CHEST SURGERY IN WAR

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CLOSED WOUNDS OF THE CHEST, AND THE PHYSICIAN'S PLACE IN A CHEST TEAM

BY

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Changes in climate, the nature of the soil, the character of weapons and missiles, render the aspect of gunshot wounds of the chest exceedingly variable. In the South African War it was decided that chest wounds were best left to the natural processes of cure. In the war of 1914-18 sepsis was so frequent in all varieties of chest wound that by 1916 Duval of the French Army and Gask of the British Army first began to apply the general rules of surgery to lung wounds. In July, 1917, a meeting of consulting surgeons and physicians drew up a memorandum which was communicated as a guide to all medical units.

A Guide for Medical Units

Briefly the following rules were laid down:

1. An open pneumothorax should be temporarily closed by suture at the earliest opportunity, either at the field ambulance or C.C.S. If suturing is impossible the wound should be packed and strapped to render it airtight.
2. Extensive parietal wounds, including the above, should be treated as any other large wound, and comminuted rib fragments removed.
3. A large foreign body shown by radiographs to be accessible should be removed, haemothorax evacuated, and the chest closed. Bullets or small fragments may be left.
4. Any large haemothorax attended by persistent respiratory distress should be aspirated; this is best done after a lapse of forty-eight hours.
5. Gross infections may be treated by rib resection and drainage. Mild infection may be closed after thorough cleansing of the pleural cavity.
6. Set operations should not be performed until initial collapse has passed off.
7. Always close a wound of the diaphragm discovered at a thoracotomy.
8. Any case subjected to open thoracotomy must be retained for ten days after operation.
9. Reliable x-ray plant and immediate access to a pathological laboratory are essential to successful chest surgery.

These rules made a great change in the number of cases left to expectant treatment. Gask estimated that perhaps 25% of cases needed surgical treatment in the first twenty-four hours; even through-and-through rifle-bullet wounds often become septic. Captain Mann of No. 3 Canadian C.C.S. (with whom I worked for a short time in 1917) noted that septic empyemata were not more common with retained missiles than with through-and-through wounds, and that fragments of high-explosive missiles showed only a slighter tendency to become septic than did rifle bullets. Of cases with retained foreign bodies (10% bullet, 90% shell) 16% developed septic haemothorax at the C.C.S. (11% bullet, 89% shell). Of cases without retained foreign bodies (39.5% bullet, 60.5% shell) 21% developed septic haemothorax (20% bullet, 80% shell). The determining factor seemed to be the character of the wound rather than the nature of the missile. Injuries to ribs and laceration of soft parts were mainly responsible for the production of sepsis.

So it came about that the proportion of cases that would from choice (not military necessity) be left to expectant treatment was small. The idea that "closed wounds" as a whole class do not need surgery is dangerous. This is especially true of "stove-in chests" with several ribs smashed and driven in without any penetrating wound. These are veritable "closed wounds," but it was universally agreed that they required immediate operation.

During the summer of 1917 Major Lockwood (of Toronto) and I had the good fortune to be so stationed at Zuydcoote, near Dunkirk, that we received our chest cases direct from the line. They came to us at No. 36 C.C.S. without stopping at a field ambulance. The Passchendaele battle did not affect us, except that no ambulance trains could be spared to take our cases to the base, so we kept our patients through to convalescence. In parenthesis I may remark that we shared the vast sanatorium at Zuydcoote with the French Mobile Surgical Unit 21, of which Prof. Duval was the chief surgeon. We worked there from August to November, 1917. The total number of "G.S.W. chest" admitted was 168; operations were performed on 82, and non-operated cases amounted to 86. Of the non-operated cases 9 were brought in dead, 21 died within a few hours of admission, yet 55 survived. It appears that we refrained deliberately from operation in only 56 cases. As I look through the fatal non-operated cases I think No. 48 is the only one upon which we decided of free choice not to operate. The results of this group of cases turned the scale in favour of early operation rather than early evacuation to the base.

I have one other set of figures of Lockwood's and mine. In September, 1916, 203 cases were admitted to a special chest ward at Heilly. Of these only 16 died in the C.C.S., but this low death rate is partly explained by the fact that abdomino-thoracic injuries were taken into surgical wards and classified separately. I do not know what was the after-history of the 187 cases evacuated to the base; but of the 168 cases at Zuydcoote 113 lived and were discharged by us convalescent. Lockwood noted in his paper that the figures showed a high percentage of recoveries in cases that previously showed a mortality of nearly 100%.

