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ARTERIAL ANEURYSM FOLLOWING INJURY TO ILIAC VESSELS REPORT OF TWO CASES, WITH A COMMENTARY ON LARGE TRANSFUSIONS

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The cases recorded below have several points of interest in common. They are examples of arterial aneurysm following war wounds; they involved in each case ligation of more than one iliac artery; the operations were accompanied by profuse and rapid haemorrhage, to combat which profuse and rapid transfusion was necessary; recovery of life was undoubtedly due to the promptness and completeness with which the blood loss was made good, and recovery of the limb, in the second case at any rate, to the application of the principle of physiological sympathetic release. Both patients were treated in the Eastern Command—one at a military, the other at an E.M.S., hospital.

Case I: Aneurysm of the Buttock. By H. Agar

During the night of Sept. 3, 1942, Gnr. W. J., aged 29, was wounded in the right buttock by a mortar-bomb splinter. He bled considerably and was unable to walk, and lay in the Desert until found by the Germans next day. Dressings were applied until three weeks later, when he reached hospital in Italy, where the wound was explored superficially without an anaesthetic. The patient was not told of any unusual feature. By December the wound had healed and he could walk with a limp, but a swelling about 2 in. in diameter remained. He was transferred to a prison camp, but soon the leg began to feel heavy and he was admitted to hospital. He reports that a diagnosis of aneurysm was made. In Aug., 1943, the buttock rapidly increased in size and became painful. Thereafter he was bed-ridden and had to lie on his left side with the right thigh flexed. There was further enlargement with increase of the pain in June, 1944, and afterwards he could not extend his right thigh.

He was repatriated and admitted to a military hospital on Oct. 11, 1944. He looked ill and the right buttock was painful. It was enormously enlarged, projecting about 4 in. beyond the left, and the skin over it was tense and buff-coloured. It was impossible for him to lie in any position other than on his left side with the right thigh flexed. Palpation revealed extreme tenderness, and a little pulsation could be detected at the periphery. There was no bruit. The thigh could not be moved more than 5°. The muscles of the thigh and leg were wasted but not paralysed, and sensation in the limb was normal. Blood count: R.B.C., 3,280,000; Hb, 62%; C.I., 0.95; W.B.C., 24,800 (polymorphs 85%, lymphocytes 10%, mononuclears 5%, eosinophils and basophils *nil*). Wassermann reaction negative. Radiography did not show any bone defect and the lung fields were normal. There was evening pyrexia up to 99.6°. Aspiration in two places revealed fresh blood under pressure but no old blood.

During the next week pain and pyrexia increased and the haemoglobin fell to 40%. The foot became anaesthetic, with paralysis of both flexors and extensors of the leg, which showed impaired response to faradism.

The differential diagnosis appeared to lie between sarcoma—that on which he was repatriated—and aneurysm. Points in favour of sarcoma were the late appearance of the swelling after wounding, the huge size and preponderantly solid consistency of the tumour, the brown discoloration of the skin, and the small amount of pulsation that could be detected. Those supporting aneurysm were that the enlargements had occurred at intervals, that radiography revealed

no bone destruction and no metastases in the lungs, and that aspiration had disclosed blood under pressure in two places.

It was decided that operation alone could help the patient. After three pints of packed red cells and two pints of whole blood had been given in three days, the haemoglobin rose to 70%. Although he had a temperature of 103.5° on the day of operation, it was decided to proceed. Anaesthesia was induced by 10 c.cm. of 1/1500 spinal nupercaine, given with the patient on the left side, and supplemented by inhalation gas-and-oxygen. The right external and internal iliac arteries were exposed retroperitoneally and tapes passed round each. A long incision was made across the buttock in the direction of the fibres of the gluteus maximus, which were pale in colour and did not bleed. They were separated carefully, but there was a sudden gush of both fresh and old blood. The cavity was fully opened and packed. Blood pressure fell immediately to 70 mm. systolic, but three pints of blood, given rapidly, produced considerable improvement. The arteries were controlled, but severe bleeding recurred when the pack was removed. Rapid exploration revealed bare bone near the sacro-iliac notch and that most of the bleeding came from that region. The wound was repacked, the right internal iliac artery was tied, the right external iliac released, and the left internal iliac artery exposed retroperitoneally and tied. This greatly reduced the bleeding, but it was not possible to stop it altogether. The wound was finally packed and the patient returned to the ward with a pulse rate of 130 and a systolic blood pressure of 70, 14 pints of blood and 4 of plasma having been given during the operation.

