'The Smart of the Knife'—Early Anaesthesia in the Services

Surgeon-Captain RNR (Ret'd) John A Shepherd
VRD, MD, FRCS

In October 1846 William Morton gave ether to a patient operated upon by John Warren of Massachusetts. Accounts of the event reached England in mid-December. On December 21st Robert Liston of United College Hospital amputated at the thigh under ether. The scene is recorded in a well-known picture, for long accepted as accurate in detail (Fig. 1). There are two alleged spectators. At the foot of the table Thomas Spencer Wells is depicted, in white trousers and a short jacket suggesting naval uniform. Then aged 29, he was a surgeon in the Royal Navy. But the features are those of Wells many years later. To his right is Joseph Lister, then aged 19, and a student at UCH. But the likeness is of a much more mature Lister. In fact the group was painted 40 years after the event. Spencer Wells was *not* present for he was then serving in Malta; his inclusion however has some relevance. It is doubtful if Lister was there; he was at the time a preclinical student and there is other evidence which refutes his presence. No Army or Navy medical officer witnessed this operation, which was at once well publicised and which triggered off an almost instantaneous adoption of ether anaesthesia in civilian practice.

Before 1846 the surgeon's repertoire was limited. Amputations of the limbs were the most frequent major operations. Abdominal procedures were limited almost entirely to explorations for ovarian cysts. Ligations of the major arteries for aneurysm were not infrequent. It is surprising what **had** been attempted without anaesthesia, for example, in 1816 Astley Cooper tied the abdominal aorta. In civilian practice the patients were strapped to the table and were given sips of wine. Some were remarkably stoical but for most the experience was harrowing, and their best hope was that they should faint right out.

If the patient had to be tough, so too had the surgeon. Liston was one who had achieved remarkable success before anaesthesia, courageous, of iron nerve, and, perhaps, callous to some extent. His sound anatomical knowledge, his skill in ligating the large vessels, and his physical strength allowed the essential of completing an operation in a matter of minutes. Not all surgeons were so able. Of a contemporary, in the quest of a virtuoso performance, it is said, "with one sweep of his knife cut off a limb, as well as three fingers of his assistant and the coat tails of a spectator."

The Service surgeons before 1846 had little experience of major surgery in peacetime. They came into their own in war and their ability was measured largely by their success in performing amputations. Before 1700 Yonge of

Plymouth, a Naval surgeon, introduced the flap technique, but it was to be long before the more rapid guillotine amputation was discarded. In 1786 Haire, also a naval surgeon, advocated that ligatures on major vessels should be cut short and not, as was the custom, left long. But this advance was also slow to be generally adopted.

The conditions under which the Service surgeons worked were primitive and scarcely conducive to any refinements. The naval surgeon inevitably operated on board ship. When a ship was about to go into action it was traditional to set up a receiving and operating area in the cockpit, a small space below the water-line, normally the unhealthy living quarters of the midshipmen and the surgeon's mates. If casualties were severe, the cockpit became a shambles. The transfer of the wounded to the cockpit was not easy, there were no stretchers and the injured seamen were manhandled through the hatches and down steep ladders.

It has been recorded that considering the conditions under which the naval surgeon performed his operations as a surgical technician he was unsurpassed. This may be rather an exaggerated statement although a few did acquire remarkable dexterity. In the novel "Roderick Random" Smollett writes of his experience during an action. "Our patients had increased to such a number that we did not know which to begin with, and the first mate plainly told the surgeon, that, if he did not get up immediately and perform his duty he would complain of his behaviour to the Admiral . . ." (The surgeon was meanwhile prostrate on the deck in fear of his own safety) . . . "This remonstrance eventually aroused the surgeon, who was never deaf to an argument in which he thought his own interest was concerned. He therefore rose up, and in order to strengthen his resolution, had recourse more than once to a bottle of rum . . . being thus supported he went to work and arms and legs were hewed down without mercy".

There are many other such descriptions which bring out the atrocious environment in which casualties were treated, the crudeness of most of the surgery and the fortitude of the injured sailor. Conditions were little better when Nelson was taken below in the "Victory", to survive only a few hours after a penetrating wound of the chest. In 1854 the cockpit was **still** the operating area.