I lay stress on this experience because it shows how few cases a physician will choose to treat expectantly. Perhaps the prophylactic use of sulphanilamide may justify a change in practice.

Classification of Cases

It comes to this, then: there were very few "G.S.W. chest" that, in the climate and soil conditions of France and Flanders, a physician would choose for expectant treatment. But circumstances may compel expectant treatment—for example, the absence of surgical facilities or, even with these facilities, the absence of radiographic facilities; or the patient may be unfit for operation owing to the severity of the intrathoracic injuries, the severity of external or complicating wounds, loss of blood, or collapse or shock due to cold or transport. Allowing, however, for such considerations, there remain two classes of "closed wound" which the physician may be allowed to look after: (1) the cases in which no operation has been deemed necessary and the patient's condition is good; (2) the cases

upon which operation has been performed and in which the surgeon has closed the chest. No physician without experience of war surgery of chest wounds is competent to select cases for Group 1.

Early Aspiration

The whole plan of treatment of closed wounds may be summarized in a short sentence: No fluid, whether blood, serum, or pus, must be allowed to collect in the chest. Early and frequent aspiration must be resorted to whether thoracotomy has been performed or not.

As a rule it is injudicious to aspirate for either pneumothorax or haemothorax immediately after the wounding. Occasionally it is obvious from the urgency of the dyspnoea that relief might be obtained by immediate aspiration. Sometimes this becomes evident after resuscitation has been tried without success or with only partial success. The patient recovers partially from his shock and, as he recovers, dyspnoea, which is often absent while the respirations are feeble and shallow, begins to show itself. It is important to recognize that urgent dyspnoea with cyanosis soon after wounding is more pronounced in cases of extensive collapse or deflation of the lung without much haemothorax or pneumothorax than in cases in which the latter conditions are unaccompanied by collapse of the relatively uninjured lungs. A useful point in diagnosis is that haemothorax or pneumothorax pushes the heart away, whereas collapsed lung pulls it.

The post-operative aspiration of a chest must conform to the one rule that no fluid must be allowed to collect in the pleural cavity. Looking back at Lockwood's cases I find it was the rule that a chest closed at operation was explored eighteen hours later. Exploration was usually repeated several times. Cultures were made, but the discovery of pyogenic organisms or pus did not mean that the chest was reopened and drained. We always tried repeated aspiration. Lockwood's comment on this point was: "The rapid recovery by aspiration from an empyema infected by aerobes and anaerobes demonstrates that repeated aspiration should be resorted to before considering resection and drainage. The mortality of the latter operation in chest wounds at C.C.S. is nearly 50%." Lockwood's rules should be adhered to.

"Chest cases should be nursed in the open air if possible. Aspiration is carried out as a routine eighteen hours after operation and at the end of the third day. Exploration of the chest is performed at frequent intervals whenever an accumulation of even small quantities of fluid is suspected, and fluid, if found, is removed by aspiration. Fluid must not be allowed to collect after operation. Physical signs are misleading, and nothing but repeated use of the exploring syringe and aspirator, aided by x-ray examination, will keep a chest safely emptied of fluid. Non-operated cases should be treated precisely as post-operative cases."

It is noteworthy that open drainage did not come into his scheme.

We did not recognize in the war of 1914-18 a separate class of "blast injuries" of the lung such as has been described amongst the air-raided casualties of the present war, and I have not seen enough examples to express any opinion about such injuries. It must be realized that the victims of air raids reach hospital alive with injuries to which a soldier succumbs on the battlefield, and we know that 50% of all chest wounds resulted in death on the battlefield in the last war. No one knows whether "blast injuries" contributed to these deaths.

The Physician's Place in a Chest Team

Now I want to say something about the physician's place in a chest team, because there is always a definite place for a physician. One of his first duties is to decide as to the intrathoracic injuries in the following way: Is there a

sufficient degree of pneumothorax, haemothorax, collapse of lung, laceration or haematoma of lung, injury to heart, pericardium, or great vessels, injury to diaphragm and abdominal viscera, or injury to vertebrae or spinal cord to account for the severity of the symptoms?

Radioscopy and radiography are indispensable in order to reach a correct conclusion on these points. If the patient is unfit to undergo immediate x-ray examination the decision is easier. He is unfit for any immediate operation save one of the following: immediate and rapid operation for the arrest of visible haemorrhage from the chest wall or thorax; arrest of haemorrhage from coexisting wounds; aspiration for relief of pneumothorax (usually valve pneumothorax); aspiration for relief of haemothorax; temporary closure of open pneumothorax.

