

RECENT ADVANCES IN HOSPITAL CARE

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In defining major injuries, I suggest that the word "major" refers not to physical size, but to the importance in terms of function and life. A person who has suffered major injuries may walk in, as I have seen a youth walk in, looking a little pale and with a ruptured duodenum, spleen, and liver. He did not feel very well and he wanted a check-up. Those are gross injuries, truly major. But I also want to deal with some much smaller, in apparent importance, very often misleading but nevertheless carrying a great danger to life or to function.

I think the advances in hospital care have come in four fields. Burns treatment and rehabilitation will be dealt with by subsequent speakers. I intend to deal with resuscitation, which must be preliminary to the fourth great advance, the recognition of the role of the largely mechanical processes of exploration, excision, suture, and grafting, in dealing with wounds and injured tissues.

Resuscitation, as we now know, is in many cases a matter of replacing missing blood. Oligaemia following severe injury is the most important single factor in most cases. About twenty years ago the work of Grant and Reeve (1951) showed that far more blood was lost than was generally appreciated. Their work was done largely on open wounds of the limbs and they were able to equate the amount of injured tissue with the amount of blood that had been lost. Since then, further work has been carried out and this has underlined the immense blood loss that can take place in the case of closed injuries. We have relied to a large extent for our basic facts on measurements of blood volume by radio-active methods and then we have learned to estimate the amount of bleeding from the degree of swelling. In a not very severe injury of the ankle, for example, there is about half a litre of swelling; if one measures the blood volume at the same time, one finds that it is reduced by about the same amount. In a fracture of the tibia, again obviously a little puffy round the ankle and perhaps a little swollen higher up (with a support behind the calf it is not easy to be sure) but measurement will show that the swelling amounts to one litre. It is not necessary in isolated injuries of this order of severity to replace that missing blood. But with fractures of the femur with much greater degrees of swelling, the amount of blood

lost into the injured tissues is of the order of two litres and sometimes more, and in fracture of the pelvis the loss may be greater still. With injuries of main vessels and vascular organs within the trunk, immense quantities of bleeding may occur. It is important to realize that one serious injury such as this may require a blood transfusion to stave off shock and more particularly to allow resuscitation to be followed by surgical repair; but we must not forget that a number of relatively mild injuries may occur in combination, associated with a severity of bleeding of the same order as with one single injury.

The importance of arresting haemorrhage and providing blood to make good the deficit is twofold: firstly to save life, and secondly to allow surgical repair of the injured tissues. Ideally, we like to get patients before they have shown the clinical picture of shock; if they are in shock, we like to get them into really good condition before they are operated on. But with many closed injuries, particularly of the trunk, it may be necessary to operate on a patient who is as yet incompletely resuscitated. The most one can hope to do in some cases is to keep pace with continuing bleeding; even with two and three transfusions going at the same time one may not be able to make up for previous bleeding until the bleeding point is found. It may thus be necessary to open the abdomen of somebody whose condition is far from ideal in order to deal with the bleeding point, and then enable transfusion to overtake loss.

The other type of shock of great importance after serious injuries follows injuries of the chest and may or may not be associated with haemorrhage. A severe blow on the chest wall, whether on ribs or sternum, interferes with the stability of the chest and with the normal pressure changes within the chest; air is exchanged perhaps between one lung and the other instead of between the lungs and the atmosphere. The lungs themselves may be bruised, interfering with the passage of blood through them from one side of the heart to the other. Furthermore, the normal sucking effect of intrathoracic pressure changes (particularly the fall during perspiration) on the great veins returning blood to the heart is impaired. The heart becomes starved of blood and even though there may have been little or no bleeding the blood pressure falls and the patient's general condition deteriorates, with a full-blown clinical picture of shock. Bleeding is, however, often present and may be very serious indeed. The intercostal vessels can be torn and lead to haemothorax, and the lung itself may be torn with pneumothorax. The lung, already embarrassed by abnormal pressure changes, collapses and there may be obstruction of the main airways by blood or vomit, cerebrospinal fluid, or retained secretion. Much can be done by relatively simple mechanical measures to put right these

defects. Stabilize the chest wall by direct surgical attack upon the fractures or perhaps by applying a form of traction to the ribs. If necessary expand the lungs by removing blood and air, and also enable the lungs to regain their function of gaseous exchange by clearing the airways. This may mean simple suction, or tipping and coughing, or it may mean bronchoscopy or tracheotomy. All these things may have to be done at short notice and in rapid succession.

