

INFLUENCE OF WAR UPON SURGERY*

BY V. ZACHARY COPE

SURGERY or chirurgery is the handicraft of healing. It has always been an art, but only during the past hundred years has it become a science. In pre-historic and early historic times the craft must have been almost exclusively exercised upon the victims of inter-tribal war. The earliest crude knowledge of anatomy may have come from skulls cleft by the battle-axe, or chests or abdomens ripped open by spear or sword; and in like manner from the time of earliest combat primitive man must have learned various ways of dressing wounds, extracting arrows or spear-heads from wounds, or applying some form of crude splint to a broken limb. By the time of Hippocrates various methods of practical value had been learnt by experience and were generally taught, but for more than two thousand years little definite advance was made in the art of surgery. Garrison states that through even the sixteenth and seventeenth centuries surgical instruction was so poor that all authorities agreed that war was the only field in which surgery could be learned. The knowledge thus gained was crude, ill co-ordinated, and only advanced by the rough method of trial and error.

Scientific surgery was not possible until there was a knowledge of anatomy, physiology and pathology, and no great extension of surgery was possible before the discovery of anæsthesia. From the time of Hippocrates until Vesalius published his monumental work on anatomy, surgery made few advances. The foundation of physiology, made possible by Harvey's discovery of the circulation of the blood, brought little immediate change apart from the interesting but abortive attempts at blood transfusion by Wren and Lower. Right up to the nineteenth century there were few changes in the methods of treating wounds, apart from those necessitated by the type of missile used. When bullets were round and propelled with only low velocity they did less damage and were often allowed to remain in the body, but when the velocity became higher more damage was done and surgeons such as Larrey used to open up (débrider) the wound and if possible remove the bullet. The usual course of wounds of the limbs was, however, so serious that many surgeons used to recommend primary amputation, and as Garrison remarks, this was often done with reckless profusion by the half-instructed surgeons of the

time. The middle of the nineteenth century saw light dawn upon this dark scene, and some of the light was reflected from the battlefield.

In 1846 ether was first used as an anæsthetic, and in 1847 Simpson discovered the value of chloroform for the same purpose. In the next year, 1848, occurred the civil disturbances in Paris and there were many wounded. The value of chloroform was immediately confirmed by Roux, who stated that he had employed it in all his operations with "very marked advantage and without the slightest inconvenience". Thus was shown for the first time how warfare may provide a favourable opportunity for trying out a new scientific remedy. Soon after this the relation of microbes to suppuration was shown by Pasteur, and in 1867 Lister demonstrated how the intelligent use of antiseptics could prevent suppuration in wounds. Though Lister's work was not everywhere received with an open mind, war provided the first great trial of the method. In the Franco-Prussian War of 1870-1871 the German surgeons were very ready to try any method which might give relief to the wounded, and many of them treated the wounds with antiseptics, particularly carbolic acid. But the strength of the solution used was not constant, the methods of using it in different hospitals were various, and the results so conflicting that, though its use became general before the end of the War, the conclusions as to its merit gained no general acceptance. Indeed, in the German history of that War the conclusion is reached "the campaign of 1870-1871 belongs to the pre-antiseptic era". Yet the account given in the history makes it plain that by this War the use of carbolic acid as an antiseptic for general use in operating became widely known among the rising German surgeons.

Though now largely replaced by the aseptic method, there is no doubt that the antiseptic method opened the way for the rapid and great advances which took place in general surgery during the latter half of the nineteenth century. By the beginning of this century surgery had advanced to such an extent that an almost complacent mood came over many who thought that it had attained the limit of its possibilities. To any who thought like this the last thirty years must have caused a rude awakening, for the titanic struggles of the nations—the War of 1914-18, the Spanish Civil War, and the present War—have shown the great limitations of surgery, and at the

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same time have provided the most valuable opportunities for research.

It is true that little of surgical value came to us from the Boer War—in fact some of the deductions made from that war have been proved to be misleading. The chief result of value was the discovery of the value of inoculation against typhoid fever—a triumph with which the name of Almroth Wright will always be associated.

SURGERY IN THE WAR OF 1914-18

The war of 1914–1918 had a very great influence on surgery in all its branches, and it will be necessary to limit ourselves to some of the most striking advances either initiated or rapidly developed during the course of that War.

It has been well said that “in former wars tetanus was a calamity to be recorded and deplored; the war of 1914–1918 has shown that it is one which can largely be prevented”. At the beginning of that War the incidence of tetanus was high, but when once prophylaxis was introduced the number of cases greatly diminished and remained so during the remainder of the War.