Duval pointed out the immense value of blood-pressure observations in the differentiation of shock from haemorrhage. The patient must be kept warm and every half-hour the blood pressure be gauged by the sphygmomanometer. In cases of pulmonary haemorrhage great care must be taken not to lower the head and not to administer subcutaneous or intravenous injections. If the blood pressure progressively falls operation is indicated, as haemorrhage is outweighing shock. It must be realized that a patient with a simple through-and-through wound or one with a small missile retained should not be profoundly collapsed or in great respiratory distress after being kept warm and at rest for an hour or two. If at the end of this time the condition has not improved the following possible causes must be considered in addition to the intrathoracic lesions just mentioned: haemorrhage, severe parietal and external thoracic injuries, diaphragmatic and abdominal injuries, and multiple wounds other than abdomino-thoracic.

Haemorrhage

This may have been very large in amount, and there may still be active bleeding. As a rule with closed thorax the amount of intrathoracic haemorrhage will not of itself be enough to produce severe shock. When there is an "open thorax" the estimated size of the haemothorax is no guide to the quantity of blood lost, as the greater part of the bleeding may have been external. In such a case physical examination is of little assistance beyond determining that there is an "open thorax" and that the patient is suffering from loss of blood. If the missile has been retained it is of the greatest importance to locate it accurately by radiographs. Signs of increasing effusion after twenty-four to thirty-six hours are scarcely ever due to active haemorrhage. Lockwood and I saw only 5 cases of recurrent haemorrhage.

Severe Parietal and External Thoracic Injuries

Comminuted fractures of ribs, scapula, or sternum produce the gravest symptoms even in the absence of severe intrathoracic injuries. It is of the utmost importance in such cases to determine the extent of the intrathoracic or pulmonary injury. Physical examination by auscultation and percussion is difficult to perform and more difficult to interpret. It will give little information beyond establishing the presence or absence of haemothorax or pneumothorax. But it is essential for the surgeon to know beforehand whether his operation should be limited to the parietes or should extend to the interior of the thorax. As a general rule, if the entrance wound is small and clean and there is no comminution of bone, whilst the extensive bony injury is confined to the exit wound, there will be no in-driven fragments, and the operation may be limited to the parietes. But if the entrance wound is large, if there are in-driven fragments of bone or pieces of clothing, and especially if a large missile is retained, the operation must extend to the interior of the chest.

Associated Injuries

Careful attention has always to be paid to injuries other than purely thoracic which may have been caused by the missile or missiles which have struck the chest, particularly injuries of the diaphragm and abdominal viscera. A prompt decision must be made as to whether there is sufficient thoracic injury to produce the symptoms or whether the thoracic injury may be ignored and a further explanation be looked for below the diaphragm. To the surgeon a definite and reliable opinion expressed by the physician that the intrathoracic injury is negligible is of great assistance. In order to form a definite opinion in such a case, physical examination of the chest becomes more important than in the class of case previously considered. If the heart is not displaced; if there is no great degree of surgical emphysema; if there is no large amount of air or fluid in the chest; but, above all, if there is a fair degree of air entry into the lungs, it may be assumed that, although the missile has entered the chest, the grave lesion exists elsewhere. In a through-and-through wound the track of the missile may make it obvious that no important structure has intervened; failing this, radiographs will be required unless the presence of an abdominal injury is made clear by other signs and symptoms. Abdominal rigidity and immobility are not by themselves clear indications of abdominal injury; these signs are often present in pure chest injuries. Increased dullness in the spleen area, haematuria, the presence of dullness in the flanks, localized tenderness and pain in the abdomen, the peculiar "catchy" breathing suggestive of diaphragmatic injury, and hiccup are signs that should be noted and interpreted as indicating injuries below the diaphragm.

Spinal Injuries and Multiple Wounds

Spinal injuries demand recognition, and not merely those which involve the actual spinal cord. Injuries to the body or processes of vertebrae may cause the gravest symptoms and present very puzzling features. Excessive pain, radiating very irregularly, is constantly met with in injuries of the vertebral bodies, and resembles the intense and erratic pain due to erosion of the vertebrae by aneurysm. Profound collapse which resists all efforts at resuscitation is often seen in spinal injuries, even when the cord is undamaged.

