Medical history

Beatty's box

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William Beatty, the surgeon aboard the *Victory* who tended Nelson in his final moments, had an unusual set of surgical instruments, put together to his own specification

In 2005, the bicentenary of the battle of Trafalgar, much attention focused on Vice Admiral Horatio Nelson, his achievements, and untimely death at the hands of a French sharpshooter firing from the *Redoubtable*.

Perhaps we should spare a moment to reflect on the surgeon who was faced with the unpleasant task of realising that his much loved commander's life was fast ebbing away. Sir William Beatty, who attained notoriety for tending Nelson and doing the postmortem examination. He went on to obtain an MD in 1817, be knighted in 1831, and be appointed as physician to the Greenwich Hospital; he died in 1842.

Naval surgeons and their instruments

Surgeons on all royal naval vessels had many roles: physician, surgeon, dietician, counsellor, and friend. Apart from using their diagnostic and dispensing skills, they had to be prepared to manage fractures, sprains, burns, battle strikes, and suicide attempts. Mr William Beatty, with his two assistants (Mr Westenburgh and Mr Smith) and a few loblolly boys (assistants to the surgeons, who also dispensed "loblolly" or gruel), would care for sick sailors in the forward sickbay of the 102 gun flagship (ships of 100 or more guns should have had five assistant surgeons). At Trafalgar, the surgeon worked on the orlop deck, below the waterline, in a dim cabin near the dispensary. In combat, the cockpit, on the larboard side, was ready for casualties.

To us, the surgical tools used 200 years ago seem basic. All grades of surgeon carried pocket sets, and ships were likely to have more than one set of surgical instruments on board. Extra items not seen in the capital sets—probes, syringes, scissors, and cupping equipment—were available. At this stage of the Napoleonic war (with 10 more years to run) surgeons had to buy their own instruments, and a capital set would cost about 20 guineas. Later in the war, sets were provided. The instruments were approved by the Royal College of Surgeons of London and the Sick and Hurt Board (the governing body for naval medical services).

Beatty's capital set

William Beatty's personal set is well designed, compact, and unusual in several respects. Having been transported, with due reverence, from the Royal

Vice Admiral of the White, Horatio Nelson

College of Physicians and Surgeons of Glasgow to the National Maritime Museum in Greenwich for the recent Nelson and Napoleon exhibition, it has now been returned to Scotland.

The brass bound leather case has two compartments. The felt lined cover of the upper compartment prevents the instruments falling out. From top down, there is an ebony-handled, two ended instrument—one end is a scalpel or catlin and the other is a chisel or periosteal elevator. Below is a bullet extraction forceps with closed bows. Next down is the tenaculum, an

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ebony-handled curved sharp hook for transfixing the open mouths of blood vessels before ligating with silk or linen. Just above the saw is a crucible steel handle for the small bow saw. To its right is a button lenticular, which depressed dura and brain during trephination. A Schmucker sliding spring catch forceps, for securing arterial bleeding, lies above a sharp lenticular attachment. This latter had a button end and sharp side-cutting blade and was passed into cranial defects, where it could trim roughened cranial bone. To the left is a Bell-type bow saw, for bone division. Inside its bow lies an ivory handled brush for clearing bone dust out of the teeth of the trephine; a D shaped recess held curved, hand held, trocar pointed needles. At the bottom right is the small wooden handle for screwing into the two lenticulars.

At the head of the lower compartment lies a large semicurved blade, two sizes of trephine saw heads, an unusual pair of cranial forceps, and the Petit screw tourniquet. The bottom left handle is for the trephines and the other for the large capital knife blade.

The set is interesting for several reasons. The lid contains more instruments than usual. Six instruments are "served" by four handles, so saving space. As a rule only the trephine had a detachable handle, which was often shared by a dental key. The bow saw blades are somewhat prone to fracture and prove less robust than the more frequently used tenon saw. A single capital knife and saw blade was often inadequate; spares would have been carried. This set, made by Laundry of London, is unusual, with some continental features. It was clearly put together to Beatty's specification.

The working parts were made of crucible steel, a process introduced in the mid 18th century, and stored in oiled paper. Steel edges were honed on a fine whetstone and metal parts brightened using an abrasive such as brick dust and oil.

Putting surgical instruments to use

Amputation, the most severe of operations, varied in outcome with the site of injury, delay in surgery, and skill of the operator. For this the surgeon required total vascular control with the Petit tourniquet, which might be released after bone division and arterial ligation, to check for haemostasis. The capital knife was used for the coup de main and coup de force, the two sweeping cuts, which divided skin and muscle, respectively, in a circular fashion. The saw is small for major long bone

Sir William Beatty's capital instruments

The ball (with epaulette bullion and coat lining) that killed Nelson

division, and the tenaculum or the Schmucker forceps were used for securing the arteries (rarely the veins).

Trephining the skull was relatively infrequently performed, usually for depressed fracture. The skin was divided in a cruciate manner and periosteum scraped away. An appropriately sized crown saw head was then attached to its handle to cut the bone disc, which was lifted out with the thin skull forceps. The skin was closed with adhesive tapes or sutures.

Exploration for relatively superficial bullets, wood splinters, or langridge (iron debris) required finger exploration or probing, "dilating" the wound with a scalpel, and searching with bullet or other forceps. Similar instruments proved handy for draining "laudable" pus from wounds, joints, or body cavities.

Treating Nelson

Nelson was struck in the chest by a 20 g lead ball, imparting 150-200 joules of energy. Having injured the ribs and lung, it transected his spinal cord at T6 level. Beatty did not probe the entry wound, so sparing Nelson the discomfort. He could have pushed a bronchotomy tube into the left chest for drainage of blood and air. There was no record of any analgesia being given. The missile eliminated any compensatory vasoconstriction by effectively giving Nelson a high spinal anaesthetic. Today, he would almost certainly have survived, but 200 years ago none of Beatty's instruments was of assistance to Nelson.

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