

Dentistry and the British Army: 1661 to 1921

Quentin Anderson¹

Key points

Provides an overview of dentistry in Britain and its relation to the British Army from 1661 to 1921.

Provides an overview of the concerns of the dental profession over the lack of dedicated dental provision for the Army from the latter half of the nineteenth century.

Illustrates some of the measures taken to provide dental care to the Army in the twentieth century before 1921 and the formation of the Army Dental Corps.

Abstract

Between 1661 and 1921, Britain witnessed significant changes in the prevalence of dental caries and its treatment. This period saw the formation of the standing British Army and its changing oral health needs. This paper seeks to identify these changes in the Army and its dental needs, and place them in the context of the changing disease prevalence and dental advances of the time. The rapidly changing military and oral health landscapes of the late nineteenth century and early twentieth century bring recognition of the Army's growing dental problems. It is not, however, without years of campaigning by members of the profession, huge dental morbidity rates on campaign and the outbreak of a global conflict that the War Office resource a solution. This culminates in 1921 with, for the first time in 260 years, the establishment of a professional Corps within the Army for the dental care of its soldiers; the Army Dental Corps is formed.

Introduction

This paper sets out to illustrate the links between dentistry and the British Army over the 260 years between the Royal Warrant of Charles II establishing today's Army and that of King George V authorising the establishment of the Army Dental Corps. It sets the background to the papers in this issue which illustrate some of the subsequent 100 years of service of the now Royal Army Dental Corps (RADC) and those members of the dental profession who have both served and continue to serve in the RADC. The relationships between dental disease, available treatment, the military requirement and the military/political response are summarised.

¹Colonel Commandant Royal Army Dental Corps, Regimental Headquarters Royal Army Dental Corps, Surrey, UK.
Correspondence to: Quentin Anderson
Email address: quentin@anneandquentin.co.uk

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Seventeenth century

At the Restoration in 1660, Britain had three armies:¹ the Army raised by Charles II in exile, the Dunkirk garrison and the main Commonwealth army. There were also small garrisons in North America and the West Indies and in coastal forts around Britain. These forces were more than either the King needed, or Parliament would pay for.² The Armies were disbanded, and by Royal Warrant on 26 January 1661, a new standing army consisting of the coastal fort and overseas garrisons and four regiments in London was created. The 10,000-strong Dunkirk garrison was disbanded in 1662 when the port was sold to France.

While the Army was 'new', its soldiers were the same, as were their weapons and their experience of dental disease and treatment.

Moore and Corbett show an increase in the prevalence of caries in seventeenth-century Britain and the establishment of a pattern similar to the late twentieth century. For 2,000 years, caries had a low overall prevalence with the cemento-enamel junction of the interstitial surfaces the most common

site; caries at contact areas was rare. In the seventeenth century, however, the overall prevalence increased, including the frequency of lesions at contact areas and in occlusal fissures.³ In contrast, it is suggested by Kerr that the prevalence of periodontal disease in British populations across the past 3,000 years is little different to that seen in modern British populations.⁴ The Army was, therefore, recruited from a population with experience of periodontal disease and an increasing incidence of dental caries.

The seventeenth century saw little dental innovation in England: treatment provided by tooth drawers and barber-surgeons was much as it had been throughout the Middle Ages. In the Army, its surgeons and their assistants provided treatment. While dentistry may have lain fallow, significant developments occurred in other areas of science. Harvey's work on circulation and work on anatomy of the brain by Willis are prime examples. Charles Allen published the first work on dentistry in English in 1685.⁵ It mentions restorations, provision of artificial teeth and even transplants, but makes little mention of the materials and methods used. Its significance, however, is its basis in,

and emphasis on, science and that its contents reflect the latest findings of the period.⁶ Of military relevance was the 1617 publication of the *Surgeons mate* by John Woodall, the Surgeon General to the East India Company. This provides a detailed inventory of the surgeon's chest on board the Company's ships and a description of each item's use. The following instruments are described as 'for teeth':

- Paces – crown forceps of varying size
- Pullicans – pelicans – fourteenth century extraction instrument
- Forcers or punches – elevators

- Crowes bills – more general surgical forceps
- Flegmes – a single bladed phlebotomy instrument for opening veins or lancing gums
- Grauers – scalers
- Small files – small bone files.

Woodall also stresses the importance of dental instruments: 'each of them are needful in the Surgeons chest, and cannot be well forborne for the drawing of teeth, as also the cleaning of the teeth and gummies, and the letting of the gums blood are often no small

things for keeping men in health at sea, and sometimes doe save the lives of men both at sea and land'.⁷

Over 250 medicines are listed, including those in Table 1 that are noted as having dental and oral health uses.

In 1626, alongside a pay rise, the free issue of a surgeon's chest was authorised to attract surgeons to join the Army.⁸ As Woodall was responsible for the provision of these chests, it is probable that the dental instruments listed above became the Army's first Dental Equipment Scale.

