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Augmented Adipofascial Flap for Soft Tissue Cover of Open Tibial Fractures : A Case Report

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***Abstract*— This is the management of a 30-year-old male student, a passenger on a motor cycle who had an open tibial fracture. He was resuscitated by the Accident and Emergency doctors before the Orthopeadic and Plastic surgery units were invited to take over the management. The fracture was reduced and maintained with external fixators by the Orthopeadic surgeons and an augmented fascial flap and a split thickness skin graft were used to cover the fracture by the plastic surgical team. The wounds healed in three weeks and the fracture united in four months.**

***Index Terms*—Augmented fascial flap, Open tibial fracture.**

I. INTRODUCTION

The leg is the part of the body between the knee and the ankle joints. The main bones of the legs are the tibia and fibula. Due to the subcutaneous position of the tibia, fractures of this bone are often associated with soft tissue loss and exposure of variable lengths of the tibia. Over the years soft tissue cover of open tibial fractures has posed a great challenge to orthopeadic and plastic surgeons. For soft tissue cover of open tibial fractures, the leg is divided into three parts--proximal, middle and distal thirds. The difficulty in providing local pedicle flaps to cover open tibial fractures increases from the proximal to the distal third. Indeed availability of pedicle flaps is so reduced in the distal third that some plastic surgeons use mainly cross leg flaps or free flaps. However, cross leg flaps require prolong immobilization of the patients' legs and this is not suitable for the older patient because of joint stiffness. The expertise of free flaps is not available in every hospital. Therefore the distal third of the leg is still a problem in many hospitals. The introduction of adepofascial flaps has slightly reduced the difficulty in providing soft tissue cover in the lower one third of the leg 1. However, numerous pedicle flaps can be used in the upper and the middle thirds because of available muscles, subcutaneous tissue and skin. The use of pedicle muscle flaps is suitable for open fractures that have a cavity for the muscle to fill but in the absence of a cavity a muscle flap may leave a tumour (swelling) on the anterior surface of the tibia [fig.1]

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Fig.1. Swelling on the leg after reverse soleus muscle flap.

Such a patient, like the patient illustrated in figure 1, may present to the plastic surgeon for removal of the tumour on the anterior surface of the leg after the wound has healed and the bone has united. A fasciocutaneous flap leaves a donor site which has to be grafted and thus give another wound—the graft donor site. The use of adepofascial flaps has solved some of these problems.

In our index patient the preoperative decision was to do adepofascial flap but the loss of subcutaneous fat from metabolic response to trauma and malnutrition made the use of adepofascial flap impossible. This is because adepofascial flaps depend on three capillary net works namely the subcutaneous, prefascial and subfascial capillary net works [fig.2]

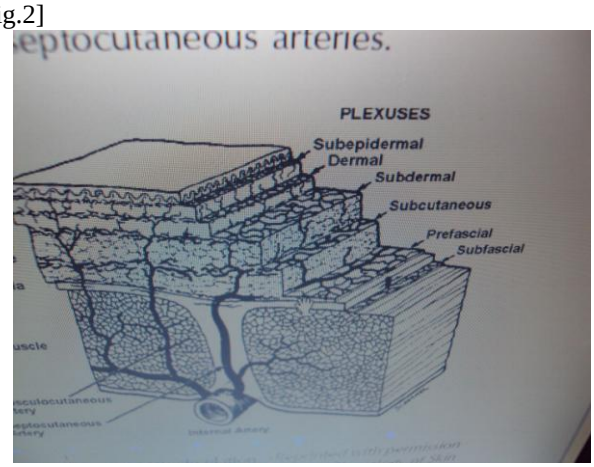

Fig.2. Capillary networks in the skin and subcutaneous tissue.

Out of these networks the subcutaneous and subfascial networks may be damaged during the procedure. This necessitated the preservation of the prefascial capillary network. Figure 2 shows that preservation of the

prefascialcapillary network is essential for the survival of adepofascial flaps but in patients who have little or no subcutaneous fat, this network may be destroyed during dissection of the skin flap. However, if the subfascial capillary network is preserved, a thin flap can survive. This is possible in the upper and middle thirds of the leg where muscles bellies abound .This is the basis of the flap we call ' Augmented fascial Flap'.

