Repair of a cosmetic defect of the lower leg with a myocutaneous free flap

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Summary

The use of free-tissue transfers by modern techiques of microvascular surgery is not new, and the many possibilities in reconstructive surgery are well documented. A case in which a disfiguring cosmetic defect of the lower leg was repaired in one stage with a latissimus dorsi myocutaneous free flap is described.

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With the advent of microvascular surgery it has become possible to transport not only skin and subcutaneous fat as full-thickness skin flaps but composite bulks of tissue including underlying muscle and bone as *one-stage* grafts for the repair of defects caused by trauma or abalative surgery for carcinoma. These new techniques obviate the painful multiple stages of reconstruction necessitated by pedicled grafts.[1-3]

Normally these free grafts, with the microvascular anastomosis of small donor vessels to the recipient vessels in the defect, are indicated when full-thickness cover is required for exposed tendons, joints and fractures or for the repair of defects when local tissue is not amenable to more conventional flaps.

Free flaps are now routinely used in our clinic for the repair of defects and the restoration of function. The method requires sophisticated microscopes and suture material as well as expertise in handling small-vessel anastomosis. We feel that once these techniques are mastered the facilities can safely be utilized for the transfer of free flaps in the repair of cosmetic as well as functional defects.

A recent case illustrates successful free-flap transfer for the correction of such a cosmetic defect. Extremely disfiguring loss of tissue on the lower leg of a very attractive young model was corrected in one stage with a full-thickness myocutaneous free flap.

Case report

A 21-year-old woman presented with a cosmetic defect of the posterior aspect of the right calf. The patient had been injured 2 years previously in a skiboat accident; she had been cut by the propeller blades, sustaining severe injuries to her right calf and lesser injuries to her left calf, both thighs and back. She was taken to the local hospital, where the wounds were expertly debrided and skin-grafted so as to provide good residual function and rapid healing. The patient subsequently consulted plastic and reconstructive surgeons in South Africa and abroad.

On examination at the Plastic Surgical Unit at Tygerberg Hospital, Parowvallei, CP, there was a skin-grafted area with substantial soft-tissue loss on the right calf. The fibula was clearly palpable through the skin. There was no functional disturbance of the remaining muscles and plantar flexion of the foot was possible. No bones had been fractured. Routine medical examination showed no other abnormalities. Arteriography indicated normal vascular anatomy of the right lower leg.

The problem was one of loss of tissue volume and body contour. Tissue transfer with a cross-leg flap would have resulted in further scarring of the other leg, while transportation of an

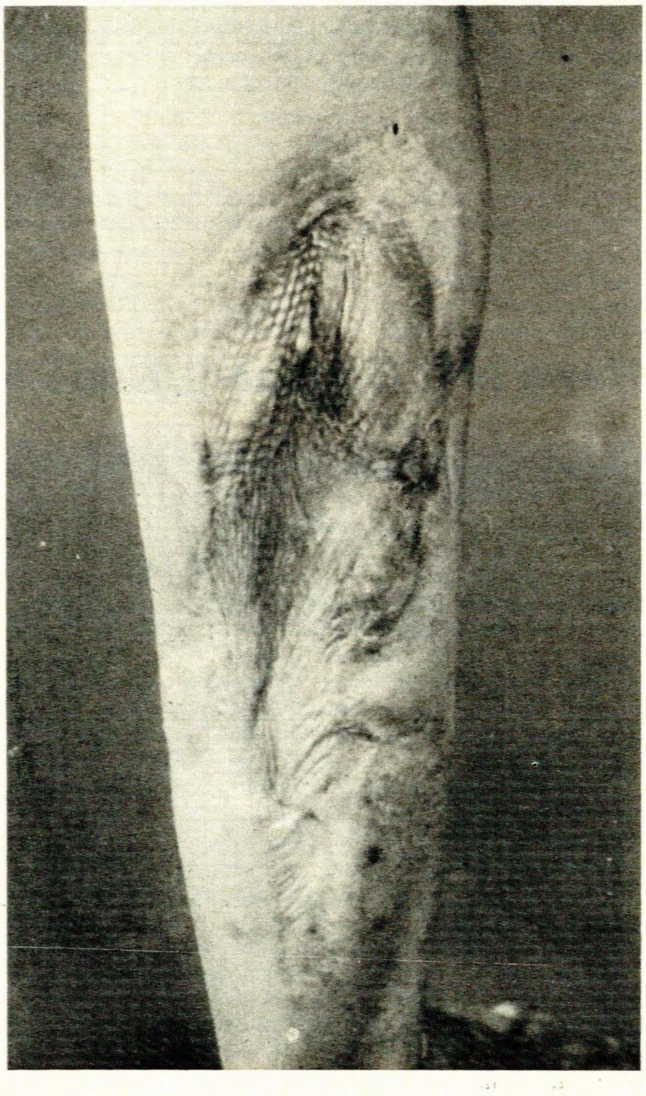

Fig. 1. Posterior aspect of right lower leg showing meshed skin-grafted areas and soft-tissue loss.