Apart from the associated injuries which the missile entering the chest may have produced, there may be other wounds that make it difficult to decide whether the patient's serious condition is attributable mainly to the chest wound or not. Here, again, if there is fair air entry into the lungs, the intrathoracic injury may be put on one side. A patient with one lung expanding well should not be greatly distressed even though the other lung is completely out of action, provided some hours have elapsed to allow him to adjust himself to his new conditions, and provided he has been kept at rest.

Mr. Thomas Johnston, M.P., Secretary of State for Scotland, has urged Scottish local authorities to improve their schemes for the relief of people rendered homeless by enemy attack. In a memorandum issued by the Department of Health for Scotland the authorities are instructed to make certain that their plans will actually work even in the severest conditions. The rest centre and billeting organization in each area ought to be so efficient that the local authority will be able to deal with its own homeless no matter how severe the raid may be. The Secretary of State is convinced that while much preparatory work has been done by local authorities the relief scheme can be still further improved. He attaches the greatest importance to the testing of emergency relief organizations, and urges every local authority to arrange rehearsals on as large a scale as possible.

MEDICAL PLANNING RESEARCH

MANIFESTO BY THE "YOUNGER HALF"

The following letter, signed by forty-eight members of the medical profession, has been received for publication.

SIR,—The nature of the war has made it clear that a considerable degree of peacetime reconstruction of all kinds will be inevitable, and the Government have already recognized this by the appointment of a Cabinet Minister to inquire into some of its aspects. Medicine will unquestionably be affected, and we feel that serious consideration should be given now to its future needs. There are many signs that the younger doctors in the country appreciate this, and it is our aim to collect and co-ordinate their thoughts so that they can be clearly stated at the proper time. We are aware that the B.M.A. have set up a Planning Commission, and other bodies have set up committees with similar purpose, but we feel that there need be no conflict. While we wish to emphasize the views of the younger half of the profession, we also hope to enlist the sympathy of many of our seniors, and will welcome their support and criticism.

Three Guiding Principles

We therefore invite all who agree with our guiding principles to join us. Our principles are three:

1. In assessing the past, and in planning the future, we will proceed by scientific methods. We will collect all available evidence, we will believe according to the evidence, and we will admit ourselves wrong whenever we are shown to be so by the evidence. So far as is humanly possible, we will examine all proposals (and the evidence on which they are based) without prejudice. We will give to tradition and custom their due weight, but not more than their due weight, and we will not disregard a thing merely because it is old, nor regard a thing merely because it is new. By so doing we hope to avoid unseemly squabbling and makeshift compromise, and at the same time achieve a high degree of unanimity.

2. We regard committees, congresses, and meetings as valuable for exchanging ideas, but of much less value for scientific research, executive work, or practical planning. Our decision is reinforced by the practical difficulties of geography and transport, which make such meetings impossible at the present time. Our proposed plan of campaign, outlined below, enables all who care to do so, including doctors serving in the Forces at home or abroad, to express their considered views, and the reasons behind their views.

3. The first consideration of all planning and proposals must be the maximum benefit of the maximum number of patients. The second consideration must be the conditions of work of those who serve the patients (doctors, nurses, lay administrators, almoners, technicians, etc.). Where these two clash, the first must have precedence. But, unless both are considered, the first will be nullified.

Since we wish to press our claims on their merits as objective, scientific, and practical proposals rather than as having the backing of so many thousands of supporters, we invite only those who are prepared to co-operate *actively* to join in our research. Co-operation can take either or both of two forms. We give below a list of subjects which we propose to consider. Any member may choose one or more of these subjects and prepare a draft report (giving a summary of the present situation, together with his proposals for the future). The time allowed for this preliminary drafting will be three months. It is hoped to have at least three *drafting members* reporting on each subject, and on the major subjects considerably more. When the drafts on each subject have been received, they will be collated, and a single "preliminary" report prepared. The work of collating will be carried out by an editorial group composed of the signatories of this letter and any who will volunteer to join them. Each of these preliminary reports will be submitted to *all* members for comment and criticism. The criticisms and comments will be studied, and wherever they are an improvement on the preliminary reports they will be embodied. Thus a series of final reports will be prepared, and we hope to issue these as a book. When this stage is reached our task will be ended.

Ordinary or critical membership is open to all. It is intended that in most cases drafting membership will be for any doctor or dentist who has been qualified less than twenty-one years; or for any final-year medical student, nurse, lay administrator, almoner, dispenser, hospital technician, or other person interested in or connected with our health services who is not over 45 years