II. Case Report

This is the case of a 30-year-old undergraduate who presented at the Accident and Emergency Department of the University of Calabar Teaching Hospital with inability to bear weight on the right lower limb and a wound on the right leg for 12 hours. He was a passenger on a motor cycle and was knocked down by a saloon car. He fell on his right leg, sustained a wound on the same leg and could not bear weight. There was no loss of consciousness. He was transported to the University of Calabar Teaching Hospital in a taxi and received initial treatment from the Accident and Emergency Unit before the Orthopeadic and Plastic units were invited to take over the management.

On examination the patient was in painful distress, he was neither pale nor febrile. His pulse rate was 80 beats per minute, regular and full volume. The blood pressure was 110/80 mmHg. He had abrasions on both forearms and the right hand. There was a wound on the upper one third of the anterior surface of the right leg which measured 4cm by 6cm and the tibia was exposed. There was also external fixators in situ .

Fig. 3. Pre operative picture.

Other systems of the body were normal. The investigations done and their results are as follows: the complete blood count gave a packed cell volume of 29%, white blood count total of 5.0 *109 and a normal cell differential. The urinalysis was normal and a wound swab for microscopy, culture and sensitivity grew staph. aureus sensitive to genticin, ciprofloxacin and cloxacillin but resistant to septrin and ampicillin. A lateral and anteroposterior x-rays of the right leg showed a comminuted fracture of the proximal one third of the tibia and fibula.

Surgical Technique: The patient was given spinal anaesthesia and placed in supine position. The right lower limb was lifted vertically by an assistant and maintained in this position for three minutes for venous blood to drain from the leg. An ersmarch tourniquet was applied on the right thigh. The lower limb was brought down, cleaned with savlon, methylated spirit and draped. A zig zag marking and incision was made about 5cm beside the fracture.

Fig. 4. Marking before surgery.

Proximally and distally based skin flaps were raised and the attenuated subcutaneous fat and deep fascia were exposed. A distally based flap was raised to include the deep fascia and about 5mm thick of muscle to ensure that the subfascial plane is not opened. Thus, the subfascial capillary network which forms the vascular supply of this flap is preserved.

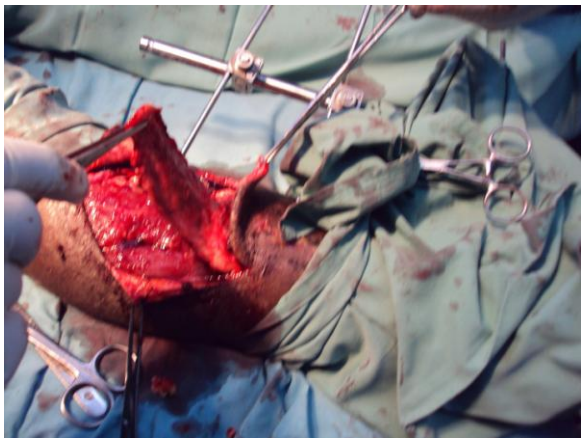

Fig. 5. Skin and muscle flaps.

The flap is transposed to cover the exposed bone and a split thickness skin graft was taken from the contralateral thigh to cover the flap. The skin flaps are used to cover the flap donor site.

III. RESULTS

1. There was complete survival of the augmented fascial flap.
2. There was about 95% take of the split thickness skin graft.
3. Healing of abrasions on the skin flaps was amazingly very good in spite of the augmented adipofascial flaps taken

from the bed.

Fig. 6. Post operative picture.

IV. DISSCUSSION:

The reconstructive problems of the anterior surface of the leg are numerous. The tibia is located subcutaneously and minimal loss of soft tissue exposes the bone. Fasciocutaneous flaps can be used to cover such defects but the flap donor site has to be grafted. Muscle flaps will leave a tumour on the anterior surface of the bone except when there is a cavity created by bone loss which the muscle can fill. Besides, the muscle function has to be considered. Adepofascial flaps are suitable for the cases without a cavity but in some patients, like our index patient, the subcutaneous fat is thin and adepofascial flaps are difficult to raise because the prefascial capillary plexus may be destroyed during the procedure. Augmented fascial flap is a suitable option when there is no cavity , the subcutaneous fat is thin and there are available muscles . The merits of this flap include the following:

1. Little or no flap donor site mobidity.
2. Absence of a tumour on the anterior surface of the tibia.
3.Better nutrition of the skin flaps because the subcutaneous fat and deep fascia have been included in the augmented fascial flap and the skin flap is in direct contact with the muscle. The latter has a better blood supply which is made available for the nutrition of the skin flaps.
4. while others have used axial pattern flaps to cover defects on the leg, this is a random pattern flap and it is easier to raise 1,3.

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