SURGICAL PROBLEMS OF WAR

This contribution is the first of four articles written by a Canadian surgeon who had considerable experience of war surgery in 1914–18

SOME EXPERIENCES IN THE LAST WAR

BY

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Late Temporary Major R.A.M.C.

It seems almost unbelievable that after such a brief respite from the agony and suffering of countless thousands of wounded men the R.A.M.C. find themselves established on the western front "taking in" again. It would be a tragedy, however, if the costly experiences gained in the last war were not the common knowledge of those engaged in the care of the victims of the present struggle.

Many months, and even years, elapsed in the war of 1914–18 before we realized the best methods of collecting and evacuating the wounded, and of caring for them so as to avoid shock and infection and to offset gas gangrene and tetanus, and before specific methods were perfected and applied to the various types of wounds. Unfortunately the knowledge of our able and conscientious consulting surgeons had been based on experiences gained largely in the South African War, the Balkans, and border disturbances in India, or in dealing with wounds in large urban centres of the British Isles in which *Clostridium welchii* was not found to exist so constantly as was the case in almost 100 per cent. of wounds contaminated with the heavily manured soil of France and Belgium.

In the burning sands of Africa, India, Persia, and Egypt grave spreading infection was rare, and wounds healed rapidly without the necessity for débridement and eternal vigilance to avoid the rapid and malignant spread of the dreaded *Cl. welchii* that became a nightmare to surgeons on the western front. In addition, civilian experiences in dealing with wounds of joints, fractures of the skull, compound fractures of limbs, penetrating wounds of the abdomen, pelvis, limbs, and, latterly, of the chest had not been sufficiently stabilized and established to be immediately applied to war wounds. In previous wars, also, the proportion of shell and shrapnel wounds was small compared with that occurring in the last war.

Gunshot Wounds of the Knee-joint

As a result it was late in the spring of 1915 before we realized that gunshot wounds of the knee-joint, and in fact of all joints, could *not* be successfully drained, and that early and wide excision of the wounds down to and including the lining membrane of the joint was necessary. All foreign bodies, clothing, mud, and debris generally must be carefully cleaned out and the joint gently irrigated with saline, the capsule then being sutured, the freshened edges of the wound approximated, and the joint encircled with mastisol dressing to exert moderate pressure and kept partially mobilized for a few days. Occasionally one had to leave a small drain just down to the sutured capsule for twenty-four to forty-eight hours only. Multiple tube drainage, various types of packs, antiseptics, suppositories of many kinds, were all tried and completely abandoned. Late in March of 1915, in Rouen, at No. 10 General Hospital, Lord Moynihan (Sir Berkeley, as he then was) and Professor Tuffier of Paris held a meeting on gunshot wounds of the knee-joint, and presented elaborate drawings and designs by a celebrated Parisian artist to illustrate the correct and only means of successfully draining a gunshot wound of this joint by using five or six large rubber tubes. Sir Berkeley was quite annoyed that none of the surgical specialists present at the meeting who had been living day and night with the victims of joint wounds enthused over the method advocated, and in fact not one of them supported the suggestion. All of us had had too much grief and had seen too many men lose not only their limb but their life after days and weeks of painful dressings, constant suffering, and repeated incisions, while racked with fever and delirium. In April of that year, at No. 3 Stationary Hospital (located at Darnetal, Rouen), total excision and suture of the wounds of joints was adopted. The great majority healed by first intention. Multiple incisions and drainage, and painful dressings, were avoided. Early motion was established. Amputation as a secondary life-saving procedure became almost unknown. Occasionally aspiration of a knee-point was necessary if there had been extensive injury to the joint surface or if infection had become partly established within the joint before the patient came to operation. It became a pleasure to walk through the wards allotted to joint cases, and not the hideous and hopeless nightmare that we had experienced for months, when too often relief came not only to the poor victim but also to the surgeon when death relieved the patient of his suffering or at the best the limb had to be amputated. In addition, if the various methods of drainage did eventually overcome infection and save the joint, the great majority were left partly ankylosed and deformed, and few of these patients ever returned to active service. On the other hand, I saw one man, an Englishman, who during the course of the war had two wounds of his left knee-joint and one of his left shoulder-joint, all at different times. He had good movement, with no distress, and returned to active service each time; eventually, in the autumn of 1917, coming in with an extensive open wound of the left chest from which he survived and returned to service.

The method of establishing drainage by wide incision of the joint and immediate active motion as developed by Willems of Antwerp was valuable in late cases with established infection, and should be kept in mind.