Blood drip was continued, and after two hours the pulse rate was 120 and the blood pressure 130/80. The circulation in the right leg was noticed to be deficient, and in spite of keeping the limb cool there was early necrosis of skin over the tendo Achillis and os calcis as well as of all the toes. A further two pints of blood and two of plasma were given by drip during the 24 hours following operation.

After 36 hours his condition was deteriorating and a foul-smelling discharge from the wound was observed. Under gas-and-oxygen anaesthesia it was reopened and gas gangrene of the remnants of muscle and laminated aneurysmal wall was revealed. A large amount of necrotic muscle and capsule was removed. The deep part of the pack was not disturbed, but the rest of the wound was left open. Penicillin was given by continuous intramuscular drip at the rate of 15,000 units three-hourly for seven days. During the second operation it was noticed that the circulation in the leg improved when the hip was flexed. Thereafter the thigh was gradually extended over several days and the circulation remained adequate. The pack was removed on the seventh day without any recurrence of bleeding. At the same time some slough was removed from the surface of the deep muscles, and secondary suture was successfully performed on Dec. 22, 1944.

By February most of the slough had separated from the heel; some superficial necrosis of the os calcis was revealed by radiography, but the bone was covered with healthy granulations. There was full and controlled movement of the knee and sensation in the leg was returning, but the muscles below the knee reacted only to galvanism. Abduction and hyperextension of the hip were limited. In spite of persistent daily efforts to maintain full movements of the toes and ankle, all joints have gradually stiffened and dorsiflexion of the ankle beyond 90° is not possible. This suggests that fibrosis has occurred in the muscles of the leg, probably as the result of the post-operative ischaemia.

The treatment demonstrated the importance of giving sufficient blood before, during, and after operation. In spite of having 27 pints in four days there was no reaction. It is satisfactorily shown that ligation of both internal iliac arteries can be performed without anxiety for the circulation in the rectum and pelvic organs, and there was no evidence that it was a factor in reducing the circulation in the limb. The efficiency of penicillin together with adequate surgery in the treatment of gas gangrene is well shown, as no serum or other treatment was given. The rapidly increasing anaemia and pyrexia, which were difficult to explain before operation, were probably due to infection in the wall of the aneurysm.

It is intended to apply small Thiersch grafts to the heel and replace them later by a pedicle flap in the hope that it will withstand weight-bearing. Should it fail, a below-the-knee amputation will be considered, although the limited control of the hip-joint will weigh heavily against such a decision.

I wish to express my thanks to Lieut.-Col. T. Scott-Law, R.A.M.C., for permission to publish this case.

Case II : Retroperitoneal Aneurysm. By John Rowlands

This patient, Lieut. U. M., a German prisoner of war, was wounded at 14.00 hours on Feb. 8, 1945. He appeared to have been hit by a bullet which entered on the lateral aspect of the right buttock and emerged from the left flank at a slightly higher level. His condition on arrival at a field surgical unit was poor, but his abdomen was soft and tender. He was given two pints of blood and one of plasma, after which laparotomy was performed (30 hours after wounding). The operation notes state that there was an extensive retroperitoneal haematoma "everywhere," but that no perforation of bowel or mesentery was found, the bullet having apparently passed behind the base of the mesentery. Routine post-operative treatment was given, and the patient was evacuated as a lying case on Feb. 19.

On arrival at a British general hospital two days later he was found to have a distended abdomen and a large mass palpable in the pelvis. His temperature was 99.6°, but his general condition was satisfactory. He had paralysis of the anterior group of thigh muscles on the left and some anaesthesia on the inner side of the thigh.

He was seen by Lieut.-Col. McArdle, Neurological Adviser, who reported complete paralysis of the left quadriceps group, a flicker in the abductors, and good contraction in the hip flexors. The anterior and posterior tibial muscle groups were normal. There was complete sensory loss over the distribution of L 2 and 3 roots, and marked impairment over the sensory area of L 4. The knee-jerk was absent. He bent the hip to 30° with the knee flexed. The recorded diagnosis was a lesion of the upper roots of the lumbar plexus—complete of L 2 and 3 and partial of L 4.