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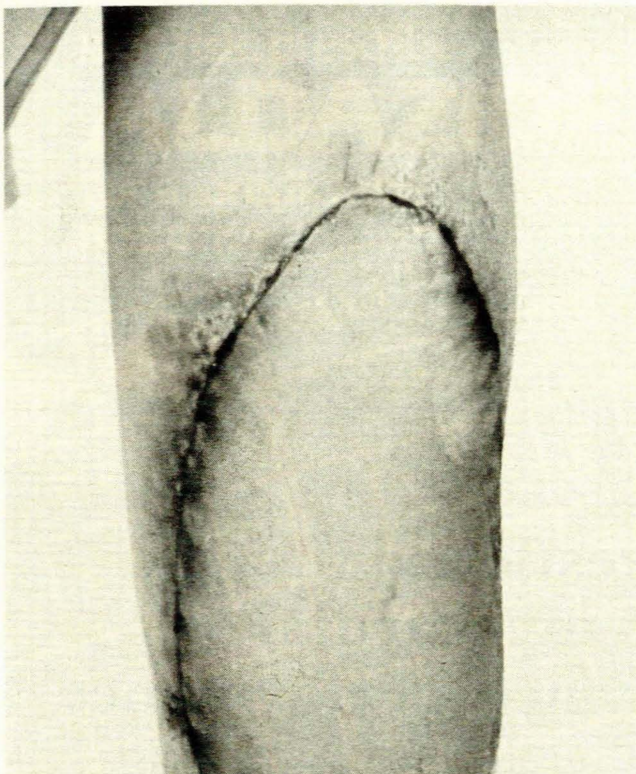

Fig. 2. Myocutaneous flap *in situ* 10 days postoperatively. The marks on the superior lateral part of the skin flap are pre-existing scars following injuries to the back.

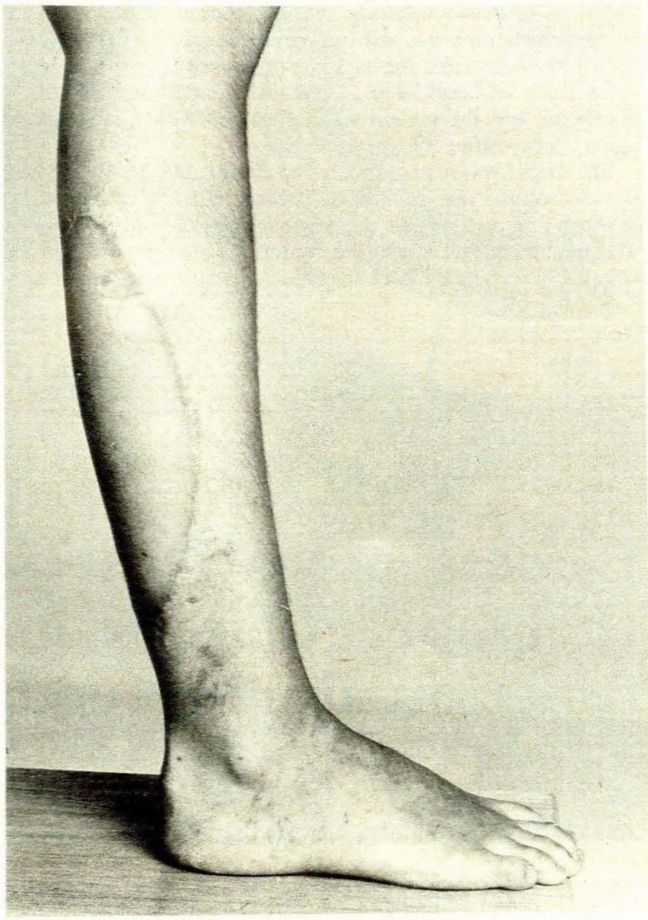

Fig. 3. Lateral view 9 months postoperatively prior to minor scar revision.

abdominal tube pedicle flap to the leg involves multiple time-consuming and uncomfortable stages with intervening scars. It was therefore decided to do a free-tissue transfer using the new microvascular techniques. Two donor flaps were considered: (*i*) an inguinal free-flap transplant; and (*ii*) a latissimus dorsi free-flap transplant.

The inguinal flap provided a choice of two arteries, the *superficial epigastric* and the *superficial circumflex iliac*. The scar would be well hidden, but the volume of tissue was considered too small to fill the muscle and skin defect on the leg. It was therefore decided to use a latissimus dorsi myocutaneous flap with its long vascular pedicle containing the *subscapular artery*. This would provide the large volume required, and the scar from this procedure would be hidden even by a low-cut evening dress.