Table 1 Medicines in Woodall's surgeon's chest listed as having dental and oral health uses

Medicine	Oral condition used for						
	Toothache	Mouth ulcers	Spitting blood*	Tooth whitening	Gingivitis/periodontal disease	Mobile teeth	Mouthwash
Oleum sulphuris per campanam (oyle of sulphur) [oil of sulphur]	✓			✓			
Oleum garyophyllorym (oyle of cloves) [oil of cloves]	✓						
Oleum absinthi chymiee (oyle of worme-wood) [oil of wormwood]	✓						
Oleum origani (oyle of origanum) [oregano oil]	✓						
Mell rosarum (hony of roses) [rose honey]							✓
Diamoron simplex [mulberry syrup/jelly]		✓					✓
Methridatum damocratis (methridate of damocrates) [a poly-pharmacy compound]	✓						
Theriacha andromachi (andromachus treakell) [Venice treacle]	✓						
Laudanum paracelsi opiatum [laudanum paracelsus opium]	✓						
Cortex granatorum [pomegranate rind]					✓	✓	
Amigdale amare (bitter almonds)			✓				
Amigdale dulces (sweet almonds)			✓				
Amylum (white starch)			✓				
Myrrha [exudate from the stem of the myrrha tree]						✓	
Masticke [resin from the bark of the mastic tree]			✓				✓
Gallæ (gales)		✓			✓		
Bolus verus (bolus armenia vel orientalis verus) [an astringent earth from armenia]		✓					
Bolus communis		✓					
Alumen [an astringent alum compound]		✓					
Flores balanstarum (flowers of pomegranats) [pomegranate flowers]					✓	✓	
Rosa rubea (red roses)			✓				
Farina tritici (white flower) [wheaten flour]			✓				
Radices althea (hollihock roots)	✓						
Radices pyrethri (pellitory roots)	✓						
Radices consolidae majoris (comfrey roots)			✓				

Key:
* = the text is unclear as to the aetiology of 'spitting blood' as it could be from causes as varied as gingivitis or tuberculosis

While restorations and dentures were known, they were beyond the Army's expectations; equipment available would suggest that definitive treatment for toothache was inevitably extraction. Wiseman, however, demonstrates with the first recorded treatment of a gunshot wound to the jaws and his treatment of the sequestered part of the right angle and ramus as a result of infection following an extraction that oral surgery might be available to soldiers.⁹ Thus, by 1661, not only were soldiers likely to experience dental problems but the Army could provide them a degree of treatment.

The Army had specific dental needs. The most common firearm in the seventeenth century was the matchlock musket.¹⁰ Musketeers carried their musket balls and gunpowder separately: the gunpowder in stoppered flasks (chargers) suspended on a bandolier. Each flask held enough powder for one shot. Musket balls were carried in a small pouch also usually on the bandolier. Time reloading was saved by using teeth to open the chargers:

- Words of command No 21: 'Open them with your teeth'
- Action to be taken: 'Bring the charger to your Mouth, pulling off the cap with your Teeth and the help of your thumb...'¹¹

Barriffe breaks matchlock drill down into 60 different actions.¹² This time-consuming system reduced accidents as it kept gunpowder separate from its means of ignition until required. The slow process of reloading left musketeers vulnerable and therefore pikemen were used in each infantry company to form a defensive barrier against attack by cavalry. The ratio of musketeers to pikemen was 2:1; thus, two-thirds of the infantry needed to have sufficient effective teeth to open powder chargers and load their muskets. When a Grenadier company was added to each regiment in 1678, it increased the dental requirement as grenadiers required teeth to bite open the fuses of their grenades:¹³

- Words of command No 12: 'Open your fuse'
- Action to be taken: 'Hold still your left hand, and bring the Granade to your mouth with your right hand, tell 1, 2, open the Fuse with your teeth...'¹¹

Apart from a significant increase in the Army's size, the Nine Years' War (1688–1697) saw bandoliers replaced by cartridges of powder and ball wrapped in paper and the matchlock was replaced with the flintlock musket. Loading was now quicker, and along with the development of platoon-firing tactics, increased the infantry's



Fig. 1 Detail from diorama at the Museum of Military Medicine depicting a seventeenth-century musketeer biting open a paper cartridge, reproduced with kind permission from the Trustees of the Museum of Military Medicine

rate of fire.¹⁰ Introduction of the bayonet started to make the pike redundant; the proportion of musketeers increased to 3:1 by the end of the war.¹⁴ Teeth were now needed to tear open cartridges (Fig. 1) at a faster rate. With grenadiers and increasing numbers of musketeers, a minimal dental standard was required to allow them to operate effectively: teeth were an essential part of their primary weapon system.

Eighteenth century

Following the Nine Years' War, the Army faced general disbandment, reducing to little more than a cadre before rapid re-expansion on the outbreak of the War of the Spanish Succession (1701–1714).¹⁵ This and numerous subsequent conflicts occupied the Army for the remainder of the century.

Nicknamed by soldiers 'Brown Bess', the Long Land Pattern musket was introduced in 1722 and along with its subsequent versions was the standard British Army musket for the next 144 years. The requirement to bite open cartridges was to remain fundamental to the infantry. Extraction remained the definitive treatment for dental pain, and while scaling may have been undertaken and various medicaments, mouthwashes and blood-letting prescribed, there is no evidence of any other treatment.

In Britain, dentistry was unregulated and undertaken by tooth-drawers and also operators for the teeth, a term adopted in the seventeenth century to indicate someone who undertook a wider range of treatments than just extractions. Many were members of the Guild of Barber-Surgeons, but tooth-drawers could vary from

itinerant practitioners to those with more static occupations such as apothecaries or blacksmiths. When in 1745 the surgeons split from the Guild and established The Surgeons' Company, some of the Guild's tooth-drawers and operators for the teeth moved with the new Company while others remained. In 1768, in possibly the first English textbook on dentistry, Berdmore confirms that apart from extraction and scaling, dental treatments then being undertaken included fillings, re-implantation, transplantation, artificial teeth, crown replacements and orthodontics.¹⁶ The relative paucity of contemporary records and archaeological evidence provides little to judge the effectiveness of these treatments, although a degree of success must be assumed as patients continued to pay and practices thrived.