He was evacuated to England, and reached an E.M.S. hospital on March 4. He was in fair general condition, but looked thin and pale and slightly jaundiced. He complained of thirst and of inability to keep down solid food, and said that his bowels, previously regular, had not been opened for five days. The laparotomy wound and the small entry and exit wounds were well healed. On the left side of the abdomen a large mass could be seen, which seemed to be rising from the left side of the pelvis, but no pulsation was visible. On palpation it appeared to be about the size of a foetal head. A thrill was present and a well-marked systolic souffle could be heard. The paralysis recorded in his Army notes was still present, and, in addition to the physical signs there described, there was complete absence of pulsation in any of the great vessels of the left leg: there was no venous congestion of the leg, but a few dilated veins could be seen over the upper part of the thigh and the side of the pelvis.

The patient complained of pain on any attempt at extending the hip, which was held in flexion, but was unaware that he had sustained a severe hot-water burn on the inner thigh. After an enema he passed a good constipated motion with no blood or pus. Examination of the rectum revealed no abnormality. The urine was normal. A blood count showed 3½ million red cells per c.mm., 56% haemoglobin, and 14,350 white cells per c.mm. with 80% polymorphs. A straight radiograph showed no bony injury. An intravenous pyelogram and barium enema were carried out in an attempt to define the tumour; the ureter could not be seen, but the iliac colon was observed to be displaced forwards and medially. A provisional diagnosis of "a leaking perforation in the external iliac artery with a gradually increasing retroperitoneal haematoma" was made.

On March 9 two pints of fresh blood were given, and though the patient's general condition improved after the transfusion it was clear that the abdominal swelling was increasing in size. Major-Gen. Ogilvie saw the patient in consultation on March 13, and performed laparotomy on March 15, six weeks after the injury.

The abdomen was opened through the old paramedian incision, which was considerably lengthened. A large retroperitoneal tumour was seen to occupy the whole left side of the lower half of the abdomen. The colon and small intestine were displaced towards

the midline. The abdominal aorta in its lower half and the origin of both iliac vessels were covered by the tumour. The aorta was exposed by dissection at the upper margin of the tumour, on the body of the second lumbar vertebra, and found to be slightly displaced to the right; it was isolated, and a tape was passed behind it to allow digital compression to be applied.

The tumour was then opened by a wide curved incision one inch outside and parallel to the displaced iliac colon, while the aorta was compressed by an assistant. A large quantity of fluid blood escaped, after which several handfuls of clot were scooped out, exposing a large cavity with an endothelial lining. At this point the vertical laparotomy incision was extended by a transverse one running outwards from its mid-point. On dissection in the inner wall of the cavity towards the pelvic brim, a rent was seen on the lateral aspect of the internal iliac artery just below its origin, from which copious haemorrhage took place as soon as digital compression of the aorta was released. This rent was closed above and below by silk ligatures, but so near was it to the origin of the vessel that its upper end could not be properly controlled, even though three successive ligatures were applied. The tear could be excluded by a haemostat placed obliquely without shutting off the passage of blood from the common to the external iliac arteries, but the alternatives that then presented themselves, of attempting arterial suture of a lateral opening in a large vessel already considerably traumatized or of returning the patient to bed with the haemostat in position, seemed to carry greater danger than ligation of the vessels. The common, internal, and external iliac arteries were therefore ligatured, and the haemorrhage satisfactorily controlled. The lumbar plexus was not inspected. The cavity was lightly packed with vaselined gauze and drained with a strip of corrugated rubber—gauze and drain being brought out at the lateral end of the transverse incision. The posterior peritoneum was closed over the operation site, and the abdominal incision was sutured in layers. During and immediately after the operation 5½ pints of stored blood and 1 pint of fresh blood were given.

The condition of the patient on his return to the ward was satisfactory, though the left leg felt very cold. When consciousness was recovered, sensation in the limb was present apart from the previous areas of anaesthesia. There was slight bluish discoloration of the big toe and medial side of the foot for the first 24 hours only. The blood pressure rose steadily, and 24 hours after operation was 178/135, but there were no signs of circulatory overload.

