they have decided that they have an important role to play in public health, including the promotion of oral health. Indeed the public health role illustrates a key difference between the attitudes of dentists and general medical practitioners towards pharmacists; most dentists seem entirely happy for chemists to take on a role in promoting oral health,[40] whilst general medical practitioners have questioned the value of pharmacists taking on public health roles.

**Conclusions**

This paper has demonstrated that there has been a close and generally supportive relationship between chemists and dentists over the last couple of centuries, although there has been both change and continuity. Both professions were able to benefit from the occupational space created when the apothecaries moved to become general medical practitioners after the 1815 Apothecaries Act.

Pharmacy was able to start a process of professionalization somewhat before the dentists, partly because they were rather less disunited than them. But as a result the dentists were able to benefit from pharmacy's experience. The continuing existence of the chemist-dentists represented a continuing though diminishing threat to the dentists' occupational territory, but there seems to have always been sufficient work for the dental licentiates for this never to have been more than a minor irritation.

If pharmacists encroached on the dentists' territory the same does not seem to have been true in the other direction, unlike the general medical practitioners where doctor dispensing remains an issue even today. Dentists seem to have shown little interest in doing their own dispensing, which would in any case presumably have been very limited, and they were happy to leave the sale and supply of dental products to the chemists. And it was not only the products that the chemists continued to be involved with; their formal authority to extract teeth was only ended in 1997.

Finally, it seems that history does sometimes repeat itself. As we have seen, sometimes dentists used to practice inside chemists shops, although the multiples like Boots declined to enter this market at the time. This side of the business was to be developed by Boots only much later. They announced that they would start up six trial dental clinics, offering a mixture of NHS and private services, from April 1999. This programme has since been

rolled out, with some located in its larger stores, and others being new dental clinics on the high street. So, with new dental clinics, with oral health promotion and the offering of dental advice, it seems that the close relationship between pharmacy and dentistry is set to continue for some time yet.

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# Teething in 18th Century: comparison among Edinburgh, Glasgow and London

**Robin Orchardson**

**Abstract:** Two hundred and fifty years ago, teething was believed to be common cause of death in infants. A contemporary publication (The Scots Magazine) gives the annual causes of death in Edinburgh and London between the years 1739-92.

The figures reveal that there were more deaths from teething in Edinburgh than London, although the reasons for this were not explained. One possibility is that the mechanism of recording the deaths was not medically valid.

**Keywords:** causes of death, history of dentistry, teething.

## Introduction

'Teething' or 'cutting teeth' is the process by which an infant's first teeth appear by emerging through the gums. The process of teething begins at about 3-6 months of age and ends at about 3 years of age. Only the deciduous teeth are affected (R. Welbury, personal communication).

It has been said that teething produced nothing but teeth[1], but this is not quite true. Teething may cause a slightly elevated temperature and may be associated with irritation, eating problems, wakefulness, and rashes.[2] But, in the past, all sorts of illnesses and even death were thought to be attributed to teething.

Hippocrates[3] was the first to propose that teething children "*suffer from itching of the gums, fevers, convulsions, diarrhoea especially when they cut their eye teeth, and when they are very corpulent and costive*".

The notion that death could be due to teething was probably made in the middle ages. Ambriose Paré[4] was the first to propose that death could occur directly from teething and advocated cutting the gum with a lancet.

Arbuthnot[5] observed that: *"Above a tenth part of infants die in teething by symptoms proceeding from the irritation of the tender nervous parts of the jaws."*

The concept that teething was a life-threating event was unchallenged, and grew in popularity, until the end of the nineteenth century.[6]

The Innerpeffray Library was the first lending library in Scotland.[7] David Drummond, 3rd Lord Madertie, founded the library around 1680, and it continued in use until 1968, when it ceased lending. The library is open to the public several days of week, except during the months of November – February. Among its volumes it has *The Scots Magazine* (1739-86: Volumes 1-48).[8]

*The Scots Magazine* is the oldest magazine in the world still in publication. It was first published in January 1739 and continues to the present day. A regular feature appeared in *The Scots Magazine* from 1739-1792, in which the number of deaths, including from teething, was recorded in Edinburgh and London.

## Method and Results

In Edinburgh, the general bill of mortality for the year, and those buried in the Grayfriars churchyard, was recorded in 1739-40 and 1778-1793. In other years (1741-1777 and 1786-92) the data include Edinburgh and West Kirk parishes. In London, the



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annual christenings and burials for the year, with diseases and 'casualties' is also recorded. The Bills did not include the English Dissenters, e.g. Christians who separated from the Church of England (Puritans, Quakers, etc.) or Roman Catholics and those of other faiths.

*The Scots Magazine* data gave the annual births and deaths, plus the causes of death by age, but there are no data comparing the age and causes of death directly. The average number of deaths in the period 1741-77 attributed to teething at all ages was 8.1% (Edinburgh) and 4.1% (London). (Table 1) We can estimate the total number of deaths by teething in the under five years of age. [a] (Table 1) The Edinburgh figure rises to one in four deaths (24.9%) in the under-fives. In London, the corresponding figures of the number of deaths of teething for the under-fives is 9.3%. The difference in the death rates between Edinburgh and London is surprising, but there is no obvious reason for the differences.

**Table 1. The number of deaths caused by teething in the years 1741-77 in Edinburgh and London. The deaths are grouped in the following categories: all deaths and under 5 years (means ± 1 standard deviation).**

| Location | Yearly total number of deaths | Deaths by teething (all ages) | % of deaths by teething (all ages) | Total deaths (0 – 5 years) | % of deaths by teething (0 – 5 years) |
|---|---|---|---|---|---|
| Edinburgh | 1,201 ± 170.9 | 95.2 ± 34.9 | 8.1 ± 3.4 | 446.8 ±157.0 | 24.9 ± 17.1 |
| London | 22,915 ± 2279.3 | 931.4 ± 203.8 | 4.1 ± 0.6 | 10,007.5 ± 1,099.3 | 9.3 ± 1.6 |

*The Scots Magazine* gives figures of the annual deaths in Edinburgh and London broken-up by age and reason of death. In 1770, for example, the causes of death are given; teething was the sixth commonest cause of death in Edinburgh. (Table 2) In London, in the same year, it was the seventh commonest cause of death. "Consumption" and "aged" were the commonest causes of death in Edinburgh. In London, these were second and third most common causes of death; the most deaths were caused by "convulsions". In Edinburgh, only one person died of "convulsions". The reason for this difference is hard to make out.

[a] The data in *The Scots Magazine* are grouped: >2 years, 2-5 years, 5-10 years, 10-20 years, etc.