The term dentist began to replace operator for the teeth in the mid-eighteenth century. In his book, Berdmore describes himself as 'Surgeon-Dentist to his Majesty'. John Hunter's book *The natural history of the human teeth*, published in 1771 and supplemented in 1778, effectively established a scientific footing for dentistry, and in 1783, the third edition of the Medical Register included for the first time a listing of dentists as a distinct grouping. Registration, however, was not mandatory and the majority of those providing dental treatment were not recorded.

Dental examinations of eighteenth century remains in Britain appear in the literature; however, the numbers reported are small with an emphasis on evidence for operative work and prosthetics.^{17,18,19} There are no large-scale data sets detailing the prevalence of caries in eighteenth century British populations. From the work of

Moore and Corbett on their seventeenth and nineteenth century data, it seems reasonable to postulate that the prevalence of caries in British populations maintained its upward trend from the levels of the seventeenth century to those of the early nineteenth century.^{3,20} This was almost certainly contributed to by the increase in annual sugar consumption which rose from 4 lbs to 18 lbs per capita over the century.²¹

While the cost of sugar produced a significant socioeconomic gradient in its use, by the end of the century, its addictive nature had made it an essential item in even the poorest households as it complemented the nation's growing thirst for tea as well as coffee and chocolate.²² This gradient appears to be reflected in the dental health of Britain's social classes as observed by Berdmore. When discussing sugar and dental problems, he states that: "The peasants and poor farmers suffer less in this way than those of rank and opulence who eat of second courses."¹⁶ It is also captured by the caricaturist Rowlandson in his depiction of poor children paid to have sound teeth extracted to make dentures for wealthy individuals (Fig. 2). A similar practice for the transplanting of teeth was also in vogue although soundly condemned by Berdmore on scientific and ethical grounds.²³

Changes in caries prevalence had little impact on the Army. Restorative treatment was expensive and driven by the expressed needs of the wealthier classes. The lower classes, including the Army's Rank and File, had fewer dental expectations probably limited to the relief of pain and extractions at an affordable price. Evidence that the Army couldn't recruit or retain sufficient, adequately dentate soldiers is conspicuous by its absence. The only dentally related change undertaken by the Army in the eighteenth century appears to have been removal of the pelican and its replacement by the newly developed dental extracting key in surgeons' instrument sets (Figures 3 and 4).



Fig. 2 A fashionable dentist's practice: teeth are being extracted from poor children in order to create dentures for wealthy people. Coloured lithograph after T. Rowlandson, 1787, <https://wellcomecollection.org/works/ct8jrj8>. Image courtesy of Wellcome Collection, under a Creative Commons licence CC BY 4.0

Early-to-mid-nineteenth century

The turn of the century saw the French Revolutionary Wars (1793–1802) end, but they were quickly followed by the Napoleonic Wars (1803–1815). Dental care was still undertaken by the regimental surgeon and assistant surgeon. In 1796, Regimental Hospital instrument sets contained:

- One gum lancet
- One key instrument for teeth
- One forceps for teeth
- One punch for teeth.²⁴

In 1799, these instrument sets were revised and the new 'Complete Set of Instruments, with Modern Improvements, for Regimental Hospitals' provided only a single dental entry: 'Key Instruments for Teeth, to fit Trephine Handle.'²⁵

While individual surgeons and assistants may have supplemented this meagre offering with

instruments of their own, the official view of dental care seemed limited to extractions. There were no set standards for Army surgeons and assistants, and levels of training and experience varied widely, although from 1803, selection procedures for surgeons were introduced and a second assistant surgeon began to be established for most infantry and cavalry regiments.²⁶

Richard Holmes describes a generic British infantryman of the period as having cleaned his teeth with the chewed end of a green twig.²⁷ While handmade toothbrushes had been around for over 150 years and William Addis had begun commercially manufacturing toothbrushes in 1780, these were expensive and not seen among soldiers on campaign.

At the opposite end of the military spectrum, Napoleon Bonaparte, renowned for his attention to personal hygiene, had silver-handled toothbrushes (Fig. 5). Barry O'Meara, the Royal Navy surgeon attending Napoleon on St Helena, however, seems to have had a predominantly



Fig. 3 Dental pelican, reproduced with kind permission from the Trustees of the Museum of Military Medicine



Fig. 4 Tooth extraction key, reproduced with kind permission from the Trustees of the Museum of Military Medicine

exodontia-based dental instrument set, as can be seen by the remaining instruments and the shape of those that are missing (Fig. 6). O'Meara describes Napoleon complaining of toothache on several occasions in 1816 and recommends an extraction.²⁸ It is not until November 1817, however, after several more episodes of toothache and swelling, that Napoleon allowed O'Meara to extract his carious upper right third molar.²⁹ Three further teeth were extracted by June 1818.³⁰ No matter the military status, extraction was still the definitive treatment.

