The Sural Artery Island Flap in Salvage of a Prosthetic Ankle Joint

Lt Col R Ravishanker

MJAFI 2004; 60 : 395-398

Key Words : Prosthetic ankle joint; Flap cover

Introduction

Soft tissue defects around the ankle present a major challenge to reconstructive surgeons. Since Amarante described a distally based fasciocutaneous flap of the leg in 1986 [1] and Masquelet described a flap based on the vascular axis of the sural nerve [2], the sural artery fasciocutaneous flap has come to be a reliable flap for defects around the ankle. There is however, no report of this flap ever used for the cover of a prosthetic ankle joint. This is a case report of the first prosthetic ankle replacement done in this country, salvaged with the help of a sural artery flap cover.

Case Report

A 43 year old DSC Sepoy sustained a crush injury to the left foot in a road traffic accident on 21 January 2001. A split skin grafting (SSG) for the raw wounds he had over the medial aspect of the ankle and foot was done on 15 March 2001. All skin wounds healed. The soldier had a stiff and non-functional ankle joint and underwent total ankle replacement with a metallic prosthesis on the 8th of July 2002.

The patient was referred for skin cover for the ankle on 26 July 2002. It was found that the incision over the anterior aspect of the ankle had disrupted exposing the extensor hallucis longus and other extensor tendons. The skin over the medial malleolus had also given way exposing the medial malleolus and the prosthetic implant. The joint was pouring out pus. Pus culture had grown *Pseudomonas*.

The reconstructive problems in this patient were many and extremely challenging. The tendons were exposed over the anterior aspect of the joint; the skin over this region was unhealthy (Fig 1); the medial malleolus with the fixation screw and the implant were exposed (Fig 2); the joint was grossly infected pouring out thick pus which had grown *Pseudomonas*; a Doppler study failed to detect any perforators over the lateral aspect of the leg; over the medial aspect, one perforator was found at a distance of 5 cm proximal to the medial malleolus. Common sense and surgical teaching

dictated the removal of the prosthesis, as it was a foreign body. As the joint had to be salvaged at all costs, a decision was taken to make an effort to save the joint and the ankle. The patient was explained all the prospective surgeries and the results that could be expected.

A staged surgery was planned. In the first stage carried out on 30th July 2002, the anterior incisions were explored. Under the exposed extensor tendons slough was found right up to the prosthetic joint, and on clearing the slough about 25 ml of thick pus was drained out. The skin margins were freshened and a "bipedicle flap" of the anterior skin was used to cover the exposed tendons and joint. The skin defect over the medial aspect of the ankle was expected to be to the extent of 17 cm by 10 cm. A very large 18.5 cm by 11 cm sural artery fasciocutaneous flap was marked extending just short of the popliteal fossa, raised to the pedicle based on the medial perforator 5 cm short of the medial malleolus and placed back in its original position as a "delay procedure". 48 hours later the patient was taken up for a formal excision of the unhealthy skin over the medial malleolus and the delayed flap was used to cover the exposed medial malleolus and joint. A feeding tube was placed within the ankle joint and two suction drains were placed under the flap (Fig 3). The next day it was found that there was over a 100 ml of thick greenish pus that had drained out from the joint. The feeding tube that had been left in the joint was then connected to a continuous irrigation with Gentamycin solution in saline. The ankle was thus continuously washed out with this antibiotic solution for 10 days. In the initial period the outflow fluid used to contain thick pus flakes and slough (Fig 4). The patient had a stormy post-operative period with temperatures going up to 105°F. Within a week however the infection started coming under control with both continuous irrigation and antibiotics like Ticarcillin, Targocid and Fortum. After 12 days, when the irrigation fluid outflow had become clear the irrigation was discontinued. The suction drains were however removed only on the 14th post-operative day when alternate skin sutures were also removed. All skin sutures were removed on the 16th post-operative day. As a small speck of pus continued to

Fig. 1 : Exposed extensor tendons (arrow)

Fig. 2 : Exposed prosthesis and screw (arrows) with raised flap

Fig. 3 : Flap sutured in place with suction drains and irrigation tube

come out at the drain site antibiotics were continued for a further 7 days. By then the patient had become afebrile and the flap had settled down (Figs 5,6). The patient is now bearing weight on the left foot and is ambulant without support. He however developed a discharge at the site where a screw had been used to fix the fractured lateral malleolus. Ankle mobility was also limited. The flap continued to be healthy.