**Table 2. Causes of death in Edinburgh in 1770.**

| | | |
|---|---|---|
| Aged (217) | Dropsy (5) | Rheumatism (3) |
| Apoplexy (1) | Fever (143) | Small Pox (69) |
| Asthma (10) | Flux (5) | Still born (33) |
| Bowel hive (23) | Gravel and stones (8) | Suddenly (17) |
| Burning (2) | Hives (1) | Suppression of urine (1) |
| Cancer (2) | Jaundice (4) | Swelling (1) |
| Childbed (14) | Iliac passion (5) | Teething (91) |
| Chin (Whooping) Cough (148) | Inflammation (2) | Ulcer (1) |
| Consumption (295) | Low spirits (1) | Vomiting (1) |
| Convulsions (1) | Measles (106) | Water in head (4) |
| Cramp (3) | Palsy (8) | Weakness (6) |

## Discussion

There is no information about causes of death in Edinburgh, other than the figures by year. In London, the Bills of Mortality were the source of the death figures. Originally published to give notice of the plague in the 16th century, they were eventually superseded in 1840 by the Registrar-General's returns. John Graunt,[9] who can lay claim to being the first statistician, noted that: *"When anyone died .... the Searchers hereupon (who are ancient Matrons, sworn to their office) repair to the place where the dead corps lies, and by view of the same, and by other enquiries, they examine by what disease or casualty the corps died. Hereupon they make their report to the Parish Clerk."* So, the accuracy of the information contained in the reports was, at best hearsay, but this is all that we have.

I could not find anything about the methods used for generation of the Edinburgh figures, but there is some information about Glasgow.

Cleland[10] wrote: *"There was no register for burials in Glasgow till 1613, but this does not seem to have been regularly made up until 1694. In 1783, the register was then remodelled and the name, the designation, the age and disease of which the person died were shown. A warden was attached to each burying ground, whose duty is to attend every funeral and to collect the necessary information and the Bills of Mortality were produced."*

In 1819, in Glasgow there were a total of 1504 deaths in the city and there were 61 deaths from teething (4.05%). There were 679 deaths under 5 years of age, making a total of 8.9% of deaths.[10]

Cleland produced a second edition in 1832, and this second report contained a supplement by James Corkindale,[11] who said: *"It was once the practice in the City for the Churchyard warden, at every interment to register from the relatives, the disease and record this in the Book. But, the list, from various causes was found so inaccurate, that no dependence could be placed on it, as affording even an approximation to the*

*death. It was proposed that every Practitioner of Medicine should be requested to furnish at the end of the year, a list of the diseases which proved fatal in the practice, specifying as far as could be ascertained, the cause of patients dying of each disease. But, the Medical Gentlemen within the population district of Glasgow was not attended with the success, which it seemed to merit. The Returns made were so incomplete as to render them of no avail."*

A subset of deaths at the Royal Infirmary and District Surgeons' patients, between 1828-31, was interesting, because no deaths from teething were recorded, probably because the individuals were too old.

In England, an Appendix to the Registrar-General's report of 1842 written by Farr[12] said, *"The process of teething is rarely an immediate cause of death, except when it occasions affections of the mucous membranes and of the nervous systems. The teething and the secondary diseases should be registered."*

Also, Guthrie[13] quotes figures for the Registrar-General's report of the deaths in 1905. He wrote: *"I do not deny that dentition is often a cause of local pain and inflammation, but I was quite unprepared to find that 2,343 infants were held to die from teething alone."* And, *"personally, I have never known a single case in which I could even suspect that teething was the cause of death, and therefore I am not disposed to attach any value to statistics which appear to the contrary".*

## Conclusions

In the 19th Century there was considerable debate about teething and whether or not it caused serious symptoms and, on occasions, death. Until 20th century, the death rate for children was high, and most of the deaths occurred before 2 years of age, about the time when teething was also occurring. Teething was widely believed to be a common cause of death.[14] Some older remedies for teething were violent, and included blistering, bleeding, placing leeches on the gums, and lancing babies' gums.[14] There was a considerable debate in the 18th and 19th century about the advantages and disadvantages of gum-lancing.[13, 14] But, the tide turned in the 20th century. Child health was improving and infant mortality was falling, and the conditions affecting teething infant were found to have other causes. Today, the view that teething is an ailment is still common, especially among parents; but, although it is distressing for the infant, it soon passes. However, the problem still exists: do the symptoms relate to something more sinister?

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# Fifty Years of Dental Implant Development: a Continuous Evolution

**James Darcey and David Eldridge**

**Abstract:** Since their conception in the 1960s, dental implants have evolved into a predictable solution for replacing missing teeth. Many of these advances have come from an improved understanding of osseointegration and material sciences, most notably recognising the inherent biocompatibility of titanium. This has allowed researchers and clinicians to focus upon achieving better functional and aesthetic outcomes. This paper describes the evolution from the original concepts to current practice in dental implantology and considers some of the challenges to success facing clinicians and patients today.
**Keywords**: Dental Implant developments, Success, Osseointegration

## Introduction

The premature loss of teeth has long established biological, functional, aesthetic and psychological consequences[1]. Older traditional fixed techniques for replacing teeth have their limitations [2,3,4] Not only is there an accepted biological consequence of tooth preparation but it is often not possible to replace larger edentulous spans with bridges, especially where no distal abutment tooth exists. Removable dentures have historically been the only solution for these larger spans or where multiple edentulous spaces exist. They can offer great aesthetics but may result in considerable collateral damage to adjacent teeth, most notably, caries and periodontal disease [5, 6]. Furthermore they may be associated with a significant psychological burden and up to 50% are not worn [7]. It is not surprising therefore that there has been a drive to develop alternative tooth replacements and the field of dental implantology has grown exponentially over the years.

## An evolutionary process

There have been many laudable attempts to achieve fixed bio-integrated prostheses since their modern conception in the 1960s. Subperiosteal implants were devices in a cobalt chrome alloy implanted between periosteum and bone with transmucosal components to facilitate the retention of removable prostheses (Figs 1a, b, c).

Fig1a Fig1b

Fig 1a: The framework for a mandibular sub periosteal implant. (Image courtesy of Dr Gordon Smith)
Fig 1b: A sub periosteal framework in situ. Notice the dehiscence of the connecting framework adjacent to the trans-mucosal component.



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Fig 1c: The same patient with the complete denture in place. These implants often provided excellent retention, support and stability.

Fig1c

Though often remarkably successful, these early subperiosteal implants could easily dehisce through the overlying mucosa or become infected. It was soon recognized that placement of the implant into the bone may be the next step. Early "endosteal" blade implants used stainless steel inserts that were "push fit" into pre-prepared osteotomies (Figs 2a, b).