It cannot be too strongly urged that in all patients with gunshot wounds of joints, on the western front, operation should be undertaken at the earliest possible moment, the joint *x*-rayed, the missile accurately located, the extent of fracturing and splintering determined, the wound excised *in toto*, the joint thoroughly cleansed, the wound closed in layers, the joint bound in mastisol or similar dressing to exert a little pressure, and then mobilized on a pillow or back leg splint for a few days.

It is, of course, unnecessary to discuss the routine injections of anti-tetanic serum in the advanced dressing station and the prophylactic use of the toxoid. With regard to the tourniquet, its indiscriminate use must be avoided. In many instances the main bleeder can be caught and tied. By the autumn of 1916 the danger of the unwise use of tourniquets was fairly well known in France. Preserved blood should be on hand in all advanced dressing stations, and there should be two or three officers in every ambulance who are deft in striking veins and who realize the necessity for saving every possible vein for later intravenous injections.

Thomas's Splints

The Thomas leg splint was first sent to the advance dressing stations on the Somme in July of 1916. It rapidly established itself as probably the most important agent of all war measures in combating shock and in saving life and

limbs. Before the Somme battle ceased for a while in December of 1916 it had become a standard equipment in dressing stations and was carried in all ambulances. All orderlies and stretcher-bearers were given instruction in applying the splint over the boot and trouser, supporting the limb from behind by bandages or by splitting the trousers, and in placing a clove-hitch on the boot to exert traction. Sir Henry Gray and I had many friendly arguments as to whether the Thomas splint was first sent up to the dressing stations in the Third Army or the Fourth, but I am sure we sent the first splints up from No. 36 Casualty Clearing Station at Heilly-sur-l'Ancre, in the Fourth Army, to an ambulance at Albert about July 8, 1916. Sir Menus O'Keeffe and Sir Harold Fawcus can bear witness that when we applied for 300 Thomas leg and arm splints in July, 1916, they seriously considered a court martial, but to their credit they approved the order, as they did so often later on. No army in France ever had a Director of Medical Services and Deputy Director of Medical Services who gave more whole-hearted assistance and support to surgical specialists than these two officers directing the medical services of the Fourth Army.

Collapse of the Lungs

I should particularly like to impress on all medical officers in the forward areas that there is a small but constant percentage of men who are wounded by a close-up shell or bomb explosion. They die without an apparent wound, or from a wound so slight or in such a position that it cannot of itself be the cause of death. These men have a rupture of the visceral pleura of the lungs or a complete collapse of the lungs from suction of air incidental to the blast or due to reflex or bends. The lungs are collapsed and practically airless. This type of wounded and dying man must be first sought for among those lying about close to the site of the exploded shell or bomb. Immediately on finding such a case—and unfortunately there are many of them—place a handkerchief or piece of gauze over the mouth, hold the man's nose, and blow hard into the lungs. Continue to exhale forcibly and inhale lightly till the victim begins to breathe; then when his lungs are expanded, and he is himself breathing, aid him by artificial respiration until the colour is restored to the face. I am firmly convinced that a few breaths will save a life that is almost lost. The case must be recognized at once, because it takes only a few minutes for death to result, as in a drowning man or as occurs in spontaneous pneumothorax. In a small proportion of these men there are one or more perforations of the visceral pleura cause massive pneumothorax, and it is not enough just to inflate the lungs. They must be kept inflated, and it may in addition be necessary to aspirate the pleural cavity or even leave a small needle in the chest wall until the minute openings more or less seal themselves over and a positive pressure within the thorax no longer occurs.

For this group of cases particularly, every advanced dressing station should have one of the small, inexpensive, compact gas–oxygen machines at hand to maintain positive pressure in the lungs until the respiratory function is safely restored. A well-fitting mask applied over the nose and mouth is sufficient. Intratracheal insufflation, while of course more valuable, is fortunately not necessary. An oxygen cylinder (with ordinary commercial oxygen) can be fitted up anywhere, and oxygen administered through a mask if a proper machine is not available.

It took nearly four years of war before we recognized the cause of death and what to do to avoid it in those who were dying and yet had apparently no fatal wound. Battalion and field ambulance medical officers, and in fact all having to do with wounds, should be constantly on the look out for this type of case. They should be sought for at once. They will be common as a result of aerial bombing, and will account for a definite proportion of the deaths of those close to the blast of bomb or shell. I have seen three such cases from one fifteen-inch shell, so they are not rare. This type of wound will be common from bombs bursting on the surface—on pavement, stone, the deck of ships, etc.—and time must not be wasted in accurately determining the extent and seriousness of other wounds of the body. If the patient is apparently dead or dying within a few minutes of the "blast" without an obviously fatal wound, immediately inflate his lungs and maintain them in inflation. In one patient, whom I saw twenty minutes after the shell burst, life could have been restored if the collapse of the left lung had been recognized. That lung, inflated under water after removal, revealed a rupture of the visceral pleura into a bronchus, causing a massive left-sided pneumothorax and death. The right lung was in expansion.

