Medical and surgical advances in World War I

On the 11th hour of the 11th day of the 11th month of 1918, 100 years ago, gunfire suddenly ceased along the length of the Western Front in France and Flanders. This marked the end of what had been named 'the Great War' or 'the War to End all Wars'. It was an uneasy peace, which was to be shattered just under 21 years later, on 3 September 1939, when Great Britain declared war on Germany, 2 days after the German invasion of Poland.

An old and wise saying is that 'the only thing to benefit from war is medicine'. This centenary anniversary of that armistice is an opportunity to review the remarkable achievements of the Armed Forces medical services during those 4 years.

World War I saw the control of a number of major diseases as a result of specific preventative measures. In the early days of the war, anti-typhoid fever vaccination was compulsory for all service men, and in January 1916, a triple vaccine for typhoid, paratyphoid A and B was introduced. On the Western Front, the incidence of typhoid and paratyphoid was recorded as 8.1 per thousand in 1917 and 0.2 in 1918. Contrast this with the incidence of 105 cases per 1000 men in the Boer War, where enteric fevers killed more soldiers than enemy bullets.

Effective sanitation measures proved effective in the control of bacillary dysentery on the Western Front, with an incidence of 4 per 1000 men in 1916, which fell to 0.79 per 1000 by 1918. However, dysentery remained a severe problem among the troops in the Middle East, Gallipoli and in East Africa because of the logistical difficulties in the provision of disinfected water.

The control of tetanus among the wounded using anti-tetanus serum proved reasonably effective, more so after an improved antiserum was introduced in 1916. However, gas gangrene remained a dreadful problem throughout the war as result of the severe tissue damage produced by high velocity missiles combined with wound contamination. Gas gangrene only came under control with the introduction of penicillin combined with early wound excision in World War II.

In the early months of the war, surgeons were dismayed at the poor results of the missile wounds they were treating. Used to treating civilian injuries with antiseptics, excision of any obvious dead tissue and wound closure, they were now seeing a new and formidable pathology – the effect of high velocity missile injuries at close range on the tissues, combined with gross wound contamination. The heavily fertilised soil of the Western Front provided perfect conditions for growth of the anaerobic organisms, the clostridia, of tetanus and gas gangrene. Pyaemia and erysipelas were common and secondary haemorrhage a serious complication as ligatures sloughed off ligated arteries. A compound fracture of the femur carried with it an 80% mortality.

> "Many lives were undoubtedly saved by the introduction of steel helmets by all the armies involved in the war."

By 1915, better results were being obtained by early wide excision of all devitalised tissues, with the wound left open and only closed when the wound appeared healthy ('delayed suture').

In the early days of war, surgeons were advised to treat abdominal gunshot wounds conservatively. It soon became obvious that the results in such cases were appalling. By early 1915, this advice was reversed; abdominal wounds were now given top priority for urgent surgery. Perforated large bowel was excised and the remaining colon exteriorised as a colostomy, damaged small bowel was resected and the viable ends of gut anastomosed. Mortality was still high, but was now in the region of 50% in those cases treated by urgent surgery in special units set up to deal with such injuries.

Plastic surgery may be said to have come of age in World War I. A young New Zealand ear, nose and throat surgeon, Harold Gillies, set up a special unit, first in Aldershot and then at Queen Mary's Hospital, Sidcup, and more or less single-handedly developed techniques such as the pedicle flap from the neck or chest wall to replace major loss of facial tissue. Bone grafts, usually from the iliac crest, were developed to replace shattered jaws. The technique of endotracheal intubation was developed by two young army doctors, Ivan Magill and Stanley Rowbotham, to enable the surgeon to operate on these head and neck cases. They can be regarded as the fathers of modern anaesthesia.

Compound fractures of the skull were common and highly lethal injuries as men peered over the parapet of their trenches. Many lives were undoubtedly saved by the introduction of steel helmets by all the armies involved in the war. Important work on gunshot wounds of the head was carried out by the American neurosurgeon, Harvey Cushing, first during a voluntary attachment to the French medical service and then, with America's entry into the war in 1917, with a special team he brought with him from Baltimore. He introduced the electromagnet to remove ferrous foreign bodies from the brain and also the valuable technique, still standard today, of debriding the cranial wound by means of a sucker; viable brain tissue remains in situ, while pulped, avascular material is readily removed by the suction.

In those four dreadful years, a century ago, of 1914–18, with the loss of millions of lives and the maiming of millions more people, on both sides of the conflict, it can truly be said that 'the only thing to benefit from war is medicine'. **BJHM**

Conflict of interest: none.

Professor Harold Ellis is Emeritus Professor of Surgery, Guy's, King's and St Thomas' School of Biomedical Sciences, London SE1 1UL