

the lung fully inflated along the line of the original incision and a large tube inserted through a separate stab incision and led into a jug of water.

The speaker then mentioned the various operations including cardiomentopexy, devised for the relief of cardiac ischaemia, and suggested that the general principles of revascularization would be important in the reconstructive surgery of war.

## Echoes of the Past.

### TWENTY YEARS AFTER.

By H. SKIPTON STACY, M.D., Ch.M.(Syd.), F.R.A.C.S.

*Honorary Consulting Surgeon at Sydney Hospital, Ryde Hospital, and Royal South Sydney Hospital.*

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#### IV.—GUNSHOT WOUNDS OF THE LIMBS.

##### CASE 1.—Wound of the Thigh with Injury to Popliteal Vessels.

*Clinical History.*—Nature of wounds : Multiple shrapnel wounds.

Signs and symptoms : Left leg : Wound of the heel with a piece of shrapnel in the os calcis. Wound of lower third of the thigh on the inner side, with oblique fracture of the femur and three small pieces of shrapnel in the vicinity. Right leg : Wound just below the patella leading to shrapnel in the inner femoral condyle; another piece just lateral to the same condyle, which had been furrowed on its lateral aspect by the missile. Next day was feeling well, but the left foot was mottled and bluish, circulation stagnant. Heel wound was smelling. Some gauze which had been plugged into the bone was removed. There were several bright red spots on the anterior aspect of the leg, which was slightly shiny and tense, especially in the anterior tibial compartment. It was evident from the condition of the foot that the femoral vein was blocked. (The foot was still warm, so was the leg.) As to the cause of the leg condition, there was a doubt whether it was not inflammatory (possibly from the septic wound of the heel, or from the small multiple skin wounds on the leg).

Operation : Under ether, with the aid of the radiographs, the shrapnel was removed from the condyle, the knee-joint being full of blood ; failed to find the piece on the lateral aspect. The wounds on the left thigh were enlarged, and a Carrel's tube passed through in front of the bone ; a Carrel's tube was also passed down the enlarged inner wound to the site of the fracture, where there was much blood-clot and contusion of muscles. Heel wound opened, but foreign body not found. Put on a Thomas' splint. Next evening, under ether, the thigh wounds were explored ; there was a

sloughy grey appearance of the wound in the muscle around the inner tube ; ? due to the pressure of the tube or ? gas infection of the muscle. As there was pus welling up from the depth of the wound, and the popliteal artery or vein had been injured, making it likely that the whole leg would become gangrenous, amputation was performed through the thigh ; the sciatic nerve was infiltrated with eucaïne 2 per cent beforehand.

Survival : The patient died shortly after.

*Post-mortem Result.*—Limbs : The amputated limb (comprising lower half of left thigh and left leg) was examined. The muscles cut through and those around the tube track were perfectly healthy, the sepsis was purely local around the tube. The femur had been stripped of its periosteum, and the surrounding muscles were much pulped by the trauma. The popliteal artery was cut clean across, a thrombus occupying the cut end of the upper portion ; the popliteal vein was distended and firmly thrombosed ; this condition persisted down the two posterior tibial venæ comites as far as they were traced. A small piece of shrapnel was discovered lying alongside the popliteal vein ; it would have been very difficult to find. Another piece was found on the medullary surface of the bone. The leg was incised over the anterior tibial compartment ; the superficial fascia was slightly œdematous, but the muscles were perfectly healthy. Left heel : The sepsis was purely local ; the wound smelled ; a piece of shrapnel in the os calcis, not very deep.

Comments : Every smelly wound is not due to gas infection ; the smell of gangrene due to vessel wounds is not to be distinguished from the other ; both are redolent of the post-mortem room. The lividity (which did not disappear on pressure) of the foot was due to the venous thrombosis and the arterial wound. What caused the bright red spots here and there on the leg ? I am not sure ; after the leg was removed they were not obvious. From the point of view of infection there was no need to take off the leg, but it appeared as if it would slowly become gangrenous from the vessel injury, judging from the foot ; and as the foreign bodies had not been removed from the thigh these wounds would have continued to suppurate with almost a certainty of secondary hæmorrhage. It was the fear of secondary hæmorrhage and prolonged suppuration that influenced the decision to amputate, but it was never expected that he would succumb to the shock ; but the operation with its accompanying exploration was unduly long in the performance.