Subsequent progress was satisfactory. The laparotomy incision healed well. The drain was shortened in 48 hours and removed on the fourth day, and the vaselined gauze was taken out in stages during the first week. There was some distension and hiccup during the first 24 hours, but thereafter distension decreased rapidly and the bowels began to move. The leg became warmer, and pulsation was recognizable in the tibial vessels after 10 days. A small collection of pus presented at the drainage opening 18 days after operation; a penicillin-sensitive *Staphylococcus aureus* was grown on culture, and the infection yielded rapidly to a short course of penicillin. There has been no improvement in the power of the paralysed muscles, but sensation has returned over the area supplied by L 4. Exploration of the lumbar plexus in the line of the track may be undertaken at a later date.

I should like to thank Col. W. L. Watson, O.B.E., I.M.S., for permission to publish this case.

Commentary on the Above Cases. By W. H. Ogilvie

In each of these patients the surgeon was faced, during the course of the operation, with haemorrhage at a rate with which transfusion could not possibly keep pace, and the only way to avoid an immediate fatal issue was by applying a temporary packing and interrupting the operation till the circulatory volume had been restored to a reasonable level. In the first case the injured vessel, which lay deep inside the pelvis, was never in view, and during alternate search and resuscitation the patient received an amount of blood that exceeds that in any report of which I have knowledge. In the second case the tear in the artery was soon defined, and, after some tentative ligatures on the origin of the internal branch, finally arrested by ligature of the common, internal, and external iliac arteries.

In each patient the affected limb was left uncovered outside the bedclothes at room temperature, while the body and the other limbs were warmed under an electric cradle. The vasodilatation obtained in this way probably exceeds that following injection or resection of the sympathetic chain.

In the first case, in which both internal iliac arteries were tied, the pelvic organs, which should have suffered maximum deprivation, did not give any evidence of damage. The heel, on the other hand, supplied by the external iliac artery which was not tied, showed arterial gangrene. This mishap was

apparently caused by spasm or actual mechanical obstruction of the external iliac and femoral arteries when the limb was straightened on return to bed. The vessels had probably become shortened by prolonged flexion of the thigh during the period when the patient was bed-ridden, and the events indicate the necessity for gradual change in position after a limb has been held in an unusual attitude for a long time.

In the second case the nutrition of the limb never seemed to be in danger, even though not merely all the iliacs, but the epigastric anastomosis which forms the most obvious collateral channel, had been tied. The compensatory circulation must have been by blood entering the ligatured internal iliac through anastomoses with the lower lumbar arteries, the middle sacral, and the branches of the opposite internal iliac artery, and passing into the external iliac and femoral arteries through anastomoses between the ilio-lumbar and the deep circumflex iliac, the gluteal and the external circumflex, the obturator and internal circumflex, the sciatic and the superior perforating, and the internal pudic and the deep external pudic.

The most striking advance in surgery during the last four years is, without question, the progress that has been made in the use of whole blood. Improvements in operative technique have allowed us to do many things a great deal better than we used to do, sometimes with half the mortality. The sulphonamides and penicillin have increased the cure rate in venereal disease and allowed the early closure of war wounds in a high proportion of cases and with greater certainty than was formerly possible. But blood, used in the quantities and at the speed that we have been taught to use it, has introduced a new therapeutic principle, allowing us to save useful lives that have never been saved before. Without the provision and adequate administration of large quantities of blood a man with an injury to a large artery will certainly die; with it he can recover, and recover with perfect function. Loss of blood is not, like loss of any other tissue of the body, irreplaceable: bone and skin defects can be compensated by borrowing from other parts of the body, but the result is a good repair, not a normal restoration; blood, though it is the fuel of the corporal machine, is not an individual tissue, but one that can be replaced in any quality and quantity from a well-equipped filling station. Injury to an artery is not, like injury to any other structure, irreparable: for whereas muscles and nerves are unique, an artery is one of many alternative channels, the remainder of which will take over and supply the same areas with the same substance when one is gone.

Yet there seems to be a temperance campaign against blood, as if it were a fluid as disreputable and as liable to abuse as beer. We are constantly told that it is used too often and in too great quantities, never that it is used too seldom and too timidly. Articles without number are written about the dangers of blood, about Rh factors and reactions; none about the thousands of men who are alive to-day only because blood was ready for them as they came out of battle and given courageously. Post-traumatic anuria is discussed in every journal, the writers taking the line, "We can't prove that transfusion was responsible, but it looks mighty suspicious": the more rational interpretation—that "the patients who developed an anuria were men who had been in severe shock of sufficient degree to produce a relative renal ischaemia and that this ischaemia was maintained for sufficient time to cause a large amount of kidney damage,"* that is that the men developed anuria not because they were given too much blood but because they were given too little or it was given too late—though one widely held by forward surgeons, is apparently suppressed as running counter to the views of the haemophobes.