Traumatopnoea and Shock

While on the subject of injuries to the lungs I would stress the need for having silkworm or heavy dermal sutures threaded on large needles and at hand ready to suture immediately and seal hermetically all open gunshot wounds of the chest. Such a procedure is life-saving, and makes it possible for surgeons in casualty clearing stations and advanced operating centres to save over 80 per cent. of patients with open wounds of the chest; yet it was not till after twenty-three months of war, and after losing practically 100 per cent. of such cases, that we realized that 72 per cent. could be saved. To-day with the vast improvement in thoracic surgery we should save at least 80 per cent. of such patients.

Greater efforts must be made in this war to offset shock. Glucose in sufficient quantities, in addition to preserved blood, must be available in advanced dressing stations. Measures must be developed to ensure supplies of warm blankets and pyjamas, and for hurriedly restoring body heat to those suffering from shock. Blood transfusion is valuable above all else.

Anaesthesia

Lundy, senior anaesthetist of the Mayo Clinic, a few weeks ago said to me, "Out of the last war came 'chest surgery'—out of this war will come 'anaesthesia,'" and he may be right. Refinements of anaesthesia will tremendously simplify surgery and greatly reduce mortality. Select spinal anaesthesia, the intravenous use of such preparations as sodium pentothal, sodium amytal, and so forth, will reduce operative shock and avoid chest complications, and permit of easy, rapid, and safe reduction of fractures and application of splints. Inhalational gas anaesthesia and simpler methods of intratracheal administration will save many lives.

In this connexion I would point out the safety and value of the massive ether anaesthesia which we employed in literally thousands of cases during the last war for hurriedly reducing fractures, for painful dressings, for drainage incisions, etc. Ten drachms of ether were poured into a measuring-glass. The patient's eyes were well protected, petroleum jelly was liberally applied to the lips and nose, and an ordinary mask with gauze fitted over the nose and mouth, with another mask over the top of that to form an air space. A small opening only was left over the top mask, and the patient was asked to take two or three long breaths, and to exhale forcibly. Just at the end of the second expiration 4 drachms of ether was poured into the opening in the mask, and the opening at once sealed by the hand over a heavy towel, the mask being so protected and held that no air could enter. In another minute or two the remaining 6 drachms was poured in. The anaesthesia was sudden and complete, patients rarely struggled, there was no excitement stage at all, and if a longer anaesthesia was required it could be maintained by drop ether or by switching to gas–oxygen. If not the mask was removed, and patients were out of the anaesthesia completely in a few minutes. The method is absolutely safe, is time-saving, and is not at all distressing to the patient. It is a sudden "knock-out," and is extremely valuable when large numbers of wounded urgently require attention.

Surgery in the Forward Areas

It was not until the spring of 1916 that it was definitely established that all wounded who could possibly be dealt with surgically should be operated upon in the casualty clearing stations and advanced operating centres within a few hours of having been wounded, and before shock, haemorrhage, and infection had reduced vital resistance to such a low ebb that thorough and complete surgical procedures could not be carried out. Consultants and surgeons in the base areas were irritated, indeed quite annoyed, because rather than being immediately evacuated to the base hospitals the gravely wounded were being held in the forward areas, often with their field dressing on, covered with mud and debris, and imperfectly splinted. Too often infection was well established because of the unavoidable delay in securing hospital trains and in ensuring rapid transit to the base hospitals. In addition valuable time was lost collecting and evacuating the wounded to the casualty clearing stations.

However, late in July, 1916, Sir Anthony Bowlby, chief consultant to the British Expeditionary Force in France, called a meeting of consulting surgeons at No. 36 Casualty Clearing Station, on the Somme. Sir George Makins, senior consultant for the base areas, was present, with Mr. F. F. Burghard, Sir Wilmot Herringham, Maynard Smith, Sir Henry Gray, Colonel Thomas Sinclair, and several other consultants. Lieutenant-Colonel George Gask, then surgical specialist of No. 38 Casualty Clearing Station, and I were seated in the witness-box, and Lieutenant-Colonel R. J. C. Thompson, then in command of No. 36 Casualty Clearing Station, hovered about, giving Gask and me the support we sorely needed. Gask had been in France but a few months at that time, and had been attached to us while No. 38 Casualty Clearing Station was being established close by. He was a safe, sane, judicially minded surgeon, not easily carried away by fads or fantasies, but quick to recognize the right or wrong of technique and methods then employed. His contribution to thoracic surgery during the summer of 1916 was epochal. Neither Gask nor I had had any previous intimation of the meeting until summoned to appear, and thus we had no time to collect our thoughts or to confer together.