By 1820, the Regimental Surgeon's dental armamentarium had been increased to three instruments:

- One key tooth instrument
- One tooth forceps
- One tooth lever.³¹

In addition, by 1838, it had increased to five:

- One tooth key
- Two tooth forceps
- One punch
- One gum lancet.³²

Medical examination of recruits began in the 1790s.^{24,25,33} It was not until 1821, however, that dental condition is given as a reason for unsuitability for service: 'Deficiency of many teeth, and particularly if accompanied with an unsound state of the remainder.'³⁴ Reports from this period indicate few recruits being rejected on dental grounds. The Centre Recruiting District in Ireland for the years 1825 to 1827 show that less than 0.4% of all recruits were rejected for dental reasons³⁵ (Table 2). Although comparisons between this and other recruiting districts across Britain at the time are not available, it seems that even with a reasonable amount of variation, dental problems were of minor significance to overall Army health. Within 20 years, however, rates had more than tripled with the Army average for the period 1842–1852 at 1.34%.³⁶

The number of dentists in Britain in 1800 was extremely low. Tooth-drawers still operated, although more apothecaries, chemists and



Fig. 5 Napoleon Bonaparte's toothbrush, <https://wellcomecollection.org/works/am3nxcp5>. Image courtesy of Wellcome Collection, under a Creative Commons licence CC BY 4.0

druggists began undertaking their role. The Company of Surgeons formed the Royal College of Surgeons of London (later England) in 1800 and joined their counterparts in Glasgow, Edinburgh and Dublin as the focus for surgical training. Apprenticeships, begun in the eighteenth century, were growing in popularity, but with no regulation or educational foundation, standards varied. Advances in science, technology and education, coupled with the ability of more people to afford more advanced care, had by the mid-nineteenth century stimulated a considerable growth in the number of dentists in England. Dentists were beginning to be established in Ireland and the number in Scotland was increasing, although in Wales, numbers remained low. Few dentists had formal medical or surgical training; the majority came from backgrounds as varied as druggists, watchmakers and goldsmiths.³⁷

Tax on sugar imports reduced the rate of increase in sugar's annual consumption, with it plateauing at 20 lbs per capita in the early part of the century.²⁰ Caries rates as evidenced by the dental acceptability of the Army's recruits would, for the lower social classes at least, appear not



Fig. 6 Remnants of dental instrument set used by Barry O'Meara when caring for Napoleon on St Helena, reproduced with kind permission from the Trustees of the Museum of Military Medicine

to have significantly changed from those of the previous century. The wealthier classes' sugar indulgence with its concomitant dental problems drove the demand for advances in treatment.

Mid-to-late-nineteenth century

The 1846 Sugar Duties Act establishing the free trade of sugar met with significant opposition, resulting in a new act in 1848 which delayed sugar's free trade until 1854. The price of sugar then fell and consumption soared; by 1901, it had risen to an annual average of over 90 lbs per capita, an over 400% increase from the beginning of the century.²¹ Sugar's affordability saw its use by the poorer classes overtake that of the wealthier classes. This, along with cheaper corn following the repeal of the Corn Laws (1846), production of cheap white bread and growth in the biscuit industry, contributed significantly to changes in diets. Sugar provided

Year	Number inspected	Number approved	Total rejected		Rejected due to state of teeth		
			Number	%	Number	% of total inspected	% of total rejected
1825	6,229	4,839	1,390	22.31	22	0.35	1.58
1826	4,018	3,243	775	19.29	12	0.30	1.55
1827	2,588	2,006	582	22.49	8	0.31	1.37
Three-year totals	12,835	10,088	2,747	21.40	42	0.33	1.53

a cheap and plentiful source of calories: it had become the fuel of the working classes.

This surge in sugar consumption contributed to a statistically significant increase in the prevalence of caries, as described by Corbett and Moore in their study of nineteenth-century burials from before and after 1850.²⁰

Dentistry continued to make progress. Wells demonstrated the anaesthetic properties of nitrous oxide for extractions in 1844, Morton those of ether in 1846 and Imlach used chloroform in 1847. Innovations in dental drills moved on apace with Harrington's clockwork drill in 1864, Green's pneumatic drill in 1868 and Morrison's sewing machine technology-inspired treadle drill in 1871. Green then patented an electric drill in 1875.

Methods of inducing local anaesthesia ranged from bags of ice to electro-galvanism with varied success.³⁸ In 1884, Freud and Koller used cocaine for ophthalmic procedures and Halsted experimented further, producing anaesthesia of the inferior dental nerve. Hunt provided the first recorded anaesthetic use of cocaine by injection in Britain in 1886 when he used it in an infiltration technique.³⁹

Amalgams were available in the 1820s, but their safety and effectiveness were controversial. Improvements, however, led to a material that, by the end of nineteenth century, would be the backbone of restorative dentistry for the next 100 years. While the history of artificial teeth goes back to the ancient Etruscans, the development of vulcanite by the Goodyear brothers in the 1840s revolutionised access to dentures. Replacing expensive denture base materials such as carved ivory and swaged gold, vulcanite eventually allowed wider access to dentures.

As dentistry evolved, the profession began to organise. The 1858 Medical Act enabled the Royal College of Surgeons of England (RCSEng) to establish the Licentiate in Dental Surgery (LDS). London dental schools began to appear and the first LDS exams took place in 1860. The 1878 Dentists Act allowed only appropriately qualified individuals registered on the first Dentist Register in 1879 to use the title 'dentist' or 'dental surgeon'. The Royal Surgical Colleges of Edinburgh, Glasgow and Ireland could also now award LDS, which made qualification more accessible. The British Dental Association (BDA) was formally incorporated in 1880. The profession had now established education, qualifications, regulation and organisation.

In the aftermath of the Crimean War (1853–1856), Andrew Smith, Director General of the Army Medical Department (AMD), requested

medical officers to conserve teeth rather than extract them in every case.⁴⁰ New dental instrument sets were authorised with filling materials and additional instruments⁴¹ (Table 3).

