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RECONSTRUCTION OF TENDOACHILLIES DEFECTS WITH DISTALLY BASED PERONEUS BREVIS MUSCLE FLAP – OUR EXPERIENCE

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ABSTRACT

Introduction :

Covering soft tissue defects in the distal part of leg and ankle is difficult. Most of the flaps used in reconstructing these defects are bulky and aesthetically unpleasing. The peroneus brevis muscle flap is ideal for covering these defects and providing an aesthetically better outcome. Peroneus brevis is a muscle located in the lateral compartment of the leg. It can be used for covering defects over the ankle and distal part of the leg without causing loss of function. It is also expendable as long as the Peroneus Longus muscle is intact. Through this study, we describe the application and outcome of distally based Peroneus Brevis flap coverage of TendoAchillies defects.

Methods: This was a retrospective study involving thirty patients who were operated from JULY 2021 to APRIL 2024. All the patients had soft tissue defects over the TendoAchillies and were managed with distally based peroneus brevis muscle flap and covered with SSG . The inclusion criteria were defects less than 4cm which required a flap, with exposed bare bone , the presence of palpable distal pulses, a clean wound bed and the absence of infection.

Results: Partial graft loss was noted in three patients, who were managed conservatively and wounds healed secondarily. An incidence of muscle necrosis in one patient. All wounds healed completely by 6 weeks of follow-up.

Conclusion: Distally based Peroneus Brevis flap is a reliable option to provide aesthetically satisfactory and robust soft tissue coverage of TendoAchillies defects that are less than 4cm wide , with minimal donor site morbidity .

Keywords: TendoAchillies Defects, Distally based Peroneus Brevis flap, muscle flaps.

INTRODUCTION:

Soft-tissue defects in the distal 3rd of the lower leg are one of the most challenging reconstructive defects that plastic surgeons face. Tendons and bones are commonly exposed, which predisposes them to delayed healing and infection. Free flaps have been used to manage these defects, with good results, but they require microsurgical expertise and have a higher complication rate than loco-regional flaps.(1) .

Most of the flaps used in reconstructing these defects are bulky and aesthetically unpleasing [2]. On the other hand, pedicled flaps, such as the sural neurocutaneous flap, soleus and gastrocnemius flaps,(3,4)have been widely employed since the 1980s. However, these flaps are more useful for defects in the mid and upper leg. The lower leg and foot continue to be a source of concern for surgeons, especially in cases of acute trauma with significant soft tissue defects.

An ideal flap should be technically easy to harvest, reliable and have a high success rate with minimal donor site morbidity. One such example is the peroneus brevis (PB) flap which gives an aesthetically better outcome too. Originally, the peroneus brevis was a type II muscle flap, but it was reclassified by Mathes S and Nahai F as type IV with a dominant pedicle or pedicles from the peroneal artery, located proximally, entering the muscle from its deep surface, and distal minor pedicles from the peroneal or anterior tibial vessels [5]. When the flap is based distally, it is recommended that three fingerbreadths be left intact from the distal tip of the lateral malleolus [6]. Originally proximally based flap was designed for shin defects by Pers M and Medgyesi S [7]. Barr S et al., and Saydam M et al., reported on the reliability of distally based peroneus brevis muscle flaps [8,9].

Peroneus Brevis is a superficial muscle with consistant anatomy, and provides a satisfactory arc of rotation to reach poorly vascularized defects in distal 1/3rd of leg. It is also expendable as long as the Peroneus Longus muscle is intact. Through this study, we describe the application and outcome of distally based Peroneus Brevis flap coverage of TendoAchillies defects.

MATERIALS AND METHODS:

This was a retrospective study involving twenty patients who were operated from JULY 2021 to APRIL 2024 in the department of burns, Plastic and Reconstructive surgery at K R Hospital , Mysore . All the patients had soft tissue defects over the TendoAchillies and were managed with distally based peroneus brevis muscle flap and covered with SSG .

Inclusion Criteria

- ❖ Defects less than 4cm which required a flap,
- ❖ With exposed bare bone ,
- ❖ The presence of palpable distal pulses,
- ❖ A clean wound bed and the absence of infection

Exclusion Criteria

- ❖ Defects larger than 4cm in transverse diametre
- ❖ Presence of scarred tissue at muscle pedicle
- ❖ Chronic heavy smokers

OPERATIVE TECHNIQUE

A Handheld Doppler was used to Localize arterial perforaters both pre operatively and intra operatively to confirm and localize perforaters. Under regional or general anesthesia, the patients were positioned in the supine position on the operating table,with a sandbag under the ipsilateral hip, to allow easier internal rotation of the hip and, thus, easy accessto the whole length of the

lateral aspect of the lowerlimb. Under tourniquet control, wound was debrided and defect was measured.

Fig. 1 Photograph shows the defect .

Fig. 2 Photograph shows the peroneus brevis muscle being identified

Fig. 3 Photograph shows the dissection and elevation of theflap.

Fig. 4 Photograph shows the flap inset with split thickness graft over it

Fig. 5 Photograph shows the donor site scar at three months postoperation.