It is often said that few patients need more than three pints of blood; it would be truer to say that patients who need only three pints of blood do not need blood at all. A loss of two pints can be made up by fluid administered by mouth. A loss of three pints can be remedied reasonably well by transfusion of plasma. A loss of even four pints need not end fatally if the volume is restored fully and promptly by plasma, though with a haemorrhage of this extent some at any rate of the replacement should be by blood. But when not only is the blood loss considerable but further considerable loss is

expected, it is necessary to have large amounts of reliable blood ready for immediate administration. And this means a blood bank. To rely upon a group of donors, however ready they may be, is to court failure in cases where large amounts of blood could really save life. For no haemorrhage, however profuse, need be fatal if the rent from which it is pouring can be stopped. Blood loss, even from a vessel the size of the common iliac, can be stopped by packs and firm pressure; and though transfusion cannot possibly keep pace with the loss while bleeding is going on, the blood can be run in at the rate of a pint in two minutes by using both arms simultaneously, and the circulatory volume can be restored while the surgeon presses the pack in position, ready, at a signal from the transfusion officer, to remove it and make another attempt to control the bleeding hole more permanently.

Blood transfusion has undoubtedly got its dangers, but they are for the most part associated with the giving of blood to those who are gravely ill and who have been repeatedly transfused over a long period. Good blood prepared by a good transfusion service, and given by a good transfusion officer who can detect a doubtful bottle at sight and stop an incompatible transfusion at the first sign of reaction, seems to have no dangers in the type of massive post-traumatic haemorrhage in which it offers the only means of saving life.

CUTANEOUS SCHISTOSOMIASIS INVOLVING S. HAEMATOBIIUM EGGS

BY

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Although the eggs in human schistosomiasis are deposited chiefly in the bladder and bowel, they are known to occur elsewhere, and may be found in organs drained by the systemic system. Deposits of the eggs of *Schistosoma haematobium* in the lungs, brain, spinal cord, heart, and kidneys are well recognized, and are mentioned in the textbooks. Deposits in the skin have, however, rarely been recorded in the literature, and are not referred to in the standard textbooks. Madden (1919) described deposits of eggs in the subcutaneous tissues, especially in the perineum, but also in the "bathing-drawers area" and rarely elsewhere, giving rise to fibrous nodules. He pointed out a resemblance to tuberculous subcutaneous nodules in the earlier stages, and continued as follows: "These nodules, or chain or irregular collection of nodules, are at first hard, then gradually enlarge and soften, and ultimately burst through the skin and discharge a thick dirty cheesy material and persist as a sinus, or as a fistula in more or less free communication with an adjacent organ or mucous surface." Girges (1934), in an account of the various sites affected in the case of *S. haematobium*, says: "Small, deep-seated, separate, multiple, elevated, dark-coloured deposits occur in the subcutaneous connective tissues in the perineum, penis, and scrotum, over the sacrum and coccyx, and particularly over the pubis, forming hard nodules closely resembling tuberculous glands. They may grow and become adherent to the skin, soften and open to the exterior, forming sinuses," which "are not as a rule connected to the neighbouring viscera." Garcia *et al.* (1940) described the case of a Filipino child with a chronic ulcer of the leg, sections of which showed the presence of *S. japonicum* eggs. The present paper describes two cases of schistosomiasis which developed a distinctive skin lesion, from which eggs of *S. haematobium* were recovered by aspiration, identical with those seen in the stools and urine in the course of investigating 130 European cases of schistosomiasis admitted to a West African general hospital in 1944. Two other cases are included because they had similar lesions, although ova were not recovered from the skin.

Case I

A British N.C.O. aged 21 had bathed in a freshwater lagoon in Southern Nigeria every day for five weeks from Jan. 23, 1944, in the course of training for jungle warfare. He frequently had to leave the water because of skin irritation, and had periods of itching during the nights after bathing. The itching affected his whole body, but was worst on the legs. He remained well until March 12, when he

* R. A. Phillips, Rockefeller Institute of Medical Research: personal communication.