While a move in the right direction, the instruments provided were a naive allocation of limited use. Not least mouth mirrors, probes,

tweezers and enamel chisels are conspicuous by their absence. Furthermore, while an extraction set was provided for each station hospital, the set for scaling and stopping was only held at District Headquarters and loaned out when requested. Once used, the set was to be returned for replenishment before it could be reissued. With

Table 3 Tooth instrument sets

Description		Number	Cost			
			£	s	d	
Tooth instruments (set for extracting)						
Elevators	Gouge	1	0	1	0	
	Left	Broad	1	0	1	0
		Narrow	1	0	1	0
	Right	Broad	1	0	1	0
		Narrow	1	0	1	0
	Straight	Broad	1	0	1	0
	Handle for any of the above	1	0	5	0	
In fixed handle	1	0	5	0		
Forceps	Lower canines and bicuspid	1	0	9	0	
	Upper 1st and 2nd molars right	1	0	9	0	
	Upper 1st and 2nd molars left	1	0	9	0	
	Lower molars	1	0	9	0	
	Lower incisors	1	0	9	0	
	Upper 3rd molars	1	0	9	0	
	Upper incisors, canines and bicuspid	1	0	9	0	
	Stumps	1	0	9	6	
Gum lancet	1	0	3	6		
Tooth key	1	0	5	0		
Claws for tooth key	1st size	1	0	1	0	
	2nd size	1	0	1	0	
	3rd size	1	0	1	0	
Handle for tooth key	1	0	1	0		
Pouch, leather	1	0	9	6		
			£5	10	0	
Tooth instruments (set for scaling and stopping)						
Amalgam	Packet	1	0	4	0	
Excavators and rosehead		3	0	4	6	
Gold foil	Sheets	4	0	10	0	
Gutta percha	Packet	1	0	1	0	
Scalers and stoppers		4	0	14	0	
Case, leather		1	0	5	0	
			£1	18	6	

Table 4 Recruit medical inspection figures for the Army (1875–1877)

Year	Number inspected	Number approved	Total rejected		Rejected due to state of teeth		
			Number	%	Number	% of total inspected	% of total rejected
1875	25,878	19,216	6,662	25.74	156	0.60	2.34
1876	41,809	30,390	11,419	27.31	304	0.73	2.66
1877	43,803	30,966	12,837	29.31	391	0.89	3.05
Three-year totals	111,490	80,572	30,918	27.73	851	0.76	2.75

only 14 Military Districts covering the entire UK, the impracticality of this arrangement is self-evident. The limited training to support medical officers and absence of reports on teeth conserved indicate that, despite good intentions, soldiers' dental care remained effectively unchanged.

Being able to open powder chargers, paper cartridges and grenade fuses had been the Army's dental priority for over 200 years. In 1866, muzzle-loading Enfield rifles were replaced with the Snider-Enfield breech-loading rifle and metal-cased cartridges; teeth were no longer an essential part of the weapon system.

The nationally increasing prevalence of caries expressed itself in the number of recruits rejected on dental grounds, which by the mid-1870s, had more than doubled the figures of 50 years earlier, although it had reduced from the peak seen in the 1840s^{42,43,44} (Table 4).

While these two data sets are not fully comparable, as the first represents one recruiting depot and the second is Army-wide, and there was no consistent standard defining grounds for dental rejection, the impact on recruiting is undeniable. Whether or not the loss of the requirement to bite open cartridges reduced the recruit dental threshold is also unclear.

Other than the replacement of the gum lancet with a spring gum lancet and four pairs of children's forceps, which had been added by 1885,⁴⁵ nothing in relation to medical officers' dental equipment or training changed. Condemned by Cunningham at the BDA's Annual General Meeting in 1886,⁴⁶ he clearly identified the inadequacies of the Army's dental equipment, yet in response, the Deputy Surgeon General stated that: 'I cannot admit that our equipment is of a meagre and unsatisfactory kind because I am satisfied that it is of the largest and most satisfactory kind'.⁴⁷ It was 12 years before any further changes were considered when the AMD wrote to Harley Street dentist W. Rushton to seek advice on updating its dental instruments (Fig. 7). Unfortunately, details of Mr Rushton's reply appear not to have survived.

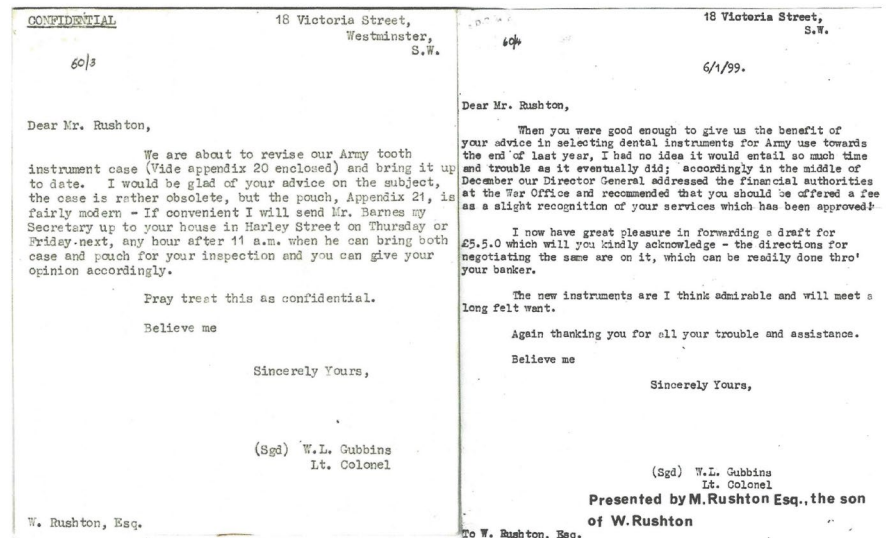


Fig. 7 Transcripts of letters from the War Office to Mr W. Rushton regarding advice on dental instrument sets, reproduced with kind permission from the Trustees of the Museum of Military Medicine