Now these problems in isolation are difficult enough, but they may be associated with injuries elsewhere. Quite apart from the damage I have mentioned in the chest there may be damage to the heart, haemopericardium or severe myocardial bruising that mimics cardiac infarction and can of itself lead to profound shock. We have seen one or two cases of small ruptures of the heart after closed injuries of the chest associated with other severe injuries. When there are other injuries the problems can be mitigated rather than solved in many instances by mechanical treatment of the chest. That will at least restore respiratory function and help to improve the circulation, but great difficulty is experienced in deciding how to manage, say, the possible abdominal injury that is all too often associated with severe injury of the chest. When the abdomen alone is injured, or when the other injuries are trivial, we have no hesitation in exploring it on suspicion. But when the chest is also injured the abdominal signs present may be simply signs referred from the chest or they may be the signs of abdominal injury. Opening the abdomen of such a patient may reveal important lesions that can be treated, it may on the other hand merely confirm that the abdominal signs came from the chest; such unnecessary exploration cannot aid the patient's chance of survival. These are the problems we have to solve in hospital: we want the patient as soon as possible, and let us worry about the rest.

Another major injury, dangerous to life and sometimes large in extent, is the severe head injury. Much has been done in recent years by good nursing, early tracheotomy and care of the respiratory tract, and the use of hypothermia to increase the rate of survival after head injury. In 1950, at the Accident Hospital something like two thirds of the victims of severe head injury died. In 1958, something like two thirds of the victims of severe head injury survived. But we have noticed that the survivors in 1958 included people permanently crippled in mind and body, whereas of the survivors in 1950 almost all recovered fully. These again are the problems that have to be faced, and, if possible, solved by the hospital side of the general medical field. We cannot foretell at the outset whether a patient is going to merely survive or whether he is going to recover com-

pletely. But again prompt attention to the airway, prompt transfer, resuscitation, and, if necessary, surgery are the basis of success when success is possible.

I want to turn from these truly major and dramatic injuries to others small in extent but often large in importance. It is well known that, provided a patient survives, a wound—a breach of tissues—has an innate capacity to heal. The healing process may be slow and may be embarrassed by infection, foreign material, or actual loss of tissue leaving a wide gap to be spanned by the healing process. In the old days the treatment of wounds was largely a matter of applying something intended to improve the prospect of healing but not always realizing the intention. The role of surgery was largely restricted to draining infection, removing foreign and septic material, ligating arteries, and all too often amputating limbs. Then with the advance in antisepsis and asepsis, and the arrival of antibiotics, the scope of surgery in repair became greatly increased and more widely appreciated. Leriche (1939) regarded the knife as the best antiseptic, and I think that is still true, and in some way, even more true than when he said it. The ideal wound healing is seen with clean surgical incision, carefully closed layer by layer, in which the healthy tissues are brought together so that only the very narrowest cleft exists between them. This can easily be spanned by the healing process and with luck there will be no infection, there will be no slough, no foreign material, no space to be bridged by the healing process. As surgeons—to some extent “tissue mechanics”—our task is to reproduce as often as possible and as quickly as possible the circumstances of the ideal clean surgical wound. We must remove dead and damaged tissue and foreign bodies; we must find out just what has been damaged and what we can do about it. We must seek to close the wound by suture or by grafting of one kind or another, and the sooner we can close it the better the chance that infection will be shut out.

The first thing needed is a clear diagnosis, but perhaps even before that one needs suspicion, for many wounds and other injuries, apparently trivial at first sight, may be of grave significance, and this applies particularly to wounds that may have penetrated. A recent paper (Guthkelch, 1960) on apparently trivial wounds of the eyelids showed clearly how much damage can be done. Radiography may be of extreme importance, revealing fractures or foreign bodies, and at one time or another such foreign bodies as a car door-handle in the head of a child, a cannon shell in the nasopharynx of a soldier, and several inches of screwdriver blade deep in the lower end of the femur, have been found under apparently trivial and sometimes neglected wounds. Only quite recently the medical

press reported the case of an apparently trivial abdominal injury in which the patient subsequently died of peritonitis. The various layers of the abdominal walls had slid across each other since the time of injury and immediately under the skin was apparently intact tissue. Penetrating, or possibly penetrating, wounds over the body cavities or in relationship to joints, and also on the hand require careful thought and may require formal surgical exploration with full facilities in a properly equipped operating theatre and, of course, under anaesthesia. The process of exploration is designed to demonstrate the full depth and extent of the wound. A probe is no substitute, nor is a finger; it may give a general idea of the size and direction, but it cannot give a clear idea of just what is there. In injuries of the scalp, for example, a probe may help in detecting a ridge or irregularity in the underlying bone; if x-ray examination has already been omitted by any mischance it should certainly be carried out at this stage. Depressed fractures may penetrate the dura or venous sinuses; if they are open they all too often have fragments of hair or hat or other foreign materials trapped in them, and only by early exploration and excision can the risk of meningitis, encephalitis, or thrombophlebitis be mitigated.