In the anxious endeavour to do everything for this patient he was seen very frequently. Judgment often better with fewer visits.

### CASE 3.—Shock from Multiple Wounds.

*Clinical History.*—Nature of wound : Multiple wounds over the legs with much laceration of the thighs and of the hips. Left iliac bone was fractured ; slight retroperitoneal hæmorrhage.

Survival: Died shortly after admission. (Presumably shock; ? hæmorrhage.)

*Post-mortem Result.*—Chest: Lungs normal. Heart: Right ventricle and left auricle collapsed and empty.

Abdomen: No intraperitoneal trouble.

Limbs: Multiple wounds.

Comments: Cause of death, shock.

CASE 14.—Wound of Femoral Vessels. Hæmorrhage.

*Clinical History.*—Nature of wound: Gunshot wound, thigh. (Aerial torpedo.)

Signs and symptoms: Very pale, much shocked. Perforating wound through the right thigh about the apex of Scarpa's triangle; punctured wound of superficial femoral artery; complete tear of femoral vein (the two ends being one inch apart); wound of profunda artery.

Operation: Bleeding stopped under a general anæsthetic, during which he became very bad. Died a few hours later of shock and hæmorrhage.

Survival: Several hours.

*Post-mortem Result.*—Limbs: The exact information given above was only ascertained at the autopsy.

CASE 19.—Wound of Posterior Tibial Vessels with Infection.

*Clinical History.*—Nature of wound: Gunshot wound, knee-joint.

Signs and symptoms: Has a through-and-through wound just below the left knee-joint behind the tibia and fibula; through the outer wound some herniated muscle is protruding, distinctly offensive. On admission he was very pale and collapsed; left leg cold from the level of the wound down, moderately swollen. Right leg had several wounds, one in the lower third of the thigh, and another in the upper third of the leg. Has a wound also on the right side of the thorax. Next day still very pale, pulse 140, temperature 102.6° F., breathing not distressed; abdomen normal. No hæmoptysis. Left leg is still swollen; skin pale, no mottling; partial anæsthesia in the upper part, complete in the lower part; foot quite cold, but above the ankle the leg was moderately warm. Right leg not swollen or discoloured. The day after operation temperature 101.6° F., pulse 140. For the next five days he lingered on, with his temperature between 97° and 99° F., and pulse about 120; intensely pale throughout. Delirious the last few nights.

Operation: Under ether, owing to the offensive smell of the muscle, it was decided that there was gas infection, and amputation through the lower third of the left thigh (circular and without flaps) was performed. All the muscles cut through were perfectly healthy, although the superficial fascia on the inner aspect of the thigh was œdematous and slightly discoloured. Wounds of the right leg excised; no search made for foreign body. Given pituitrin and intravenous saline at the conclusion of the operation, but he

was very bad. Examination of the amputated limb showed a lot of blood-clot and fresh fluid blood in the track of the wound. It also showed both posterior tibial artery and vein to have been wounded; portion of the artery was shot away, and there was a small wound of the vein. The nerves were also injured. It was doubtful whether the anterior tibial vessels were injured or not. The muscle near the wound of exit was mushy, non-contractile and smelly; the blood-clot around it was also offensive. But apart from this the muscles looked healthy, except in the lower two-thirds of the leg where they were paler than normal (evidently the result of the vascular injuries).

Survival: Seven days.

*Post-mortem Result.*—Limbs: The muscles of the left thigh stump were offensive and brownish black on the surface; also to the depth of a quarter of an inch; the adductors were obviously infected for two inches up, then a sudden line of demarcation; above this the muscle was quite healthy. No crepitation or sign of gas, either superficial or deep. The superficial fascia was healthy looking. Right leg: The remains of the anterior tibial muscles (except the peroneus tertius) were pale and unhealthy looking; the whole exposed surface of any structures that were left in the anterior tibial compartment, were smelly, brownish black and necrotic; the peroneal and calf muscles were perfectly healthy. The right thigh was quite normal.