It is not clear if any revised instrument sets had been issued by the start of the Second Boer War in 1899. The Army deployed to South Africa with its full complement of regimental medical staff, hospitals and bearer companies, but dental care was limited to what was possible with a small set of instruments in the hands of a largely dentally untrained cohort of medical officers.

As the Army in South Africa increased, civilian volunteer hospitals were raised, including the Imperial Yeomanry Hospital (IYH). Mr Frederick Newland-Pedley was invited to join the hospital as its dental surgeon. Through charitable donation and his own expense, he disembarked at Cape Town in February 1900 with two to three tons of equipment, including three dental chairs. This then had to be moved 500 miles north to the IYH at Deelfontein. Initially accommodated under canvas, he established a limited facility by use of a deck chair and the tent pole as head rest. Then, allocated a small wooden shanty with tarpaulin roof, he was able to set up a small

dental surgery and the office of a camp journal he started: the Devil's Fountain⁴⁸ (Fig. 8).

Eventually allocated a hospital hut, he established his combined bedroom and workroom and had use of the reserve operating theatre as his surgery. Before leaving England, he proposed that two senior dental students should join him as assistants. RCSEng agreed that they would recognise service in South Africa as equivalent to the same period in a hospital at home. He applied to the IYH Committee for them to be sent. The committee agreed and stated they would meet the necessary pay and expenses. The War Office, however, refused to allow their deployment, leaving Newland-Pedley as the only dentist in support of an Army of 200,000 men. His report highlights the poor condition of the Army's teeth and the lack of an effective system for dental care: '...the percentage of exposed pulps is very high, as nearly every patient would rank as a neglected case.'

'Nothing is done to preserve the soldier's teeth while he has any and when they are gone

he must go home as a man unfit for service. It would be better and quicker to put a soldier's teeth in order than to train a fresh man as a substitute for the invalid.⁴⁸

On returning home, he continued to press the case for better dental support to the Army.

Early twentieth century

Newland-Pedley was not alone: the BDA also petitioned the government and eventually four dental surgeons were contracted to go to South Africa in 1901. They had no military status and had to provide their own hand instruments. Surgery furniture and materials were provided but no workroom equipment and, therefore, no denture facilities.

Before the war ended in May 1902, the Army's strength in South Africa had reached over 400,000; four dentists to support this force was totally inadequate. Teeth continued to be lost and the numbers invalidated for dental causes continued to grow. The Countess Howe's report on the IYH includes summaries from its senior clinicians, which include many references to the poor dental condition of the troops.⁴⁹ This is borne out by official statistics which recorded 6,942 admissions to hospital for dental disabilities, of which 2,451 were invalidated back to the UK as unfit for service. Many not sent home could only be employed in base areas as they could not masticate front line rations.⁴⁰ The number of dental problems not requiring hospitalisation but addressed by regimental medical officers' (RMOs') forceps is unknown but cannot have been small.

The early twentieth century saw significant dental developments. Objections to women entering the profession were eventually overcome, and when Mason's College became the University of Birmingham in 1900, it was empowered to confer dental degrees with the first BDS degrees being conferred in 1906. Other universities followed. Despite the increase in qualifications, the 5,015 names on the Dentist's Register in 1910 was an increase of barely 200 over the previous 20 years and is estimated to be less than half the number practising at the time.

BDA reports in the 1890s highlighted the poor condition of children's teeth across all social classes.^{50,51} Toothbrush clubs and other education initiatives began to appear. The government acknowledged the need for better care for children and established subsidised or free school meals and publicly-funded school health services.⁵² Over 20 years after Fisher delivered