Discussion

Soft tissue defects around the ankle joint have always been a conundrum for reconstructive surgeons. Until Ponten in 1981 [3] described his fasciocutaneous flap for cover of lower limb soft tissue defects, reconstructive options had been few and ranged from highly uncomfortable crossleg flaps to the drastic step of an amputation. Amarante with his description of a distally based fasciocutaneous flap (1) opened up new vistas and Masquet with his latex injection studies laid the basis for the distally based fasciocutaneous flaps having their vascular axis around the sural nerve (2). The arterial supply of this flap is from the superficial sural artery which courses along the sural nerve to either terminate or anastomose with the supramalleolar branches of the peroneal artery and posterior tibial artery. Rarely it travels all the way to the foot to communicate with the lateral tarsal artery. The artery gives lots of arteria neuorum to the nerve along with septocutaneous

Fig. 4 : Bipedicle flap pus in suction drains

Fig. 5 : Healed bipedicle flap

Fig. 6 : Healed sural artery flap

perforators. Venous drainage is also good due to the paired vena comitantes that travel with the artery.

This flap has thus been utilized as a reliable flap for small and medium sized defects around the ankle and foot. The largest flaps that have been documented by various authors have however not exceeded 15 cm in length [4-9]. These flaps have been mainly used for soft tissue and skin defects around the ankle region caused by trauma, pressure sores, melanoma excisions and electrical burns. There is no record in literature of this flap having been used as a soft tissue cover for a total ankle prosthetic implant. The size of the flap used for this patient too is the largest documented, being 18.5 cm by 11 cm. The major problems in this patient were manifold. He had:

- Exposed extensor tendons with unhealthy skin around the incision line.
- Scarred unhealthy skin around the exposed medial malleolus.
- No perforators on the lateral side of the leg.
- Multiple foreign bodies including the ankle prosthesis and a screw used to fix the fractured medial malleolus that had got exposed.
- Fulminant *Pseudomonas* infection in the ankle joint.

Common surgical principles indicated that the

treatment for this patient was removal of the prosthesis followed by a suitable skin cover once infection came under control.

In this patient however, the need for salvage of the ankle prosthesis was dire. This was the first total ankle joint replacement done in this country. Removal of the prosthesis would have led to an unstable ankle that would need arthrodesis with bone grafting for which again a flap cover may have been necessary.

It was thus decided to take a calculated risk of attempting skin and soft tissue cover so as to salvage the prosthesis. It was planned to carry out the surgery in stages.

In the first stage, the exposed extensor tendons were provided skin cover with a bipedicle flap. As the skin over the anterior aspect of the ankle was not very healthy, this bipedicle flap was given a chance to settle down before a delayed sural artery flap based on the medial perforator was raised and used in the second stage to cover the exposed medial malleolus and prosthesis. A point to be noted was that this was not the classical sural artery flap which is laterally based.

The post-operative period was stormy as a result of fulminant infection in the joint. The continuous irrigation of the joint cavity with an antibiotic helped in local wound infection control. Powerful systemic antibiotics given for three weeks took care of the systemic infection. As a result of the neo-vascularity brought to the ankle region by the vascularised flap, healing took place and the patient is now ambulant on a fully healed and mobile

ankle.

The aim of this paper is to highlight what is probably the largest documented sural artery flap used to salvage the first ankle joint replacement in this country.

References

1. Amarante J, Costa H, Reis J, Soares. A new distally based fasciocutaneous flap of the leg. *Br J Plast Surg* 1986;39(3):338-40.
2. Masquelet AC, Romana MC, Wolf G. Skin island flaps supplied by the vascular axis of the sensitive superficial nerves: Anatomic study and clinical experience in the leg. *Plast Reconstr Surg* 1992;89:115-9.
3. Ponten B. The fasciocutaneous flap: Its use in soft tissue defects of the lower leg. *Br J Plast Surg* 1981;34:215-7.
4. Rajacic N, Darweesh M, Jayakrishnan K, Gang RK, Jojic S. The distally based superficial sural flap for reconstruction of the lower leg and foot. *Br J Plast Surg* 1996;49(6):383-9.
5. Yilmaz M, Karatas O, Barutcu A. The distally based superficial artery island flap: Clinical experiences and modifications. *Plast Reconstr Surg* 1998;102:2358-67.
6. Jeng SF, Wei FC. Distally based superficial sural island flap for foot and ankle reconstruction. *Plast Reconstr Surg* 1997;99:745-50.
7. Fracalvieri M, Verna G, Dolcet M, Fava R, Riva Rossa A. The distally based superficial sural flap: our experience in reconstructing the lower leg and foot. *Ann Plast Surg* 2000;45(2):132-9.
8. Sadhotra LP, Singh M, Bhandari PS. A distally based superficial artery flap for ankle defects. *Ind J Plast Surg* 2000;33:69-72.
9. Costa-Ferreira A, Reis J, Pinho C, Martins A, Amarante J. The distally based island superficial sural flap: clinical experience with 36 flaps. *Ann Plast Surg* 2001;46(3):308-13.