The Army surgeon in the pre-anaesthetic era had some advantages. At least he operated on dry land and not on a rolling ship, in a stuffy, ill-lit space rendered almost intolerable by an increasing stench of blood and the smoke of battle. But his equipment was sparse. He had

Fig. 1. — Liston's Amputation under Ether

his case of instruments, ligature material, dressings and a tourniquet. On or near a battlefield simple regimental hospitals or aid posts were established in requisitioned buildings or in tents, but the wounded were not always brought to these units and the surgeon frequently operated, as at Waterloo, in the open, with the patient on the ground. He was usually single-handed and there were no trained orderlies. Even in general hospitals behind the lines there was no room set aside for operating and the surgeon worked with his patient on a bed, if there were beds, or on a makeshift table.

An observer in the Peninsular War describes a general hospital thus: "I saw two hundred soldiers waiting to have their limbs amputated . . . the smell from the gun-shot wounds was dreadful . . . There they sat waiting for their turn to be carried to the amputating table. A little further on, in an inner court, were the surgeons. They were stripped to their shirts and bloody: a number of doors, placed on barrels, served as temporary operating tables: to the right and left were arms and legs flung here and there without distinction, and the ground was dyed with blood"².

As in the Navy the surgical experience and training of the military surgeon was sparse. Not until Guthrie appeared on the scene was there any real advance in the management of war casualties. By the end of the Peninsular War, at Toulouse, his results following amputation were unsurpassed. Regrettably at Waterloo the lessons he had taught were forgotten. Operations on the battlefield were done largely by inexperienced young surgeons. In the base hospitals at Brussels, not far distant, there were more experienced men, but as so often the case, the transport from the battle front was inefficient and infection or gangrene had supervened before treatment was given.

The early history of wound surgery is best studied in relation to amputation. For more than two centuries an argument has raged concerning the respective merits of early or delayed amputation. In the Army Guthrie had come down on the side of urgent operation (thus defy-

ing the teaching of John Hunter). In the Navy early amputation was accepted much earlier. The Naval surgeon, of course, unlike the Army surgeon, received casualties within minutes of injury. In 1732 John Atkins recommended immediate removal of the severely damaged limb. He wrote: "The heat and surprise in action made it the properest time for amputation, men meeting their misfortune with greater strength and resolution than when they have spent a night in thought and reflection"³. Atkins, quite unwittingly, was preaching the merits, now so well understood, of the early excision of damaged tissue, as a means of preventing gangrene and of reducing secondary shock. But there were no refinements of resuscitation or pain relief. Indeed venesection was often done for the exsanguinated patient: some saw this as a means of relieving shock and pain.

It was all too readily accepted, both in civilian and service practice, that pain was a necessary accompaniment of any operation. Little was done for its relief. In the Navy it is the tradition that a strong tot of rum was offered but the practice was not universal. The soldier was given a bullet on which to bite! It must be said that there was, in an era of vicious flogging and harsh discipline, little regard for the feelings of the wounded sailor or soldier.

After 1846 the Service doctors were slow to recognize the potential value of general anaesthesia. In 1847 the medical journals were inundated with reports of the successful application of ether, from every corner of the British Isles. Only one report can be found from a Service source. The young Naval surgeon Spencer Wells was quick to seize upon the new technique (Fig 2). He was then serving in the Naval Hospital at Bighi, Malta, and had already proved one of the brightest of the younger naval doctors. Soon after hearing of Liston's success Wells sent to London for a Hooper's inhaler, one of the earliest devices for administering ether. He reported a successful dental extraction and demonstrated the apparatus to the Malta Medical Society on March 6th, 1847. By June he had recorded more than a hundred cases in which he had used the method, including major operations. His results were published locally and appeared also in the British journals⁴. Sadly this pioneer effort attracted no attention in the Navy at the time. (Leaving the Navy in 1856 Wells, of course, became a prominent figure in British surgery.)

No record can be found of any Army doctor using ether in 1847. Cantlie suggests that general anaesthesia was used in the treatment of the wounded in the Kaffir Wars in 1847 but the incident he quotes is that of a District Surgeon William Atherstone performing an amputation under ether in June successfully⁵. Two Army doctors were present at this operation, Hadaway and Irwin. Both subsequently served in the Crimean War but neither seem to have taken much note of Atherstone's early success.

Meanwhile in Edinburgh James Young Simpson had been quick to exploit ether. In 1847 he circulated a ques-

Fig. 2 — Spencer Wells as a Young Man

tionnaire to most of the British hospitals. From the answers he was able to show that the mortality rate in amputations for which ether was used was much lower than that in the pre-anaesthetic period. It is difficult to believe that Simpson did not write to the Service hospitals: Haslar, for example, at the time, had a high reputation. However, if he did seek information from the Services none was forthcoming, and this may imply that there was no experience of ether to report.