Fig 2a

Fig 2b

Fig 2a: A full arch fixed bridge on blade implants. (Image courtesy of Mr Gordon Smith)
Fig 2b: A 4-unit bridge supported by two blade implants. Notice in both cases the bone loss around the fixtures.

These implants suffered from fibrous encapsulation, progressive mobility, dehiscence and infection. They were also technically demanding to make and fit. There was little robust scientific literature to support their use and the concept was never adopted by undergraduate curricula. During this period of experimentation with different designs and concepts the endosteal implant was conceived; a root form prosthesis inserted into alveolar bone following preparation of an osteotomy matched to the implant. The first attempts at this concept were aggressive trans-osteal "Bosker" type appliances where the implants were stabilized with bi-cortical fixation.

Again these were challenging to place and restore and suffered many of the same problems of sub-periosteal implants. The first oral root form implant was placed by Per-Ingvar Branemark in 1965 [8]. Though good primary stability could be achieved with threaded screws fibrous encapsulation invariable ensued. Following many design modifications, largely borne from trial and error rather than controlled study design the first reports of osseointegration were published [9]. At the time these remained contentious claims.

## Osseointegration

During this period similar bone anchored designs were being trialled in Switzerland and Germany including hollow formed (core vent) and ceramic implants. Neither concept appeared successful with the former suffering bone loss and the latter prone to fracture under load [10]. (Fig 3).

Fig 3: Core-vent hollow form implants.

When peri-implant disease reached the perforations rapid bone loss followed. The design was also inherently weak and these were prone to fracture.

In North America in 1978 a consensus conference proposed certain success criteria for all implants including blade type designs. These criteria stipulated: no more bone loss than 1/3 the implant height and mobility of no greater than 1mm in any direction [11]. Clearly true osseointegration was a long way off if these standards were to be adopted and some researchers began thinking laterally. Zarb et al investigated the use of PMMA to "cement" blade implants but found this technique lacking [12]. The same group then shifted their attention and adopted the Branemark technique with different materials and designs. They initiated the Toronto Study to investigate osseointegration and began the collection of a significant database upon implant success and outcomes. This study had several important consequences[10, 13]:

- The concept of osseointegration was validated.
- This paved the way for the introduction of implantology into the undergraduate curriculum.
- It led to the publication of a significant text on the subject [14].
- The researchers found that not only material science but operator factors play a role in the success of implants. This latter point holds true to this day: poor surgical technique and inadequate cooling are key factors in early failure of implants.
- A new culture of more robust scientific investigation into dental implantology was born.

A new definition of osseointegration was proposed; "*A process whereby clinically asymptomatic rigid fixation of alloplastic materials is achieved and maintained in bone during functional loading.*" [15]

## Materials used for implants

It was recognized that a critical factor for implant success was the biocompatibility of the implant material. Alumina oxide ceramic implants showed good integration but were readily contaminated, liable to fracture and the difficulties of manufacture limited the restorative potential to indirect post and crown based restorations (Figs 4a and b).

Fig 4a

Fig 4b

Fig 4a: Alumina implants
Fig 4b: An integrated alumina implant

Titanium based materials overcame these difficulties. This inert metal quickly develops a titanium dioxide layer making it not only biocompatible but permitting direct contact of bone with the implant surface [16]. The original implants were machined and it soon became apparent that surface texture of the implant was also of huge significance to integration with bone. It is now known that threaded and moderately roughened surfaces have a better bone response (Fig 5).

Fig 5. A modern implant with a threaded, roughened surface.

Current advances seek to improve the interface between bone and implant surface by using materials that are not inert but osseoconductive or osseoinductive, permitting bone to "bond" to the implant surface and to encourage further bone formation [17].

**When should the implant be loaded?**

Depending upon bone type and implant design, integration was thought to occur within 3-6months. Restoration of implants was delayed accordingly. This dogmatic approach to timing exposure and loading has more recently been questioned [18].
Immediate loading is defined as*" restoration within 72 hours of implant placement and early loading is restoration within 6 weeks"* [19]. Indeed there is evidence that restorations may be placed on implants immediately or early after placement in cases where the restoration can be protected by the surrounding dentition. It is important that the clinician considers the difference between functional and non-functional loading. In the former, micro-movement may disrupt integration. A delayed approach to uncovering and restoration is advised if: grafting is required at surgery or there is any doubt about the quality of bone or good primary stability could not be achieved or it is impossible to remove the prosthesis from heavy functional loading. The British Society of Restorative Dentistry now recommends delaying restoration for 2-3 months in the mandible and 3-4 months in the maxilla [20]. Immediate functional loading should only be considered by experienced clinicians in well planned cases where loading is shared across multiple implants. This concept formed the basis of the Lederman Screw in the 1970s, evolving in recent times into the Novum Concept and the "all on 4" protocol [21]. Four implants are placed in the mandible and loaded immediately following placement. Though both temporally and technically demanding and there is a dearth of evidence to support it, this protocol appears to be growing in popularity.

**Implant Planning**
Assessing bone volume to facilitate planning has historically been time consuming and prone to inaccuracy. Traditional methods used two-dimensional radiography and tissue mapping to estimate bone levels and plan implant size and position (Fig 6).


Fig 6. A dental pantomogram radiograph with ball baring markers to estimate the proposed position of mandibular implants in relation to the inferior dental nerve.

Though three dimension planning has been available for decades in the form of Computed Tomography (CT) its uptake was limited in implant dentistry owing to the high radiation dose and compromised fine detail. Cone beam computed tomography has revolutionized implant planning as it permits 3D imaging without the significant x-ray exposure of traditional computed

tomography (Figs 7a, b). In its most simple iteration this allows 3 dimensional assessment of bone volumes and identification of anatomical structures such as the sinuses or mandibular nerve canal [22].

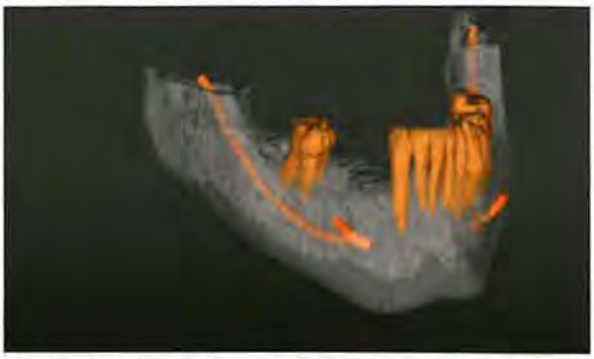

Fig 7a Implant planning software allows 3-dimensional pre-surgical site assessment and identification of key anatomy. (Image courtesy of Rachel Goddard at Dentsply Implants)

Fig 7b: Implants may be planned digitally to optimize restorative success.