Bacteriological Report: Aerobic culture of the muscle around the wound: *Staphylococcus albus*. Anaerobic culture showed an organism of the *Bacillus putrificus* type.

Comments: Possibly gas infection of the right leg; possibly the necrosis of the muscles, etc., of the right leg was due to the vascular injuries, together with infection by putrefactive and other organisms.

#### CASE 22.—Gas Gangrene of Thigh and Leg. ? Septicæmia.

*Clinical History.*—Nature of wound: Gunshot wound, limbs. (Bomb.)

Signs and symptoms: Bomb wound in a raid; two foreign bodies in the lower third of the right thigh; another in the right leg; several other wounds in the left thigh and leg. General condition, good. Temperature 98° F., pulse 100. Next day felt well, temperature 100·6° F., pulse 124. Following day, not so well. Temperature 100·4° F., pulse very feeble, 136; is delirious at times; no vomiting. Right foot was mottled and numb; whole leg was swollen, and the skin is discoloured a reddish brown up to half-way up the thigh; no emphysema. The left foot is also slightly mottled. Died that day.

X-ray Report: X-rays of the right foot and leg showed distinct dark spaces (due to gas infection) in the deeper tissues; these are visible up to just below the knee-joint; above the knee, there is a track of dark space leading up to the foreign body on the inner side of the femur but no gas spaces evident elsewhere. Left leg not X-rayed.

Operation: Wounds were already exuding pus (about twenty hours

after wounding). The pus was thin and yellow with a few gas bubbles. Wounds opened up, Carrel's tubes with gauze inserted; foreign bodies not removed. Two days later was operated on again under ether; he was given pituitrin and one and a half pints of intravenous saline, causing great temporary improvement in the pulse. The right thigh was amputated about the junction of the upper third; it was attempted a little lower but there was much pus in the superficial fascia there. The sciatic nerve was infiltrated with novocain before section. Died several hours later.

Examination of amputated thigh: Showed coffee-coloured discoloration of the superficial fascia of the right thigh; the deep muscles were also infected as evidenced by gas bubbles and slight loss of tone, but the level of infection was about two inches below that of the superficial fascia; there were also small gas bubbles in the femoral sheath, and on opening the vein there were small gas bubbles mixed with the blood; the level of the gas bubbles in the sheath was also about two inches lower than the infection under the skin. The muscles below the knees were discoloured and soft, and exuded many gas bubbles on section. The left leg (examined within half an hour of death) showed coffee-coloured discoloration of the superficial tissues of the leg, with pus along, and at the bottom of, the several wounds; spreading up along muscle planes into the thigh.

Bacteriological examination: Films of pus from the left leg showed streptococci in very large numbers. Films from the right thigh and leg showed streptococci in very large numbers with large Gram-positive bacilli (morphologically *Bacillus aerogenes capsulatus*) in small numbers. Film from the blood of a vein in the arm; no organism seen. In spite of this death was thought to be due to septicæmia.

Comments: X-rays can only be relied upon to show coarse gas infection; fine bubbles are not evident. Superficial gas infection may not always show emphysema. Foreign bodies should be removed if possible, and the wound should be laid well open. Although there was no vomiting in this case, the feeble pulse was a warning.

The wounds had the odour of the post-mortem room.

(To be continued.)

## Current Literature.

**ITALY.** Law of the 6th June, 1939, introducing compulsory vaccination against diphtheria.

Compulsory anti-diphtheritic vaccination is introduced throughout Italy for all children between the ages of 2 and 10 years. It will usually be performed at the same time as anti-smallpox vaccination and this latter procedure is deferred until the 2nd year of age. All children now attending school, as well as future entrants, must present a certificate of vaccination against diphtheria.

NEVILLE M. GOODMAN.

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