On November 10th Simpson announced his discovery of the anaesthetic properties of chloroform. The repercussions were even greater on civilian practice than those after the introduction of ether. In Scotland and in the provinces in England ether was almost completely discarded for chloroform. In London the profession were equally divided in their support for the two agents. At the time the proportion of Scottish or Scottish-trained doctors in the Services was remarkably high (both Directors-General, Smith and Burnett were Edinburgh graduates). This makes it more surprising that chloroform was not quickly accepted in the Services. Chloroform was more likely than ether to have appealed to the doctor on active service. The quantity of chloroform required for a case was less: it was not inflammable; it was much easier to induce a patient with chloroform than with ether, using a simple "rag and bottle" technique.

An attempt has been made to discover the extent with which chloroform was used in the Services between 1847 and 1854. One may search reports of the management of war wounds in the revolutions and wars of the period, assuming that *someone* in authority, in either Service, might have taken note of any reference to anaesthesia.

In the Paris Revolution of 1848 chloroform was used for the wounded in the street fighting. Reports from the French surgeon Velpeau appeared in the *British Journals*⁶. These were discouraging for Velpeau considered that chloroform was dangerous for the shocked patient. At the time the Paris School of Surgery had considerable influence and Velpeau's opinion carried great weight in Britain. In the Danish-Prussian War in 1850 chloroform is said to have been used with success, but no contemporary report appeared in Britain. In the French Wars in North Africa it can be conjectured that chloroform was used with good effect, for the French Medical Service adopted it without hesitation at the start of the Crimean War.

The British fought some minor campaigns between 1848 and 1853, in South Africa, India and Burma. No contemporary reports of the use of chloroform have been found, but these may be hidden somewhere in Service archives. There is however belated reference to general anaesthesia for the wounded in the Punjab campaign in 1851. Some years later it was reported that 53 major operations were done under chloroform, but in 47 without anaesthesia the mortality was lower⁷. It is possible that this experience discouraged the Army authorities.

A record is contributed to the "*Lancet*" in April 1851 by an obscure Assistant-Surgeon in the Indian Medical Service, William McEgan (1817-1857).

"The cases I now enclose for insertion in THE LANCET may be highly interesting as regards military surgery. In the action where these wounds were inflicted there were 125 of the enemy killed, and 49, as per list enclosed wounded; whilst we, on our side, had four European officers and 16 men wounded; none killed. This occurred against the imposter Appa Sahib, where I accompanied my regiment, the 2nd Nizam's Cavalry, into action, having my horse cut down under me, so that we doctors are not at all times exempt from the good things going. After attending my own wounded, I proceeded to those of the enemy, and out of 49 cases, I had 18 amputations to perform, all under the influence of chloroform; and, with the exception of three cases every man recovered"⁸.

This is the only positive suggestion to be found, prior to 1854, that chloroform should have a place in military surgery.

McEgan served in the Indian Medical Service for 11 years, to die heroically in the Mutiny in 1857. The only recognition he received was a brief notice in the "*Lancet*", "Massacred with his wife, Dr McEgan had some rough service with the 2nd Nizam's Cavalry in the Deccan".

Operation records for the period from Service hospitals

do not seem to have survived. Lloyd and Coulter in their *Naval Medical History* note that chloroform was first used at Haslar in 1852 but give no evidence for this.

Service doctors were quite prolific contributors to the medical journals, although more often on medical matters than surgical topics. A search has revealed few references of significance. In 1853 Steele, surgeon to HMS *Arethusa*, reported the use of chloroform at sea⁹. An Army report of an operation by Mitchell, in the Plymouth Regimental Hospital, in the same year, is of an amputation at the thigh¹⁰. There is no mention of anaesthesia but, "the patient a man of great resolution bore the operation well", which suggests that he remained awake! No doubt however many younger Service doctors, who had learned to use anaesthetics in their medical schools, did use chloroform despite the apathy of their seniors.

It is interesting to look at the sparse directives given to Service officers at the onset of the Crimean War. In the Army regimental medical officers were instructed, by Smith, to purchase the latest edition of Guthrie's "Commentaries". If they **did** read this all to be found was a brief paragraph mentioning chloroform, but no recommendation for its use in battle casualties. In the Navy the directives from Burnett were based largely on the belated publication of a report of the experience of a medical officer at the Battle of Navarino, in 1827¹¹. The only hint of chloroform comes in the instructions for preparing the cockpit for action, for chloroform is mentioned as a drug to be available on the surgeon's table. But there are no directions as to who should give it, or how, or when. The ship's chaplain was given the specific task of administering wine or brandy to the wounded! Burnett did however ensure that supplies of chloroform went to most warships. Clearly its use depended on individual initiative.