This diagnostic tool has evolved so that by using radiographic stents and implant planning software, it is possible to plan precisely the site, length, width and angulation of implant fixtures.[23] More importantly this computer software allows clinicians to plan implant placement in reference to the final tooth position; this is critical in achieving the best restorative outcomes (Fig 8).

Fig 8: Placement without adequate planning may result in divergent and potentially unrestorable implants.

Implant companies can now produce surgical stents from these scans that enable the dentist to duplicate the planning position intra-orally. This can be done with sufficient accuracy in certain circumstances to allow immediate restoration [24]

**Developments in the restorative phase of treatment**

**Achieving Stability**

The restorative component of treatment was largely an afterthought until predictable implant integration with bone was developed. The first challenge was a stable connection of the prosthetic component (or abutment) to the implant. All implant designs need to include an anti-rotation device to allow the implant driver to engage and screw the implant. Branemark connections used an external hex and although this design remains in use today it is often awkward to seat the abutment (Fig 9)

Confirmatory radiographs to ensure correct seating are considered best practice. There may be inaccuracies during impression taking and there may be a tendency to screw loosening [25].

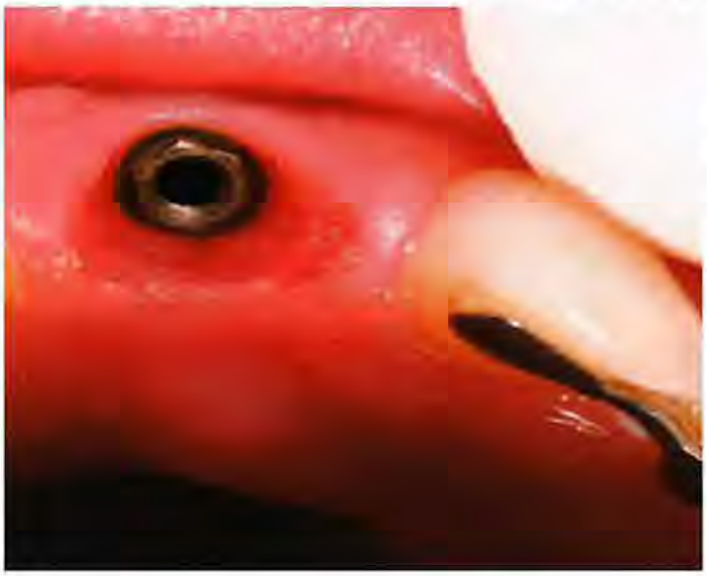

Fig 9: The external hex driver. Notice the plaque accumulation adjacent to the hex.

The move to an internal hex and Morse taper connections brought more certainty to the restorative dentist that the connection was engaged and secure (Fig 10).

Fig 10: The internal connection of an Astra EV implant. (Image courtesy of Rachel Goddard at Dentsply Implants)

It also revealed an interesting concept called *platform switching*. The basis of this concept was that there will always be a micro-gap between implant and abutment and this may have two important consequences: Bacteria will be found in the gap leading to chronic local inflammation which could result in local bone loss, analogous to periodontal disease [26, 27]. Furthermore micro movement at this interface may induce bone resorbtion [28]. The use of an internal hex and/or Morse taper connection not only reduces this micro gap but shifts the micro gap away from the periphery of the implant. This movement is termed platform switching and is associated with more favorable long term crestal bone levels [25]. Some designs such as IMZ implants also included stress breakers but these required regular maintenance with little supporting evidence and are no longer used (Fig 11).

Fig 11: The "IMZ" stress-breaker. A resilient insert placed between abutment and restoration.

**Fixed or removable prosthesis?**

Though many patients and dentists view fixed restoration as the raison d'etre for dental implantology there are many situations where removable solutions are the more sensible strategy, not least that fixed solutions are invariably too expensive for the majority of patients. There is also some evidence that shows that patients are as satisfied with a removable prosthesis if they are combined with a fixed implant component [29].

If the implants are to retain partial or complete prostheses there are a number of systems available, all of which are based upon male and female components interlocking to unite the denture to the fixture. These include: studs, magnets, locator attachments, bars and beams (Fig 12a, b).

Fig 12 a

Fig 12b

Fig 12a: A milled titanium bar connecting 4 maxillary implants

Fig 12b: The corresponding complete denture with resilient plastic clips to engage the bar.

All implant retained prostheses can offer significant improvements to quality of life through regained masticatory function and improved aesthetics. The McGill consensus statement recommends that the gold standard management for the edentate mandible should be the placement of two implants to retain a denture [30]. Unfortunately in the UK we remain a long way from this becoming standard clinical practice.

**Cement or screw retained?**

For fixed restorative solutions the connection design remains contentious to this day. Final restorations may be screw retained or cement retained. Many would argue that all prostheses should be screw retained wherever possible as this facilitates long term maintenance and the possibility of retrieval. It is however not always possible to screw- retain prostheses, especially if the angulation of the implant results in the screw access hole being sited in the aesthetic zone, as may often be the case with maxillary implants (Fig 13).

Fig 13: The angulation of the implant UL2 is such that it would be impossible to screw retain a prosthesis without an access hole in the labial aspect of the crown.

Furthermore screw loosening has been cited as one of the biggest causes of post implant placement complication [31]. Cement based retention negates the need for a screw and allows the restorative dentist to alter the angulation of the abutment to implant but has two significant drawbacks. The first is the frequent inability to remove all the excess cement from around the abutment. This may result in peri-implant cementitis that if not managed can result in peri-implantitis. The second is the difficulty in removing the restoration should the abutment screw loosen or the prosthetic treatment plan change in the future (Figs 14 a,b).

Fig 14a: A screw retained abutment with cement retained crown. Even when using temporary cement crown removal may be very difficult.
Fig 14b: Once the crown has been cemented, the only way to access the screw for removal is by drilling a hole through the crown.

**Abutments and connectors**

Most advances in restorative techniques have come in the form of material science and construction techniques. Traditionally abutments have been constructed using cast-to principles and gold before completion of definitive prostheses, be they single crowns, bridges or removable dentures. With the increasing prices of gold alloy and the introduction of CADCAM aided designs[32] there has been a progressive move towards milled titanium abutments, often constructed off-site (Fig 15).

Fig 15: Milled titanium abutments allow precision of marginal placement, tissue contour and taper.

These offer increased precision and are more cost-effective. Ceramics have been developed that can fuse to titanium allowing full arch fixed restoration in titanium and ceramic. Our understanding of glass free ceramics, most notably zirconia, has also led to the progressive introduction of metal-free abutments and restorations [33]. Though there is little long term data to support their use, these may offer improve aesthetics whilst maintaining good tissue compatibility. These advances have completely changed the techniques and skills required of the modern technician.