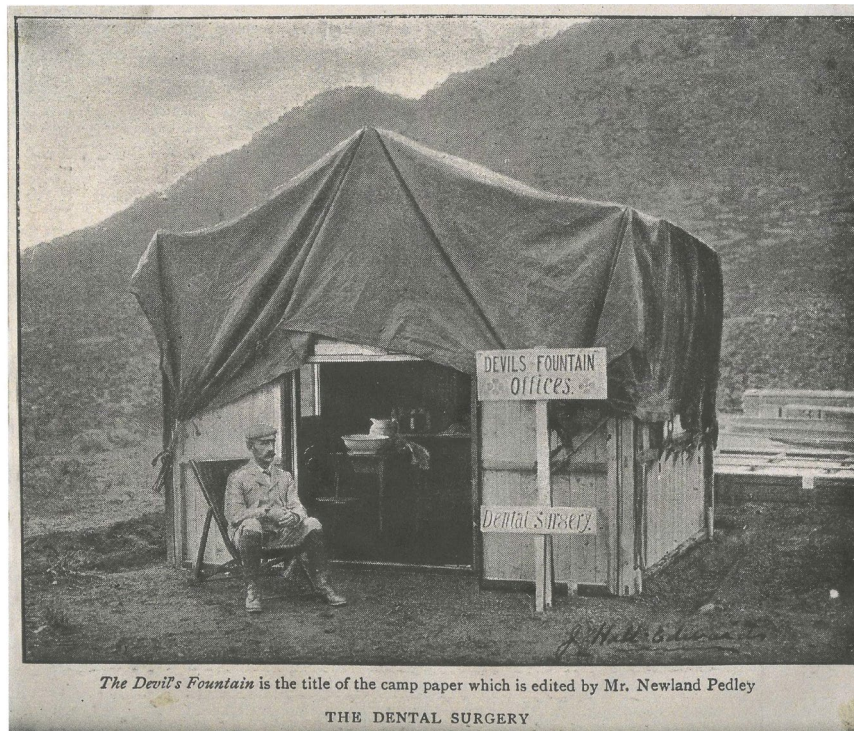


Fig. 8 Boer War: a dentist outside his hut at a military hospital. Halftone, c.1900, after J. Hall-Edwards, <https://wellcomecollection.org/works/ay7cdwvn>. Image courtesy of Wellcome Collection, under a Creative Commons licence CC BY 4.0

his first paper on 'Compulsory attention to the teeth of schoolchildren', action was being taken.⁵³ Cunningham established the Cambridge Dental Institute in 1906 to provide free treatment for schoolchildren, and within three years it had, under the Borough Council, become the first clinic of the new school dental service.⁴⁷

In the Army, recruit rejections on dental grounds between 1893 and 1904 rose from 1.5% to 7.2%, with the largest increase of 5.2% occurring between 1900 and 1904. Helliwell postulates that this was a result of experiences in South Africa and the regulations still being very subjective. A 1906 change in regulations made it clearer that teeth should be 'so distributed as to permit of efficient mastication'. This resulted in a third fewer rejections in 1907.⁵⁴ A dental course to grade medical officers as 'specialists' was set up at Guy's Hospital Dental School in 1903 but abandoned in 1908, as only four officers had been graded and none employed in that capacity. In 1904, the Army employed a dental surgeon in each of its eight major UK garrisons. This was also abandoned in 1908 and replaced by a system of part-time contracts. Overseas, three full-time contract dentists were appointed in 1910 for British troops in India, rising to ten by 1914.⁵⁵

In 1914, dental care for the Army was still inadequate. The British Expeditionary Force

deployed to France without any dental officers. Dentists offered to treat recruits free of charge and those who were qualified and prepared to act as honorary dental surgeons to UK-based military hospitals were identified. During the Battle of Aïnse (12–15 September 1914), Sir Douglas Haigh suffered severe toothache and a dentist was requested from Paris to attend him. Within two months, six dental officers had been commissioned and sent to France and a further 14 joined them before the end of December.⁵⁶ They were attached to Casualty Clearing Stations. The number of dental officers gradually increased to 150 by August 1915. Recruitment was restricted to registered dental surgeons; those with medical qualifications were commissioned into the Royal Army Medical Corps (RAMC) while those who were singly qualified were commissioned in the Special List. Other dental practitioners had volunteered to join the combat arms or, if medically qualified, the RAMC as RMOs or with Field Ambulances. One was William Kelsey Fry who, following injury and the award of the Military Cross as RMO with the Welsh Fusiliers, was appointed to the Cambridge Military Hospital in Aldershot where he worked with Harold Gillies on the increasing number of facial wounds from the Western Front. In 1917, both were transferred

to the newly opened Queen's Hospital Sidcup, which was designated as the central military hospital for facial and jaw injuries. Here, they played a prominent role in the development of the specialities of maxillofacial and plastic surgery. Together with the work of other hospital-based dental surgeons such as Frank Colyer and Charles Valadier, these specialities grew to be among the most significant medical advances of the war.

Many charities supported the medical services, including the donation of mobile dental surgery and laboratories by the Civil Service Motor Ambulance Fund, dental surgery cars by the Silver Thimble Fund and the provision of dental treatment to many soldiers in the home Army and their families by the Ivory Cross National Dental Aid Fund.

In October 1915, the Earl of Derby, Director General of Recruiting, introduced a scheme to encourage volunteers for service. As only a few dentists and no dental mechanics were to be exempt, this had the potential to decimate dental provision to the civilian population. The BDA appealed to the Earl of Derby and the Director General of the Army Medical Services (DGAMS), Sir Alfred Keogh, but were declined. The DGAMS was of the opinion that neither dentists nor their mechanics should be excused as a class from military service.⁵⁰ The scheme was short-lived and replaced in January 1916 by the Military Service Act, which introduced conscription but with no change to dental exemptions. By the end of 1916, the shortage of dentists in general practice was becoming acute.⁵⁰ This led to the establishment of the Dental Service Committee (DSC) consisting of the BDA and government representatives. Any dentist, not exempted by his local Tribunal, who was under 35 and medically fit, would be available for general military service. If, however, he was over 35 or not medically fit, he would only be taken for service in his professional capacity provided he placed himself at the disposal of the DSC for work in a district where there was an urgent need for dentists. The Army retained the right to take a registered dentist for service in his professional capacity regardless of his age or medical category, unless he was exempted by Tribunal.⁵⁷

By the end of 1917, even with 501 dental officers now in the Army, dental provision for theatres of war other than the Western Front was almost non-existent. The Parliamentary Committee on Manpower and the Army Dental Service, the Pennefather Committee, was formed to examine the issue. Reporting its

findings to Parliament on 12 December 1917, it concluded that: 'the efficient man-power of our Army would be increased, and preventable sickness and suffering to our soldiers reduced:

1. By greater attention being paid to the teeth of soldiers while training in this country before being sent abroad, particularly in regard to conservative treatment i.e. calculated to prevent unnecessary extractions
2. By increasing the number of qualified dental surgeons at Base camps and casualty clearing stations, and also by the use of travelling dental lorries or ambulances
3. By detailing a larger number of specially skilled dental surgeons to cooperate with Army Medical Officers in the treatment of jaw wounds
4. By withdrawing from combatant and other non-dental services (other than medical and surgical services) all qualified dental surgeons, who are now in the Army or may come up for recruitment, detailing them to dental work in order to carry out the duties mentioned in the preceding paragraphs; and providing the necessary number of dental mechanics

5. By placing the organisation of the military dental service under the general direction of one or more experienced dental surgeons with special authority over Army dental officers of all ranks, and in an advisory position in regard to dental supplies and equipment, such dental director and officers to be under the orders of the Principal Medical Officer of the RAMC.⁵⁰

The report was accepted and its recommendations implemented. Dental officer numbers increased to 714 by August 1918 and 850 by the time of the Armistice in November. Major J. P. Helliwell was appointed to DGAMS's staff at the War Office in January 1918 as dental adviser and to coordinate the Army Dental Service (ADS). Promoted to temporary Lieutenant Colonel in March 1918, he was supported by inspecting dental officers in each of the Home Commands. Improvements in dental arrangements for recruits was achieved through more dental surgeons being appointed to Depots, many of whom had been serving in combat units and were now transferred under recommendation 4 of the Pennefather Report.

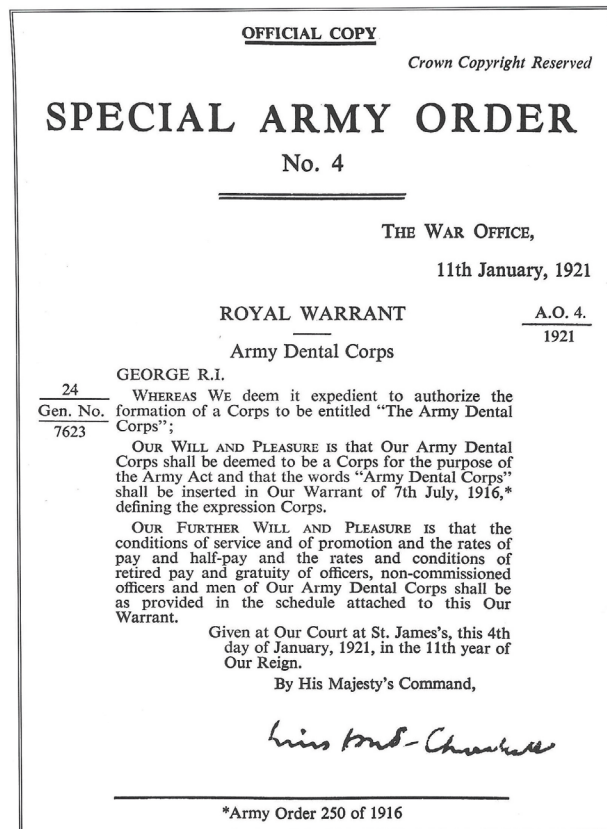


Fig. 9 Special Army Order No 4 of 11 January 1921, reproduced with kind permission from the Trustees of the Museum of Military Medicine (contains public sector information licensed under the Open Government Licence v3.0)

The First World War saw dentists serving in uniform as an accepted part of the Army, delivering a long overdue service which significantly contributed to the reduction in disease wastage and concomitant maintenance of fighting power.

Persevering with their proposal to form a permanent ADS, in late 1919, the BDA were requested to submit an outline scheme to the AMD. This was approved and forwarded to the Treasury. On 23 February 1920, the Secretary of State for War, Winston Churchill, in the Army estimates for 1920–1921 stated that a proposal for a Dental Corps of 110 officers and 132 other ranks had been made. The scheme was passed by the Treasury in April 1920.

The Army Dental Corps was authorised by King George V in a Royal Warrant on 4 January 1921 and promulgated in Special Army Order No 4 signed by Winston Churchill on 11 January 1921 (Fig. 9).

Summary

Dentistry has had a role in the fighting power of the Army for at least the last 400 years. Initially, with low levels of caries and dentistry's limited treatment options, the Army's needs were catered for by its medical staff. Soldiers' expectations and the treatments available to them were in line with those of the general population. For the next 200 years, little changed in the Army, although from the mid-eighteenth century, dentistry began to develop even if new innovations were beyond the expectations and means of most of the population. From the mid-nineteenth century, however, while the Army's dental requirement to bite open paper cartridges ceased, the prevalence of dental disease grew sharply. Without training or equipment, the Army's doctors could only continue to provide an essentially exodontia service. Criticism of shortcomings in the Army's dental provision was refuted by the AMD. Consequently, the Boer War was a dental disaster. Despite this, only minimal arrangements were subsequently made to address the problem and 1914 found the Army's dental state little improved. Even when the need for a uniformed dental service was identified, its implementation and organisation was *ad hoc* and fraught with unnecessary obstacles. It took four years and the appointment of a dental adviser to the War Office before the situation improved. Following post-war pressure from the BDA and acceptance of the benefit to the Army's

combat effectiveness afforded by an organised military dental service, the Army Dental Corps was formed in 1921.

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