In septic wounds the surgeon's task is just as important, and again the knife, if not the most valuable antiseptic, is an extremely valuable one. One seeks again to remove dead and damaged tissues and to bring together healthy surfaces whenever possible. Secondary suture may be appropriate, but because there may have been considerable loss grafting is often the best way of achieving closure when the elasticity of the tissues is impaired. The value of antibiotics is debatable, particularly for fresh clean wounds properly treated, but I have a growing impression that with the right sort of surgery in favourable circumstances antibiotics and antibacterial drugs in general may be largely unnecessary for fresh injuries, particularly clean cut ones. In septic wounds they are extremely important provided they are correctly used. The antibiotics are not a substitute for surgery but a supplement to it. They should prepare the wound, or the patient, for the mechanical process of cleansing and closing the injured part. The use of antibiotics should be based on up-to-date bacteriological knowledge and on the state of the wound, and the correct one should be given systemically for spreading infection or applied locally as an immediate preliminary to surgery in localized infection.

Finally, a few words about some other injuries minor in extent, but major in importance. Wounds are breaches of tissue and they may or may not include breaches of the skin. A painful, swollen finger may merely have been sprained, but if one tests the stability of the joint it may show quite a lot of side-to-side movement. It may be

possible to do this without local anaesthesia, but general anaesthesia may be needed with larger joints, and radiography shows decisively that a good deal of rock can be produced. A troublesome injury of this kind affects the metacarpophalangeal joint of the thumb; it may be possible to swing it sideways, and at operation the ligament on the post-axial side of the joint may be found to be extensively torn. The ligaments may be tucked in to the joint or they may be curled up and a long way from each other. They will heal ultimately but on the one hand the scarring that constitutes healing may bind the joint together and cause permanent and severe stiffness, while on the other hand the scar may subsequently stretch and leave this important joint weak, thereby impairing the strength of the pinch grip. Another reason for caution in these mild injuries is the possibility that the joint has been dislocated. Some of these dislocations are reduced spontaneously or by a bystander very shortly after they have occurred, but whether a dislocation is suspected or not, x-ray examination is needed, both before and after reduction in appropriate cases. For example, an apparently simple dislocation of the finger seen after spontaneous reduction would be painfully swollen and easily dismissed as only sprained. Without radiography one would miss a tell-tale flake of bone. In such a case there is a gap in bone and also in capsule and ligaments, a gap furthermore that extended through the soft tissues round the tendons through the tendon sheath. To leave the flake of bone there is to invite the formation of a large mass of scar that will permanently stiffen the finger and most likely resist any form of surgery or physiotherapy. Restoring it to its rightful place closes the gap in the tissue, closes the internal wound and enables satisfactory or even perfect function to be restored.

These principles apply also to injuries of the knee, the shoulder and the hip joint. Careful clinical examination should establish not only that injury has occurred but should seek to establish whether there has been a major rupture of ligaments as in one case where the meniscus was lifted up still attached to the femur but torn off the tibia together with ligamentous and muscular tear extending about half way round the joint. These are the injuries that can be treated by surgery, and it is a recognition of the role of surgery, tissue mechanics, in the care of these injuries that has represented one of the great advances in hospital treatment during the last few years. Much depends on diagnosis, and much of diagnosis depends on suspicious awareness that these injuries may have occurred, and appreciation of what can be done to treat them very often successfully. What we ask, and what we need if we are to do these things as successfully as we can, is to receive those patients

alive, if possible not in shock, with their wounds adequately covered and splinted, and without too much morphine.

REFERENCES

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DISCUSSION

A. J. Laidlaw, L.R.C.P., L.R.C.S. (*Worcester*): I agree with Mr London that surgery is a more useful defence than antibiotics against infection. This is particularly important nowadays because antibacterial drugs especially in hospital are in many cases losing their effect. I would like to have had his views on mouth to mouth breathing, and the use and abuses of the Brook airway mentioned by Dr Leak. Mr London rightly showed the importance of being suspicious in all accidents, and this should be emphasized not only to consultants, general practitioners, and casualty officers, but also in particular to the casualty officer's deputy. For in many cases he is the first doctor to see the case, and is frequently not at all interested in casualty work but may well be a resident from the skin, psychiatric, or gynaecological department. There have been many remarkable advances in accident care in certain hospitals, like the highly organized and efficient one mentioned by Mr London, and this appears to be the kind of hospital that has found the solution to many of the accident problems. The recently published report by the Nuffield Trust under the chairmanship of Dr Fry is certainly a most sobering and realistic report and shows that the casualty services of the various hospitals are not only in many cases decades apart, but quite often are living in different worlds. While the highly organized Accident Hospital is at work with its new techniques, we must remember that in many hospitals the x-ray department is on duty only in office hours, and although in theory someone is on call they may rarely be called. The medical profession would do well to watch with great care, perhaps forbid in some cases, the examination, treatment, and discharge of patients by nursing staff without a doctor having been called. In some instances this occurs even when the general practitioner has sent a letter, and sometimes the nurse follows up the case herself.

I enjoyed Dr Leak's contribution, and as a fellow general