**Modern solutions to historical challenges**

Clearly, if implants are to be placed, there must be sufficient bone. For many patients pneumatisation of the sinuses, insufficient height of bone above the inferior dental nerve and, more generally, severe resorption have historically contraindicated implant placement. One early solution was to consider grafting which involved the subperiosteal placement hydroxyapatite crystals (HA)
(Fig 16).

Fig16: Sub periosteal hydroxyapatite augmentation. There is no oestegenesis and the graft material is not resorbed.

Though this type of grafting was a forerunner to modern granular allograft and xenograft use there was minimal osteogenesis into the HA and it did not resorb. Implants could be placed but there was no integration in the graft region. Though more predictable grafting and continued evolution in implant design have enabled clinicians to help these patients there have been several key developments of note, namely:

**Immediate placement of HA and socket preservation**

In selected cases it is accepted practice to place implants into fresh extraction sockets before significant resorption has occurred [34]. This also expedites the restorative phase Fig 17).

Fig 17:Socket preservation: following

extraction of the UL1, bovine bone is placed into the socket followed by a collagen sponge. This reduces post-extraction ridge resorption.

The placement of particulate,bone into fresh extractions sockets has been demonstrated to reduce post-extraction alveolar resorption and permits implant placement at a later date [35].

**Particulate grafting:**
For smaller areas of bone deficiency bone scrapings may be harvested from the implant osteotomy or adjacent sites and used to augment the deficiencies [36]. Particulate or block xenograft materials such as BioOss and Coral are proven and predictable bone substitutes. These have the added advantage of no donor site morbidity and shorter surgery time (Fig 18).

Fig18: For smaller areas of bone loss or fenestration of the implant a xenograft of particulate bone may be used.

**Onlay grafting:** The use of blocks of autogenous bone from other sites both intra and extra orally has been facilitated with Piezo instruments and is a predictable method of increasing bone height vertically and horizontally [37].

**Sinus lifting:** This process of raising the lining of the maxillary sinus and placement of particulate bone to augment sites in the posterior maxilla is now widely undertaken with high success rates [38]. Traditionally performed via Caldwell Luc approach a more modern Summer's Lift augments the sinus through the osteotomy prepared for the implant [39].

**Short implants:** Short implants are those defined as <8mm in length. Implants between 4 and 6mm are now being routinely used in sites with insufficient bone height. Early outcome data is positive with high success rates reported [40].

**Mini implants:** These are single-piece trans-mucosal implants with stud attachments constructed with titanium alloy. These are smaller diameter, requiring smaller osteotomies (Fig 19).

They offer a simple short-term solution to support and retain complete dentures and are of particular value in medically compromised patients or those with severe bone resorption that precludes wider implants [41]. Their long term survival data is mixed.

Fig19: Mini-implants are single-piece titanium screws with Trans mucosal studs offering a simple, minimally invasive solution for poor denture retention.

**Zygomatic implants:** In the severely resorbed maxilla longer implants, (55-66mm) can be placed that are primarily anchored in the zygomatic buttress but emerge through the alveolus (Fig 20). As these are long they may flex and should be linked to other implants for rigidity. Success rates of 80% plus have been reported [42].

Fig 20: Quad-zygomatic fixtures placed in a case of severe maxillary resorption. The flexibility inherent in such lengthy implants can result in large amounts of micro-movement under loading, as such it is recommended that these implants be splinted together.

**Coaxial implants:** The abutment connection to the head of coaxial implants is positioned at an angle that deviates from the long axis of the implant. This allows these implants to be placed at

unusual angles yet still be restored conventionally. Classically these are placed with a mesial incline in the anterior maxilla and mandible but emerging distally to allow restoration in the premolar region without perforating the sinus or damaging the mental nerve respectively.

**Ridge expansion:** Where there is good bone height, but inadequate width, it is possible to predictably split the ridge, thus creating space for an implant whilst simultaneously preserving the cortical plates. A more radical type of ridge expansion is available in the form of distraction osteogenesis. Following osteotomy, segments of alveolus are progressively separated at such a pace that permits formation of new bone within the osteotomy.

**Alternative uses for dental implants**

Implants are now being used in extra oral and craniofacial sites, most notably for developmental and oncology defects to facilitate reconstruction. Not only may they be placed into the pterygoid plates and laterally into maxilla to support and retain obturators but may be placed into the temporal bone, orbit and nasion to retain ear, orbital and nasal prostheses.

Fig 21a

Fig 21b

Fig 21a: Extra oral implants placed into nasion and scapula linked with a cast bar and magnet.
Fig 21b:These allow anchorage of a prosthetic nose. (Images courtesy Professor Craig Barclay)

Clearly this can have significant life-changing outcomes for this cohort of patient.

**Success or Failure**

Current implant systems have very high survival rates with ranges from 94.5%-98.4% at 5-10years for single tooth implants and 95.2%-86.7% for bridges at 5-10years [43]. It is now possible to place implants and inform patients that the implant will remain in-situ for decades to come. The wary clinician must however distinguish these figures from success. The traditional definition of success was less than 1.5mm of bone loss in the first year and less than 0.2mm/year thereafter with an absence of suppuration, mobility, pain and radiographic bone loss [44]. This definition does not acknowledge the importance of healthy soft tissues, aesthetics, prosthetic success or patient satisfaction [45]. If we consider this broader definition of success the figures are

less compelling with success rates of 61.3% for single tooth implants at 5 years [43]. Factors such as screw loosening, fracture of restorations and loss of retention of anchorage components are all too common. Biological complications are equally important (Figs 22, 23): the incidence of peri-implantitis is increasing with up to 26% of all implants placed developing the condition [46].

Fig 22

Fig 23

Fig 22: Perimplantitis loss around push-fit Frialit 2 implants.
Fig 23: Catastrophic loss failure: Exfoliation of implants and screw loosening of the remaining supra-structure.

Peri-implantitis cannot easily be managed: cleaning and maintaining a micro and macro mechanically roughened titanium surface is far harder than dentine and cementum. Clinicians and patients should be aware of this distinction and lower expectations accordingly.

**Conclusions**

There are currently over 400 different manufacturers of dental implants all claiming to offer a panacea for the missing tooth. Clinicians must not take advertising promotions at face value and should attempt to understand the science behind the claims these companies make. In particular, significant consideration should be given to longevity and maintenance requirements, using trusted manufacturers, likely to have access to components long into the future. Single missing teeth should not be viewed in isolation but as part of a holistic oral assessment. Until improved long term implant survival data can be demonstrated patients must be informed of the ongoing costs of maintenance and risk of peri-implant disease. Modern implant studies have advanced our knowledge considerably in the last fifty years but more research and development is required if we are to consider the implant as a true replacement for natural teeth.