Sir Anthony Bowlby called the meeting to order, and without any preliminaries asked me to outline to the austere group assembled what we were doing for gunshot wounds of the head. Gask was then asked for his opinions, and the question was open for discussion. In such a manner we covered every type of wound from head to foot. The discussion at times was somewhat heated, not with regard to the type of surgery, the methods employed, or the results, but as to whether or not it was wise to attempt such measures in the forward surgical centres—namely, the casualty clearing stations. Sir George Makins quickly realized that it apparently was feasible to deal with the gravely wounded in those stations, and in his quiet suave manner broke down the opposition of the other consultants from the base areas. Sir Anthony was as pleased as Gask and I were, because he had given us *carte blanche* with the wounded and had defended our action in operating and keeping large numbers of wounded in the casualty clearing stations. So ended in July, 1916, all organized opposition to surgery in the forward areas. From then on every possible effort was made so to organize, equip, and man casualty clearing stations and advanced operating centres that every gravely wounded man could be given the finest of surgical attention and nursing care at the earliest possible moment after being wounded. In addition, the gravely wounded could be retained as long as necessary, and on evacuation were put into comfortable trains where special treatment such as the Carrel-Dakin method could be given on the journey to the base. Unfortunately, it was not until late in the autumn of 1916 that all casualty clearing stations, on the Somme front at least, adopted the policy of the "early operation" on all the seriously wounded.

RADIUM POLICY AND PRACTICE

THE COMMISSION'S REPORT

The tenth annual reports of the National Radium Trust and the Radium Commission[1] are largely occupied with the position following upon the passage of the Cancer Act. The Act contemplates the purchase of additional radium and appliances by the Trust with money loaned by the Minister of Health. The question of securing the required radium at reasonable cost at once became urgent, and the Trust approached Eldorado Gold Mines, Ltd., Canada, and negotiated an option to buy up to a maximum of 10 grammes of radium a year from the company at a price of £4,500 per gramme during five years. The arrangement is subject to the condition that the Trust shall purchase not less than 2 grammes each year during the period and also that it shall purchase by instalments the 17 grammes which it has held upon loan from the mining concern.

The Commission states that one effect of the Cancer Act will be to throw upon county and county borough councils the duty of making arrangements to secure that the facilities for persons suffering from cancer are adequate. It is anticipated that the local authorities will use predominantly the nineteen hospitals in England and Wales and the four in Scotland in which the Commission has already established national or regional centres. Large parts of the country still do not possess reasonable facilities for effective treatment, and further medical centres will have to be established in such areas on the initiative of the local authorities and with the co-operation of the voluntary hospitals wherever possible.

Centralization of Treatment

Centralization has been the policy of the Radium Commission since it began its work, and here again it points out the need for limiting the more highly specialized forms of cancer treatment to a comparatively small number of hospitals. It is expected that the arrangements to be made by local authorities under the Act will necessitate authorities combining to formulate a scheme which will serve a whole region. They will do this by utilizing an appropriate hospital, in most cases an existing radium centre, as headquarters, and by some affiliation between the treatment centre and other hospitals in the region which do not possess complete facilities for all forms of treatment. Provision is made in the Act for combined committees of local authorities with power to co-opt. A few experiments in this direction were made with the help of the Commission in various parts of the country before the Act went through; they were not always successful, but they did show that such a process was practicable. The association which the Commission has formed during the past ten years with voluntary hospitals in all parts of the country enables it to give appropriate advice to all concerned in promoting the objects of the Act.

Co-operation between Departments

Committees of the Commission have been visiting various national and regional centres during the year. The work at these centres is being generally carried on at a very high level. But it is once again pointed out that it is very difficult to get work of a consistently high standard and to make rapid progress in radiotherapy except at large centres, well equipped and staffed. Again, whatever the size of the centre there is a real danger that the patients may not get the most suitable treatment unless there is effective co-operation between the departments concerned. All cancer patients should be seen in consultation by a radiotherapist, a surgeon or specialist surgeon, and, if possible, a pathologist, and the same three consultants should be available when patients are seen at the follow-up clinic.

[1] *Tenth Annual Report of the National Radium Trust and the Radium Commission*, 1938–9. London: H.M. Stationery Office. Cmd. 6161. (6d.)