The operation

The patient was placed on her abdomen with her left side slightly elevated. Through a longitudinal incision in the scarred calf, the first pair of surgeons exposed the bifurcation of the posterior tibial artery and concomitant veins. This was easy because of the absence of overlying tissue. As soon as this was achieved a template was made of the scar and transferred to the skin over the latissimus dorsi of the contralateral side. In doing so it was not necessary to turn the patient; this saved time in that two surgical teams were able to work simultaneously. The calf scar and skin were excised and further exposure of the vascular bundle was obtained. The latissimus dorsi myocutaneous flap and its vascular bundle was dissected. The full volume of the latissimus dorsi muscle was included. The skin island was designed large enough to cover the defect in the leg and yet small enough to enable primary closure of the back using subcutaneous and subcuticular Vicryl sutures. The large undermined area in the back was suction-drained.

The microvascular team prepared the posterior tibial vessels. There was good back-bleeding from the distal cut end of the posterior tibial artery due to collateral circulation. The latissimus dorsi pedicle was cut and the tissue bulk was handed over. The arterial anastomosis was performed first, with subsequent perfusion seen from the draining vein. One venous anastomosis was made with use of a technique of uninterrupted perfusion through another vein, which was later tied off. Nylon 10-0 was used for the anastomosis.

During the operation a high urine output was maintained with intravenous fluids. No Rheomacrodex furosemide or anticoagulants were used. The core temperature was monitored and a warming blanket was used to ensure good peripheral perfusion. Heparinized saline 5 000 U/l was used for local irrigation. The total ischaemic time amounted to 55 minutes. The muscle was secured and the skin closed subcutaneously. A large Portovac drain was left *in situ* for 72 hours in the leg. At the end of the operation during transfer of the patient pain and a drop in temperature gave rise to peripheral vasoconstriction. This was alleviated by analgesics and warming blankets. The patient was observed in the intensive care unit for 24 hours.

A short course of high-dose prophylactic antibiotics was used and physiotherapy was instituted immediately after the operation. The drains from the back were removed once the 24-hour volume was less than 50 ml. There were no postoperative complications, and the patient was discharged with a satisfactory repair 15 days after the operation.

The defect was over-corrected to compensate for the loss of muscle volume due to atrophy, which could be estimated as between 25% and 40% of the original latissimus dorsi volume. The final result left a repaired contour of the right calf and an acceptable scar on the back that lies within the brassiere line.

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Effects of caffeine ingestion on thermoregulatory and myocardial function during endurance performance

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Summary

The effect of caffeine administration on thermoregulatory and myocardial function during endurance performance was studied. A caffeine solution (250 ml; 5 mg caffeine/kg body weight) ingested 1 hour prior to 2 hours of running by 5 subjects was shown to have no significant effect on sweat loss, water deficit, percentage change in plasma volume, final rectal temperature and serum electrolyte levels, as compared with a similar control group who were given a caffeine-free drink. The rectal temperatures in both groups did, however, reach levels known to be associated with heatstroke despite a recommended regimen of fluid replacement. No pathological electrocardiographic changes occurred in either group. It is therefore concluded that the use of caffeine for ergogenic purposes by young athletes is a relatively safe procedure.

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Caffeine, a methylated xanthine contained in a large number of beverages consumed throughout the world, was classified as a 'doping agent' in 1962 by the International Olympic Committee (IOC) following a finding that it was the commonest 'doping agent' consumed by Italian athletes.[1] In 1972, caffeine was removed from the long list of drugs banned by the IOC, largely owing to the work of Fishbach.[2]

During prolonged exercise, the onset of exhaustion is delayed if muscle glycogen is spared. Caffeine has been shown to increase plasma free fatty acid (FFA) levels, resulting in a diminished dependence on muscle glycogen during exercise owing to an increased reliance on fat metabolism. This muscle glycogen-sparing effect is thought to account for the well-known ergogenic effects of caffeine. Recent studies[3,4] based on respiratory exchange data and skeletal muscle biopsies have suggested that enhanced FFA uptake and oxidation, together with an increased mobilization of FFA from muscle triglyceride stores, may also play a role in caffeine's ergogenic effect.

Wyndham and Strydom[5] have shown that the severity of water deficit incurred during prolonged exercise is one of the most important factors influencing the rise in body temperature. Costill and Saltin[6] have demonstrated that the ability of an athlete to replace fluid during sustained exercise at an intensity above 70% of maximal oxygen consumption ($\dot{V}O_{2max}$) is limited mainly by gastric emptying time. Caffeine results in gastro-intestinal smooth-muscle relaxation,[7] which should therefore hinder fluid replacement during marathon running by delaying gastric emptying. Furthermore, the diuretic effect of caffeine, although of little consequence at rest, together with increased gastric acid and small-intestinal secretion resulting from caffeine's inhibition of phosphodiesterase, an enzyme responsible for the conversion of cyclic adenosine monophosphate (cAMP) to 5-AMP, may lead to the development of further water deficit during long-distance running. This, coupled with the increased metabolic heat production resulting partly from endogenous catechola-