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*David Eldridge qualified at Kings in 1972 and undertook community, hospital and practice posts before specialty training in restorative dentistry at the Eastman Dental Hospital, London. He was appointed Restorative Consultant in 1982. Initially based at the Manchester Royal Infirmary but with more time in the Manchester Dental Hospital as well as sessions in Withington, Wythenshawe and Macclesfield.Hospitals He has restored both sub-periosteal and blade implants and was a pioneer for the use of endosseous implants in the UK. This began with training in West Germany in 1986 with Alan Quayle and Gordon Smith, Bob Howell and John Cawood. Since then he has seen many iterations of the dental implant from Corevent and Tuningen ceramic implants to titanium using IMZ, Straumann, Southern and Astratech implants.*

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# French Mobile Dental Vehicles during the Great War

**Xavier Riaud**

**Abstract :** The development and implementation of mobile dental clinics in World War I is described
**Keywords** : France, mobile dental clinics, World War 1, dental cars, dental vehicles

## Events leading up to the development of mobile clinics

Right from the beginning of the year in 1915, the Senator of the Seine, P. Strauss planned the development of a mobile dental service for the French army[1].
He stated: "*This mobile service will aim to provide health-care services at the front as well as in the other army zones. Emergency dental and prosthetic treatment will be provided allowing a more comprehensive health service. Where required, the motor vehicle will also be able to address any emergency situations for soldiers who have mutilated faces and jaws, by providing temporary prosthodontic appliances which will help to avoid bad facial scarring ...*"

The Senator's plan was adopted by the Higher Consultative Commission of the Health Service and a decision was made to carry out a trial on troops operating at the rear of the armed forces.

Prior to July 1915, many people had already considered the development of a mobile transport vehicle for stomatological care. Thus, in April 1915, the report written by Major Doctor, Blot, from the Val-de-Grâce Hospital, Head of the Stomatological Service, proposed the fitting of a bus such as "the Paris bus" into a vehicle which would provide dental care and maxillo-facial operations. In addition, he also proposed the outfitting of a vehicle such as Berliet's into a prosthetics workshop.
While one of the teachers from the Dental School of Paris was beginning to develop the project, Gaumerais, a dental surgeon, took matters into his own hands and designed and implemented the first prototype of dental car[2].
It was only on July 31st 1915 that Justin Godart inspected the new cars which were intended to deliver various military health services[3]. The model developed by the dental surgeon Gaumerais, was obviously demonstrated to Godart on that day[4]and his design for a mobile dental clinic was chosen. Shortly after, it entered service and Gaumerais was appointed as the dental surgeon and also the head of the mobile dental service. The staff of the mobile clinic included an additional dental surgeon, Viel, a dental technician and a driver. This innovational dental service was widely acclaimed and was considered to be very beneficial for the army. Subsequently, in May 1916, nine other mobile clinics were equipped and deployed. They were so effective that Gaumerais suggested removing the standard fixed dental clinics of the military

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[1] See Strauss P., « Proposition à la Commission supérieure consultative du Service de santé relativement à l'organisation des services dentaires militaires » ["Proposition to the Higher Consultative Commission of the Health Service concerning the organisation of dental military services"], in *L'Odontologie*, 30/03/1915.
[2] See Augier Sylvie, *Les chirurgiens-dentistes français aux armées pendant la Première Guerre mondiale (1914-1918) : Organisation d'un service dentaire et stomatologique*, [The French military dental surgeons during the World War I]. PhD in Dental Surgery, Lyon I, 1986, pp. 69-70.
[3] See Zimmer Marguerite, « Petite histoire de l'art dentaire: des origines à nos jours - De 1910 à 1920 » ["A little story on dental art from the 18th century to 1950], in *Actes de la Société française d'histoire de l'art dentaire [Acts of the French Society of Dental Art History*"], no date, pp. 4-5.
[4] See Augier Sylvie, *Les chirurgiens-dentistes français*..., op. cit., 1986, pp. 69-70.
Bruschera maintained that in November 1916, there were seven dental cars (See Bruschera L., « Les services dentaires aux armées (zone de l'avant) » [The military dental services (forward zones)], in *Congrès dentaire interallié 1914-1917 [In inter-allied dental Congress 1914-1917*], G. Villain (ed.), volume II, Paris, pp. 1235-1236).



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corps, which were too far from the front, and replacing them with his mobile clinics. His clinics provided much needed treatment in the field, and were more able to respond to the needs of the troops and the inhabitants of the neighbouring villages.
There were two stomatological cars per army. The staff was made up of a stomatologist and of a dental officer, that is to say two dental officers. They were assisted by two dental technicians and a driver. They aimed to provide dental care and the fitting or repairs of dental appliances. They also had to give the front line prosthetic care which was needed to allow the rapid evacuation of those injured with maxillo-facial wounds. The mobile clinics were moved and located to parts of the battlefield where they were most needed, thereby providing a local service to the troops. In this way dental treatment was provided to troops who were deprived of regular dental service, such as : groups of artillery, infantry or independent cavalry divisions, training battalions, regimental care units, etc. They were not static health facilities, and were not supposed to be used that way.

This is how Gaignon, a dental officer from a group of divisional stretcher-bearers from the 76th division described the use of this mobile service[5].
*Each dentist was attached to a section of the stretcher-bearers group and provided consultations every morning from 08.00am to 11.00 am, in the quarters of the section. During the afternoon, on a fixed day, each dentist went to a Divisional Aid Station where he made himself available to the troops based at the front. In the event of enemy attacks, these vehicles were supposed to return to the evacuation hospitals indicated by the commanding officer of the Army Medical Service. The staff of these cars, together with specialised surgical teams, gave the immediate prosthetic care which was needed to allow the rapid evacuation of those injured with maxillo-facial wounds*[6].
Between October 15th 1916 and April 15th 1917, the parking place of the vehicles was closer to the battle lines. The cars generally were in a village which served as quarters for resting troops.

**The design of the dental vehicles**

The vehicles were manufactured by Renault or Barré. The dental vehicle was similar in design to that of radiology vehicles[7]. The car was divided into two parts[8]. At the front, in the first third, was a laboratory for dental repairs. In the remaining two thirds, was a dental office. They were lit by several bay windows. The rear panel opened in two equal halves. The first one which had windows lengthened the roof. The second folded to form a deck supported by two iron pillars. The dental chair, which was almost outside the car body, was firmly attached to the floor of the deck. The surgery was closed by stretched canvases fitted with windows. Thus, the patient could have privacy from his comrades. A small ladder facilitated access to the improvised cabinet. There was no electricity. However, there was a chair, a spittoon, a chest with two rows of drawers, shelves with instruments and dressings. There was also a foot pedal operated sink which was provided with water thanks to a metallic tank containing 10 litres of water. If needed, a petrol heating device was available to heat some water.

