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Gas gangrene after amputation for peripheral vascular disease

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ANAEROBIC myositis after amputation through poorly vascularized tissues is usually rapidly fatal. Although this complication has been well recorded (Ham, MacKenzie & Loewenthal, 1964; Karasewick *et al.*, 1964) it appears that it is still a cause of death which may be avoidable. Two such patients are reported who died in this hospital within the space of 3 months from gas gangrene. A therapeutic and prophylactic regime is outlined.

Case reports

Case 1

A.E.G., male, aged 84, an ex Salvation Army Officer was admitted on 9 June 1965 with established gangrene of part of the left foot which had been present for 8 weeks. This was associated with some pain, the intensity of which was difficult to gauge.

He was a diabetic of 10 years standing and at

the time of admission he was controlled on a 15 portion diet and 16 units of Lente insulin daily.

In 1958 he had been admitted with septic arthritis of the left first metatarso-phalangeal joint and again later that year with two indolent ulcers on the left foot, which lesions had gradually healed.

He was a rather frail old man. The blood pressure was 160/80 mmHg and the pulse was irregular due to extrasystoles. The left foot was relatively warm, but there were no pedal pulses palpable. There was dry gangrene of the lateral border of the foot, all four lateral toes and the lateral half of the hallux.

The right foot was cold and pulseless, but there was no gangrene.

Operation: On 11 June a mid-thigh amputation was carried out under a general anaesthetic. This was the traditional operation at the site of election 25 cm distal to the greater trochanter. Generous skin flaps were allowed. The muscles were sutured over the end of the bone stump;

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at the time it was noted that the femoral artery was completely occluded and there was very little bleeding from the cut muscle. A double corrugated drain was sewn in and pressure bandages applied. No antibiotics were given.

Progress: The following morning, 18 hr after operation, his pulse rate was 110/min and more irregular than it had previously been. His temperature commenced to rise. His bladder was palpable and as he could not pass urine an indwelling catheter was inserted and 750 ml of urine drained.

His diabetic state worsened rapidly—the urine now contained sugar in quantity, and ketones. It was observed that there was oozing from the amputation site which stained the bandages, but this was not such as to cause concern.

On the following day (42 hr after operation) his temperature was 39°C and pulse 110/min. The ooze was now foul-smelling and when the dressings were removed there was gross subcutaneous gas formation in the remainder of the limb. A swab was taken which showed *Clostridium welchii* on smear and culture.

The patient was now treated with intramuscular procaine penicillin (1 mega-unit 3 hourly) and gas gangrene polyvalent antiserum (30,000 units intravenously after a subcutaneous test dose); two pints of blood were transfused.

In spite of these measures, he died 60 hr after operation.

Case 2

R.S., male, aged 75, a casual gardener was admitted on 1 September 1965 with gangrene of the toes of the right foot, which was not painful. In 1963 the patient had undergone bilateral lumbar sympathectomy for rest pain in both feet, more severe on the right. He had made an uninterrupted recovery then from this procedure and his rest pain had been abolished.

He was a healthy-looking man. His pulse rate was 64/min with numerous extrasystoles and his blood pressure was 150/70 mmHg. There was no cardiac decompensation.

The right foot felt cold distal to the ankle and there was dry gangrene of the second, third and fourth toes. Both femoral pulses were palpable, but no pulse distal to these was felt in either leg.

Treatment: On 3 September a standard right mid-thigh amputation was performed. The muscles were apposed over the bone end and the wound was drained. No antibiotics were administered.

Progress: About 18 hr after the operation, there was a sustained rise in pulse rate which occasioned no comment.

The following morning (24 hr after operation), the temperature was 37.4°C and the pulse rate was 110/min. The patient looked unwell and there was a tinge of jaundice to the conjunctivae. There was a brownish malodorous discharge from the operation site and the stump was swollen, discoloured and crepitant. A swab was taken which revealed *Clostridium welchii* on direct smear and culture.