The War of 1914–18 helped largely to make of blood-transfusion an immediately available life-saving measure. So far as can be ascertained it was not until the seventeenth century that the transferring of blood to man, either from an animal or from another man, was considered a practicable proposition. But in spite of the many investigators who experimented with blood-transfusion, there were two great obstacles to the general adoption of the method; one was the clotting of the blood, the other the incompatibility of one blood with another, leading to serious or fatal consequences. In the first decade of this century Landsteiner detected the agglutinins in blood, and Jansky and Moss were thereafter able to classify bloods into four groups and to say which were compatible. Just before the War of 1914–18 the method of preventing clotting by using paraffin-coated tubes was discovered, and actually in 1914 several observers noted that sodium citrate when added to blood prevented its coagulation and caused no harm when injected intravenously. It was after the War had already begun that the first transfusion with citrated blood was made by Agnote in Buenos Aires. There was a delay of two years before the great value of transfusion was realized by the contending armies, but when the American surgeons came across to Europe transfusion was rapidly developed and soon became a recognized measure for saving life. Banks of stored blood are available during the present War for the immediate treatment of shocked or exsanguinated patients, and a further

advance has been the use of stored serum or plasma. There have indeed been some who say that there is at present too free a use of this method.

The treatment of wounds underwent great developments during the course of the War of 1914–18. At the beginning many surgeons had a blind faith in the efficacy of antiseptics to prevent or stop sepsis in a wound—a faith which they would scarcely have entertained if they had carefully studied the original writings of Lister. This simple faith was shattered by the work of Wright, Fleming and others, who showed that the antiseptics commonly used, for example, carbolic acid and perchloride of mercury, did more damage to the tissues than to the microbes hidden within them. This led to the use of other antiseptics such as flavine and the hypochlorites, which were more efficacious and did little damage to the tissues. Good results were also claimed for a mixture of bismuth, iodoform and paraffin (BIPP), using a technique introduced by Rutherford Morison. (Readers of Lister's papers will recall with interest that iodoform was the only antiseptic substance that he ever recommended to be introduced into the interior of a wound for its antiseptic effect.) But in order to apply any antiseptic the wound had to be opened up (*débridement*), and when it was opened up the difficulty of reaching all the damaged parts became evident. So by logical necessity surgeons were brought to see that the best method of avoiding septic wounds was thoroughly to excise the damaged tissues along the edges of the wound, and this ultimately became the routine treatment whenever possible. This excision of damaged tissues (wrongly called *débridement*) became standard treatment and constituted a wonderful advance in surgical technique. (It is only fair to state that this method had been advocated in the time of the Napoleonic wars by Desault and by Larrey, but they considered that it was only applicable to wounds of the soft parts of the face.)

During the War of 1914–18, thoracic surgery underwent considerable modifications and improvements, which have continued progressively to the present time. The free opening of the thorax, which before that War was a dreaded procedure, is now a daily occurrence.

A branch of surgery which may almost be said to have owed its origin to the War of 1914–18 is that of plastic work. In previous wars gunshot wounds had usually or frequently been made by bullets discharged from a distance, but in the terrible bombardments and close fighting of that War the character of the wounds by shells and bombs became more mutilating. Moreover, in trench warfare and with the wearing of metal

helmets the face was the only part left exposed and was therefore very frequently injured. Such injuries, if the patient survived and the wounds healed, produced terrible caricatures of the human face, and such revolting sights stimulated surgeons to devise methods of repair which should, so far as possible, restore parts to their original appearance. Thus arose the modern art of plastic surgery, in which patience, skill and ingenuity are more needed than in any other branch of surgery. It would take me too long to tell of the marvellous and ingenious turns of technique called into play in this art, how skin is made to travel caterpillar fashion from one part of the body to another, how noses are made from skin borrowed from one part and bone or cartilage taken from another area of the body, how large gaps in the jaw are made good by bone transferred from another bone and grafted on to the remnants of the broken jaw-bone, and many other marvels which are now of daily occurrence.

At the beginning of the War of 1914-18 gunshot injuries of joints were usually treated by incision into the joint, irrigation by antiseptic solutions and drainage by rubber tubes inserted into the cavity of the joint. As the War proceeded, however, it was found that to put a drain into a joint was bad technique, that incision of the infected parts of the wound and removal of foreign bodies with closure or almost complete closure of the joint-cavity led to much better results. After three years of war the improvement was so great that more than four-fifths of joint-wounds were healing by first intention without suppuration, and the amputation-rate at the base hospitals was down to 7 per cent. This was indeed a notable surgical advance directly due to the War.

The loss of a limb is not uncommon in peacetime, but in war it is a very frequent occurrence and it would not be surprising if the great experience of war-time should lead to improvements in the technique of amputation. As a matter of fact during the War of 1914-18 the terrible injuries and the frequent occurrence of gas gangrene frequently made formal amputation inadvisable, so that little technical advance was made in that direction. Ingenious advances were, however, made in the prosthetic apparatus to replace those limbs which were removed, for as the late Mr. Elmslie remarked, "progress in the design and manufacture of artificial limbs has usually occurred as a direct result of great wars".

Though the War of 1914-18 advanced surgery it did not greatly help surgical education. War surgery is very different from civil surgery. In that War, by force of circumstances or by the absence of proper grading, many men of little experience were compelled to do much operating.

After the War it was soon evident that such operative experience did not constitute a full or adequate surgical training to cope with the great variety of civilian surgical work. In the present War a much better system has been used for choosing and grading surgeons for responsible work, and the benefit of this has already been observed.