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[5] See Gaignon A., « Communication de la pratique dentaire sur le front », [Communication on the dental practice on the front]. In Congrès dentaire interallié 1914-1917 [In inter-allied dental Congress 1914-1917], G. Villain (ed), volume II, Paris, 1917, pp. 1305-1310.
[6] See Œuvre collective [Collective work], *Science et dévouement. Le Service de santé - La Croix- Rouge - Les œuvres de solidarité de guerre et d'après-guerre [Science and dedication. The Health Service – The Red Cross – War and post-war solidarity works]*, Quillet (ed.), Paris, 1918, pp. 237-242.
[7] See Augier Sylvie, *Les chirurgiens-dentistes français…*, op. cit., 1986, pp. 70-76.
[8] See Konieczny Bruno, *Le chirurgien-dentiste dans le Service de santé des armées françaises durant les guerres modernes [Dental surgeons in the Health Service of the French Armies during modern wars]*, PhD in Dental Surgery, Nantes, 1992, pp. 32-33.

Oral health vehicle #2 by the garage door[9].

The interior of the Oral health vehicle #2 [10].

The laboratory included a workbench with two seats[11]. It was equipped with a petrol burner, a workshop lathe and a board on which was a vulcaniser. A fuel heater powered the vulcaniser. The instruments necessary for any prosthetic work were hung on the sidewalls. Three carbide lamps provided lightning. Thanks to these vehicles, the soldiers could return to the front faster, without having to resort to evacuation routes and without having to interrupt the progress of the war.

Louis Lasfargues, a medical assistant major, and Louis Viau, a dental officer, described the functionning of their care unit[12]. "*Our car worked as a small mobile prosthetic center, making new dentures for men whose mouths had been prepared by the division dentists, or repairing all broken devices. The parking space for the vehicles was close enough to the battle lines, generally in the middle of the division, in a village which served as quarters for resting troops. The men, whose mouths were ready and whose gums had healed,, were sent to us by the division dentists with a complete file (odontogram, medical certificate, acceptance by the division practitioner and the director of the health unit) according to the headquarters' orders from*

[9] See Petit Daniel, private collection, Nancy, 2006, © Daniel Petit.

[10] See Petit Daniel, 2006, © Daniel Petit.

The price of a fully-equipped dental car, amounted to 21 000 francs, was a considerable amount of money at that time.

[11] See Augier Sylvie, *Les chirurgiens-dentistes français*..., op. cit., 1986, pp. 70-76.

[12] See Lasfargues Louis & Viau Louis, « Une voiture de stomatologie aux armées » ["A dental car in the army"], in *L'Odontologie*, 30/07/1917, pp. 278-280.

*April 18th to July 15th 1916. (...) The dental vehicle stayed at least one month in each army corps, which allowed us to see once again the men fitted with devices and to perform any needed additions. (...) With the help of two mechanics, one vulcaniser and petrol lamps which were very difficult to handle and slow to heat, we were able to deliver 313 devices including 1,723 teeth and to repair 80 others*[13]*. Following the instructions, Sundays were devoted to visits and the vehicle maintenance. The vehicle worked 138 days in the space of six months (that is to say 180 days) and consequently delivered an average of more than two pieces per day without taking account of the repairs even though each monthly trip made us lose at least two to three days. Thus, it avoided the evacuation of more than two hundred men who, in fact, left their units for a relatively short period of time, instead of spending eight to a dozen days, or even three weeks at the rear prosthetic center.* "

As serious fighting began and the loss of human life on both sides was tremendous, wounded soldiers filled the field care stations and the number of mobile dental care vehicles quickly proved inadequate. There were not enough railways and roads were impassable as a result of poor weather conditions. Orders of dental supplies and equipment no longer kept up. The injured were moved to the rear of the army thanks to light cars with springs, a system of stretchers carried by horses, or in mountainous areas by sleds or side by side beds made of pine[14]. The first dental trailer was inaugurated on March 31st 1916. They were drawn by horses but from 1918, with renewed bombings, dressings and other surgical instruments were transported, from one trench to the next, by wheelbarrows.

M. Justin Godart (1871-1956), Undersecretary of State to the Military Health System from 1915 to 1918[15].

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[13] See Lasfargues Louis & Viau Louis, « Une voiture de stomatologie aux armées » ["A dental car in the army"], in *L'Odontologie*, 30/07/1917, pp. 278-280.
[14] See Zimmer Marguerite, « Petite histoire de l'art dentaire: des origines à nos jours - De 1910 à 1920 » ["A little story on dental art from the 18th century to 1950], in Actes de la Société française d'histoire de l'art dentaire [Acts of the French Society of Dental Art History"], no date, p. 5.
[15] See Musée du Service de santé des armées au Val-de-Grâce, personal communication, Paris, 2007, © Musée du Service de santé des armées au Val-de-Grâce.

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# Ladybird books and Teeth

**Sandra Halford**

**Abstract:** In the 1970's, whilst working as a school dental officer, it became apparent that there were very few books available for young children giving information about teeth. This paper describes how the Ladybird books on teeth came into existence.

**Keywords:** Ladybird books, teeth

## Introduction

I was recently asked to give a short talk about my work to a Probus group, a club for retired professional and business people. I told them I had qualified as a dental surgeon more years ago than I care to remember (in actual fact in 1963). I have always been aware that hearing the word 'dentist' causes a rise in blood pressure for a number of people. It followed that there was a need to educate people about teeth and dentists, perhaps starting with children. So I decided to speak about a Ladybird book which I had previously written.

## Ladybird Books for children

Known and loved the world over, Ladybird books were a series of books for children of all ages. For millions of people they bring back the golden days of childhood - learning to read, discovering the magic of books, and growing up. The very first Ladybird book was produced by a jobbing printer called Wills & Hepworth during World War I. Based in Loughborough, Leicestershire, they began to publish 'pure and healthy literature' for children, registering the Ladybird logo in 1915. Some of them are no longer politically correct. For example, In the *ABC Picture Book*, 'A' stood for armoured train! The books sold for about two shillings and six pence [1] years ago, they are now collectors' items, worth in some cases up to £70, when out of print and in pristine condition.

## The story begins

It all took place in the 1970s. At that time, my late husband Bob heard that in 12 months he would be serving in Belgium at SHAPE (Supreme Headquarters Allied Powers in Europe), so I would have to leave my post as a school dental officer in Essex. At the same time I was asked by the deputy Head Teacher of my children's school if I could help with a project about teeth with his class of junior children aged 10-11 years. I went into the school during my lunch time and worked with the children for about an hour, once a week, for 6 to 7 weeks.