When war was declared against Russia in March 1854 the British Expeditionary Force was built up in the Dardanelles and transferred to Bulgaria in June, where it saw no action. In September the Allied Armies embarked at Varna for the Crimea. John Hall, the Principal Medical Officer anticipating a major battle after landing, issued instructions concerning casualty organisation (Fig 3). For the first time there was an official directive about chloroform:

"Dr Hall takes this opportunity of cautioning medical officers against the use of chloroform in the severe shock of serious gunshot wounds, as he thinks few will survive where it is used. But as public opinion, founded perhaps on mistaken philanthropy, he knows is against him, he can only **caution** medical officers, and entreat they will narrowly watch its effects; for, however barbarous it may appear, the smart of the knife is a powerful stimulant; and it is much better to hear a man bawl lustily than to see him sink silently into the grave"¹².

Hall's advice was seen by many of the younger medical officers almost as a prohibition of the use of chloroform in the severely wounded, and as evidence that he was out

of touch with modern medicine. He was greatly criticised when the order was reprinted in the "Illustrated London News". The influential Professor Syme of Edinburgh at once wrote a ponderous letter to the "Times" pouring scorn on what Dr Hall thought on the subject. Syme affirmed that exhaustion or shock did **not** increase the risks of operation under chloroform; he stated "pain instead of being a powerful stimulant, injuriously exhausts the nervous energy of the patient"¹³. Hall, often unjustly maligned for many of the medical blunders of the War, was to face much more criticism for his statement, even to be accused of gross inhumanity.

Richard Mackenzie, a young and prominent Edinburgh surgeon, was serving as a volunteer with the 79th Regiment (Fig 4). He was perhaps the best trained and most experienced surgeon at the Battle of the Alma. He is said to have performed 27 major amputations on the wounded. Exhausted by his efforts he succumbed to cholera two days later. Shortly before the action he had sent a letter home, "There is some truth in the use of chloroform in attending with risk in gunshot wounds. But surely surgeons of the Army have sufficient sense not to give it when a man is in a state of collapse bordering on death. Dr Hall's order is intended to discourage the use of it altogether. No one, I should think, will take notice of it"¹⁴.

The Army after landing at Eupatoria marched southwards towards Sebastopol to fight the first major battle since Waterloo, on the banks of the River Alma. In less than three hours the British lost 362 killed and about 1,000 wounded. It took three days to deal with the wounded and to transfer survivors to the ships which took them to Scutari. The operating conditions were primitive and a so-called general hospital was established in a farm on the North bank of the river. Straw was laid on the floor and there were no operating tables. It was reported "the postures of the operators were a source of great irksomeness and fatigue." Many operations were done in the open on the field of battle.

Hall's directive did not prevent a majority of surgeons using chloroform. The main limitation was a shortage of the drug. Smith had, in fact, sent out 240 lbs of chloroform between April and September (sufficient to anaesthetise more than 3,000 patients). But it must be remembered that chloroform was used in prescription for many medical conditions, including cholera, that some of the supply went to Scutari, and that much was lost or left behind in Varna, with other medical stores.

Despite the difficult conditions after the Battle of Alma the value of chloroform was apparent. Subsequently in the much more bloody Battle of Inkerman chloroform was used extensively, and in the long siege of Sebastopol which followed. There had been harsh criticisms in the medical press of an alleged failure of the Army doctors to use chloroform routinely. In fact a proportion of the often senior officers, still preferred to operate without anaesthesia. In November one was quoted in the "Medical

Fig. 3. — John Hall

Times and Gazette", writing after Inkerman. "I hear there is a great cry against our not using chloroform: but the more I see the more strongly I am convinced that it is not of much value in the field: it reduces the number of medical men available for duty. It would be simply murder to leave the administration of it to any but educated hands and seldom can you get more than one doctor to assist at an operation . . . Another reason is that the shock of a wound which requires immediate amputation is so great, that chloroform depresses a patient"¹⁵.