The sutures were removed, thus allowing the wound to be opened widely. Oxygen was administered by face-mask. Crystalline penicillin was given in large doses and a blood transfusion was commenced. The patient was transferred to the Oxygen Unit at Peter McCallum Clinic for treatment with hyperbaric oxygen by Dr H. A. S. Van den Brenk.

He was placed in the tank and the pressure raised to 3 atm absolute (30 lb/in² gauge pressure). He was rather restless while under pressure, and after 1½ hr in the tank he died.

A necropsy was performed which revealed no other cause of death apart from the gas gangrene.

Discussion

The gas-forming anaerobic organisms are ubiquitous. They are harmless commensals in man's gastro-intestinal tract and may be found anywhere on the skin, more especially in the perineum.

They produce disease in circumstances which favour exsorption and rapid spread, viz. relative anoxia and the presence of dead tissues. Clinical infection thus depends on the soil rather than the seed.

Gas gangrene after amputation for peripheral vascular disease is a well-recognized entity (Gye, Rountree & Lowenthal, 1961) as the 'soil' is particularly propitious for the organism. It is, therefore, incumbent upon a surgeon who performs this operation in the presence of vascular occlusion to be aware of the possibility and take measures to prevent its occurrence. The following measures are suggested:

- (1) As most *Clostridia* are sensitive to penicillin (Nagler, 1945), prophylactic crystalline penicillin should be given by injection in a dose of at least 10 mega-units/24 hr. This should commence 24 hr prior to surgery as the drug may have to diffuse slowly through avascular areas at the site of amputation.

- (2) Sutures to oppose the muscle ends over the bone should be avoided if the muscle is bloodless and even if bleeding is satisfactory, they should be slack.

- (3) These wounds should always be drained, even if haemostasis is easily attained. A tube

drain with side holes may be more effective in allowing access for air than the usual corrugated drain.

(4) The wound should be inspected daily.

(5) An hourly pulse chart should be kept and any sustained rise immediately reported. It is emphasized that this was the first sign in both the above patients.

If gas infection is suspected, vigorous treatment should be instituted:

(1) The wound should be widely opened and a swab taken for bacteriological examination.

(2) Blood transfusion should be commenced as soon as possible as these patients all have some degree of haemolysis.

(3) Penicillin should be given as above.

(4) Hyperbaric oxygen can be life-saving (Brummelkamp, Boerema & Hoogendyk, 1963) though the salvage rate in these elderly arteriosclerotics will inevitably be disappointing. Until the patient can be placed in the oxygen pressure-chamber, oxygen should be given by face-mask.

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Primary Raynaud's disease associated with sclerodactyly and digital osteosclerosis

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THE USUAL skeletal lesion associated with primary Raynaud's disease, or with Raynaud's phenomenon secondary to another disorder such as progressive systematic sclerosis, is digital osteoporosis affecting particularly the terminal phalanges of the hands. Rarely there may be progression to osteolysis of the terminal phalanges associated with wasting of the pulp and beaking of the nails, which in systemic sclerosis may be accompanied by ulceration of the tips of the fingers, indolent paronychia and sometimes soft tissue calcification.

Increased bone density (osteosclerosis) of the metacarpals and phalanges is rarely found in association with Raynaud's disease, and is not mentioned in the majority of relevant textbooks. The following case is of interest because of the

existence of both osteosclerosis and sclerodactyly, apparently secondary to Raynaud's disease.

Case report

A 45-year-old housewife stated that ever since childhood she had been prone to attacks of numbness and pallor followed by blueness and then redness of the hands, precipitated by cold. Her feet were affected to a lesser degree. The episodes were more severe in winter, when she regularly suffered from chilblains, but they occurred throughout the year. During adolescence she had observed wasting of the ulnar three fingers of the left hand, which progressed for a while and then became stationary. Lately she had noticed that the left hand was habitually colder and bluer than its fellow.