Each evening at the end of the day I wrote up what we had done and included the children's reactions to illustrate their enthusiasm and their involvement; e.g. "one child suggested this and another observed that ..." The plan was to send a copy of the transcript to all of the primary schools I covered in the school's dental service.

I provided a lot of visual aids at school but there was a noticeable absence of books. So I wrote to the publishers, Ladybird Books, saying that as a mother I was constantly buying their books for my children. We all loved them, but as a dentist I could not understand why there were no books on Teeth and Dental Health in any of their series. There was an immediate reply saying they could not decide which age group to



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target. Quickly they received my response and suggestions: maybe a sister book to their book *Your body*, perhaps entitled *Your teeth*. It should/could/would be suitable for teachers and juniors for projects and could possibly be recommended to expectant and nursing mothers. A copy of the project write up had been enclosed for them to read. A casual comment was made that to interest small children perhaps it could be done through animals. Their instant reply was to ask if I would consider writing a script for the younger age group, i.e. six-year-olds; and if I could supply a synopsis of the plan.

**A book about animal teeth is devised**

So I planned:

- To go through the evolutionary scale of animals, relating structure and shape of teeth to their function, mentioning the types of food eaten.
- To find an animal story of what happens when animals eat the wrong foods.
- To talk about the work of veterinary surgeons (vets), relating it to the work of dentists; to show how the children themselves should look after their teeth.

The editor gave his immediate approval. Initially I contacted a local vet and also a local small zoo. The vet was very helpful, providing a gory photograph of a dog under an anaesthetic after a scale and polish. There was plenty of blood, which the children would have loved, but not the editor: he was squeamish. The zoo indicated that it only fed its animals foods that were recommended. A trip to London took in the Natural History Museum and London Zoo in Regents Park. At the Museum the senior lecturer, Joyce Pope, said: "A Ladybird book? Ladybirds don't have teeth, just hard mouth parts, called mandibles". "Yes", I exclaimed, with fists flailing the air, I knew the first page of *Teeth* had been constructed.

At the London Zoo the vet showed me a handful of teeth and asked "do you know what these are?" They looked remarkably human but bigger. He said they had belonged to Guy the gorilla and had been removed whilst he was under a general anaesthetic. What joy, I had found the subject for the middle section of the book, the story that was needed. What a happy return journey. I spent a long time reading children's books and came to realize the need for short words and sentences. But then my 5-year-old daughter came home from school and told me they had been learning about the dinosaur Tyrannosaurus Rex. Wonderful, perhaps I could be more adventurous with my wording.

**A book for junior children**

Because I felt strongly about "*Your teeth*" idea for the juniors, I wrote that script too. When I visited the editor in Loughborough I took both scripts along. A cheque was produced immediately for the animal script. I was advised that if I could find a sponsor for the "*Your teeth*" it would also be published. Proctor and Gamble were the sixth company to which I wrote. Happily they responded that they would be interested in being involved in publication of "*Your teeth*". Once I introduced Proctor and Gamble to them Ladybird's response was "leave us to get on with it".

I moved with my husband and daughters to live in Belgium and in 1977 received the Galley proofs on which to comment. It was enjoyable reading the results of my efforts and I loved the illustrations they had produced. I felt honoured that the editor, Vernon Mills, had done some of them himself. I felt uncomfortable to see a whole page illustration of shelves of Crest toothpaste but had to accept it as Ladybird had used Procter and Gamble to sponsor that book. For me the advertising was not subtle enough.

The book was published, costing 20p for the 48 pages. Further, it was translated into numerous other languages including French, German, Italian, Spanish and Portuguese. My husband actually saw a little boy sitting at the side of the road in Nepal reading the Ladybird Leader book *Teeth* [the name of the series for children aged around six years] translated into Nepalese. It gave us a great feeling of satisfaction to realise how far afield the books travelled.

It is sad that a week before the book was launched in 1978 the newspapers announced that Guy the gorilla had died whilst under a general anaesthetic to have more teeth extracted.

It gave me great satisfaction to have been involved in this venture. I hope it has raised awareness amongst thousands of children and their parents about the rules of good dental health.

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Based on a paper to the Probus Group, Newbury.

**Acknowledgement:**
I would like to thank Professor Stanley Gelbier for his help and encouragement in writing this paper.

[1] 2s6p = 7.5p in current coinage.

**Author Biography**:
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# The Lilian Lindsay Memorial Medal

**Stanley Gelbier**

The Lilian Lindsay Memorial Medal was awarded to Rufus M. Ross at the AGM of the Lindsay Society in October 2015

## Biography

Rufus Ross qualified from Glasgow Dental School in 1947, so he actually practised dentistry before the NHS started. He has a longstanding passion for dental history.

In 1996, Rufus was one of the founder members of the West of Scotland Dental Research Group, which was later renamed after Henry Noble. Rufus was its honorary Secretary, becoming chairman from 2004 and remaining so for ten years. Even then he remained a member of the committee.

Rufus has also served as a member of the Lindsay Society's committee, ensuring close contact between the two groups.

He has made many contributions to dental history. Rufus was involved in mounting an important Witness Seminar on the impact of the National Health Service on the practice of dentistry, which was a joint enterprise between the Henry Noble Group, The Centre for The History of Medicine of the University of Glasgow and the Lindsay Society.

Rufus helped to develop close relationships with both Glasgow's Unit for the History of Medicine and the Faculty of Dentistry at The Royal College of Physicians and Surgeons of Glasgow.

Rufus edited the Newsletter of the Scottish group for four years from 1997. It became the *Dental History Magazine* in 2007. Rufus has been a regular and valued contributor to the dental press, especially to the *Dental History Magazine*. Well known is his paper on Doc Holliday and dentistry.[i] Perhaps less known is his erudite and witty article on early attitudes to female dentists.[ii]

Rufus' academic credentials are outstanding. In 2012 he graduated for the fourth time, with a BSc degree from the Open University. He also holds a BA (Hons) from the OU. A very great achievement came in 1995, when he was awarded a PhD by the University of Glasgow for his thesis entitled 'The development of dentistry: a Scottish perspective circa 1800-1921'. It was when he began his research for that degree that he first became aware of the Lindsay Society and became a member.

It is known know that his Scottish Colleagues are proud of Rufus' contribution to dental history. Now the Lindsay Society acknowledges his major contribution to the history of our profession by presenting Rufus with the Lilian Lindsay Memorial Medal. We can think of no better recipient.

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[i] *Dental History Magazine* 2012; 6: 1.

[ii] *Dental History Magazine* 2014; 8: 1.



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