SURGERY IN THE SPANISH CIVIL WAR

The statement that war provides the opportunity of trying out any new method of treatment needs to be qualified by the remark that the opportunity furnished is not always seized. During the Spanish Civil War, however, we had an example of man and opportunity meeting at the appropriate time. I have mentioned that in the War of 1914-18 excision of contaminated wounds proved the best treatment, but with very extensive wounds complicated by fractures and injury to joints, suppuration often could not be prevented, and the consequent frequent after-dressing, either by Carrell-Dakin technique or other means, proved very tedious and prolonged. Similar prolonged and inconvenient treatment had been necessary at one time in those cases of inflammation of bone in which the bone had been widely opened to let out the pus. Twenty years ago, Winnett-Orr proposed that it would be a better proceeding to give complete rest to the part by immobilizing it in plaster of Paris casing and letting the wound heal underneath the plaster. Though, *a priori*, this appeared a dirty and unsurgical method, yet it proved an unqualified success and saved much time and trouble to the surgeon and much discomfort and pain to the patient. It is quite possible that this method may have been applied to gunshot wounds of the limbs before the Spanish War—in fact a similar method is stated to have been used by some surgeons in the last century—but there is no manner of doubt that the credit for making this technique applicable to severe gunshot wounds of the limbs attended by fractures mainly belongs to Trueta.

Trueta practised excision of the damaged tissues of the wound and immediate encasement of the affected limb in plaster of Paris which, unless some complication became evident, was left on for five or six weeks before being changed. It was found that severe infection seldom ensued, that what infection was present usually subsided within a few days, that virulent streptococci which were often present at the beginning gradually disappeared, and the wound took on a healthy appearance so that when the plaster was removed it revealed a granulating surface and a uniting or united fracture. This simple method, which perhaps largely depends upon the perfect rest to the part,

has proved efficient in this present War and must be accounted one of the most remarkable advances in wound treatment of late years.

SURGERY IN THE PRESENT WAR

The present War has been raging for more than two years. Realizing the need and opportunities for research on certain problems the authorities have already arranged for special research units, and some useful information has resulted.

The bugbear of the surgeon is the streptococcus, deadly to human beings, often persistent and latent in wounds and sinuses and difficult to dislodge. A few years ago mankind was blessed by the discovery of a drug which, given internally, was able to diminish and often destroy the streptococcus wherever it might be in the body, except on the surface of wounds. Recently Colebrook has found that this drug, sulphonilamide, when put on to the surface of an infected wound, has a direct inhibitory or destructive effect on the streptococcus, and this discovery is full of promise.

The other discovery deals with the effect of blast upon the human body. Everyone is now aware of the terrible effect of the blast due to the bursting of a large high-explosive bomb. A person may be killed by this blast without any external mark of injury being apparent. How this lethal effect is produced and how it may be prevented has been the subject of a research by Zuckerman and by others who have already obtained results which are full of promise for the successful prevention of injury from the terrible injuring force.

INDIRECT RESULTS OF WAR UPON SURGERY

War affects a nation otherwise than by direct physical damage. Food-supplies are often diminished to a level which is incompatible with health, and various diseases may find a chance to flourish which could not gain a footing in normal times. This was shown by the statistics of surgical diseases as they occurred in one of the large Russian hospitals during the time of the War of 1914-18 and the subsequent revolution. The whole social framework of the country was broken for a time and disease of every kind was rife. Starvation and undernourishment were prevalent. In these circumstances it was noteworthy that the number of cases of appendicitis and cholecystitis diminished almost to vanishing point, while ulceration of the stomach and duodenum increased altogether out of proportion. It is certainly significant that the most common surgical disease of the abdomen should almost disappear when war compelled drastic reduction in the diet scheme. It may well be that many other factors were concerned in this reduction, but on the face of it there may be some indication as to the pathology of appendicitis.

Every wise practitioner is taught by time and experience that to prevent is better than to cure, or to speak paradoxically, prophylaxis is the better part of treatment. The best cure of wounds is to prevent them. So we may hope that future generations may profit by the terrible experiences of the present time and there may develop the perfect prophylaxis of the war disease—that for which all of us are longing—peace.

PLANNING, SCIENCE AND FREEDOM

BY PROF. F. A. HAYEK

LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

THE last ten years have witnessed in Great Britain a strong revival of a movement that for at least three generations has been a decisive force in the formation of opinion and the trend of social affairs in Europe: the movement for 'economic planning'. As in other countries—first in France and then particularly in Germany—this movement has been strongly supported and even led by men of science and engineers. It has now so far succeeded in capturing public opinion that what little opposition there is comes almost solely from a small group of economists. To these economists this movement seems not only to propose unsuitable means for the ends at which it aims; it also

appears to them as the main cause of that destruction of individual liberty and spiritual freedom which is the great threat of our age. If these economists are right, a large number of men of science are unwittingly striving to create a state of affairs which they have most reason to fear. It is the purpose of the following sketch to outline the argument on which that view is based.

Any brief discussion of 'economic planning' is handicapped by the necessity of first explaining what precisely is meant by 'planning'. If the term were taken in its most general sense of a rational design of human institutions, there could be no room for argument about its desirability. But