In the hospitals at Scutari chloroform was used in all major cases. There was no problem of wound shock. Dr Pyemont Smith, a civilian working in Scutari at the end of 1854 wrote, "The celebrated manifesto of Dr Hall against chloroform had not much attention paid to it at Scutari. I had been accustomed to the use of chloroform, but certainly had never seen it given to the extent that it was employed there. An operation was never commenced before the patient was fully under the influence of chloroform. Where a patient can, without injury to health or life, be brought into this state (and I must acknowledge that I did not see or hear of anyone dying under the influence of chloroform, and this extreme ac-

tion did not prove so injurious as I expected), it affords great facilities to an inexperienced operator, and prevents any necessity for hurrying an operation"¹⁶.

Although there was no shortage of medical officers some anaesthetics were given by non-qualified persons. The Reverend Osborne, a philanthropist who was a firm ally of Florence Nightingale, reported, "Chloroform was always used and, it appeared to me, with the greatest success, which I attribute a great deal to the practice of administering it on a handkerchief held lightly to the face instead of using some instrument which whilst it secured the inhalation of the anaesthetic excluded too much of the atmospheric air"¹⁷. (Simpson would have approved of this observation.) Osborne not only assisted at some operations but on occasions he gave the anaesthetic: he wrote of one instance at which he officiated, "I am afraid to say the length of time the patient was under the influence of chloroform. His head was on my knee the greater part of the time and I had to keep up the administration of this estimable agent . . . I was left with one of the surgeons to try and recover him from the torpor under which he had without pain borne a most severe application of the knife etc. As a last resort I found out his name and had him sharply spoken to by it. So strong was the force of habit that he made just sufficient effort to waken, to enable us to order him to drink the wine we gave him. Keeping up the same sharp military tone of voice we got more and more swallowed and he soon recovered . . ."¹⁷. Despite such amateur anaesthesia and methods of resuscitation, according to Osborne, no anaesthetic deaths were reported in this period at Scutari.

Despite all criticisms it did seem that by the end of the war chloroform was established as an essential adjunct to war surgery, but this was not entirely the case. The Army doctors had formed a Crimean Medical and Surgical Society in which to discuss their problems. On April 19th 1856 under the chairmanship of John Hall, the Society met in the Crimea to listen to a paper on chloroform by Deputy-Inspector Mouat¹⁸. He opened with the statement that the profession at large looked to the Army doctors to contribute their experience towards the settlement of the important question as to whether chloroform should or should not be given to the severely wounded. He said "I much fear that they will be somewhat disappointed in our results and conclusions." He made much of a few fatal cases following minor operations, which had been attributed to chloroform. He supported Hall in his directive against using the drug in the shocked patient. He affirmed that Simpson's teaching had no relevance as he had used chloroform almost entirely in obstetric cases and considered that civilian surgeons, like Syme, dealt with cases in no way similar to those with severe gun-shot wounds. But he offered no statistics to prove his points, listing only a few selected cases in which, without anaesthesia, major amputations had proved successful or in which, with anaesthesia, the shocked patient had died. He concluded that, firstly,

Fig. 4. — James Mackenzie

Fig. 5. — Sir G H B Macleod (1828-1892)

chloroform was highly injurious in the severely injured and shocked casualty and, secondly, that "in the moral sense it should never be used for a minor operation."

There was a long discussion in which Mouat received considerable support for his views. But some spoke out against him, mostly the more junior doctors. Dr McLeod, a young man (later to be Professor of Surgery in Glasgow), appointed as a civilian surgeon to the Army Hospitals in the East, was the most vociferous critic (Fig 5). He expressed regret that Mouat's statements would go forth to the world: he believed them to be completely erroneous and not representing the general opinions of the majority of Army surgeons. Like other speakers he considered that most fatalities attributed to chloroform were due to the ignorance of the correct technique of using the anaesthetic. Mouat's paper was reproduced in 1857 in the comprehensive Medical History of the War published in 1857, thus representing the official view.

Despite such adverse comment it is clear that the experience in the Crimean War resulted in acceptance of general anaesthesia in military practice. Meanwhile in the navy, without any opposition or discussion, the anaesthetic had come to stay.

Many lessons were learned in the Medical Services during the Crimean war, not least the necessity of caring for the sailor or soldier in a more humane manner, to which Florence Nightingale contributed so much. The acceptance of general anaesthesia in the Services, however belated, stands out as one of the few success stories of the Crimean War.

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Footnote: For the general background to this paper free use has been made of KEEVIL J J, LLOYD C, COULTER J L S. "Medicine and the Navy" Edinburgh 1963 Vols. II-IV and CANTLIE N. "A History of the Army Medical Department" Edinburgh 1974 Vols. I-II.