The fibular head and tip of the lateral malleolus were marked, as was a point 7 cm proximal to the tip of the lateral malleolus. A skin incision was placed along the lateral aspect of the lower leg , subcutaneous tissues and deep fascia were incised, the peroneus longus muscle was reflected posterolaterally, exposing the superficial peroneal nerve and preserving it, superficial to the Peroneus Brevis muscle.

The Peronius Brevis muscle was gently scraped off the bone and interosseous membranes in craniocaudal direction. As soon as sufficient length had been elevated cephalic portion of the muscle was reflected in a caudal direction to cover the entire defect. The tourniquet was deflated after elevation of the Peronius Brevis muscle and before closure of donor site and setting of the flap. Hemostasis was ensured before the wounds were closed.Defect was reached either by excising the intervening skin or tunneled in a subcutaneous fashion.

The donor incision was closed with sutures, reapproximating the deep fascia of the lower leg.The Peronius Brevis muscle was fixed in the target location , meshed split skin graft was secured with skin staples over the muscle.

Postoperative Procedures

All patients remained in bed with strict leg elevation for 5 days postoperatively, under intravenous antibiotics. The Parameters assessed are degree of pain , cosmetic appearance and overall result of operation. Post operative pain was assessed using Visual analogue scale from immediate post operatively to one week,where as Cosmetic appearance and overall result was graded using Likerts scale { Score 1 to 5 } at 6 weeks post operatively.

RESULTS:

The study included 30 patients of which 19 are male and 11 are female with age group between 18-60 years with a an average of 48 years and a tourniquet time varying between 20 to 30 minutes with average time of 25 minutes , where as Etiology of the defects are ten patients came with history of Distal tibial fracture after RTA, seven with Machinary Injury, three with Ladder fall and two with Bicycle Fall, five with Post Inflammatory Soft tissue loss and three with history of Post Tumour Excision. The average time taken for the procedure was 45 minutes on an average.

Twenty Nine patients had an uneventful recovery, with the exception of three patients who had a partial graft loss and one with muscle necrosis. Table 01 shows the complications associated with the flap are partial graft loss in three patients due to infection in one and seroma causing suture dehiscence in two. There was an incidence of muscle necrosis in one patient who is a chronic smoker and all wounds healed completely by 6 weeks of follow-up.

Flap Complications		**Donor Site Complications**	
Complications	No. of patients	Complications	No. of patients
Infection	01	Infection	01
Distal Tip Necrosis	0	Suture Dehiscence	02
Total Flap Loss	01	Seroma	02
Graft Loss	03	Hematoma	0

The follow-up period was six months and Post Operative questionnaire was given to patients and likerts scale (table.02) was used to caliculate the patient satisfactory rate, which showed 10 patients rating overall result as good and 4 as very good and 6 are satisfactory in aesthetic outcome.

	Patient Satisfactory Scale (Likerts Scale)	
Score 1	Very dissatisfied	00
Score 2	Dissatisfied	00
Score 3	Satisfied	06
Score 4	Good	10
Score 5	Very Good	04

DISCUSSION:

Post-traumatic soft tissue defects in the distal one third of the leg are common. These wounds are usually deep with exposure of the underlying bony structures or tendons stripped of their paratenon. Such wounds cannot be covered by skin grafts and would necessitate the need for a local or free flap [2]. Numerous flaps have been described to address this issue. Adipofascial flaps have the benefits of being simple to raise and versatile, when employed in cases of small-to-

moderate defects[10]. One such example is the distally based sural artery flap, first described by Masquelet et al in 1992[11]. The sural artery flap is an excellent choice for the reconstruction of even larger soft-tissue defects of the lower limb venous congestion, a loss of sensation in the area of sural nerve function and aesthetic impairment.

Muscular flaps are the first choice when dealing with osteomyelitis[12,13,14,15] and soft tissue infection, as there is increased blood flow in denervated muscle flaps, due to a reduction in vascular resistance[15,16]. Free flaps are the first choice when dealing with defects of the distal 3rd of the lower leg, because of their good vascular supply and adequate tissue volume[17]. Their disadvantages, however, include donor-site morbidity, increased operation time, use of major vessels of the leg, costly microsurgical equipment, and the need for microvascular expertise; furthermore, not all patients are willing or healthy enough to endure the lengthy free tissue transfer procedures.

The PB turnover flap was first described by Mathes and Nahai[18] in 1997. In 2001, Eren et al[6] published an article demonstrating the use of the PB flap in 19 patients, as a valid alternative to free tissue transfers. Initially the PB flap was described as a type-II muscle flap, and was used as such for coverage of defects in the distal 3rd of the leg,[5,19] until it was reclassified as a type-IV flap (due to its numerous vascular pedicles) by Taylor and Pan in 1998.[20] Peroneus Brevis Muscle flap offers a stable soft tissue coverage of exposed ligaments, tendons, and the bone, without the need to sacrifice one of the major arteries of the leg.

Peroneus Brevis Muscle flap has a negligible postoperative donor site morbidity, as preservation of the peroneus longus muscle preserves foot eversion. The draw back of this flap is it is suitable only to cover small to medium sized defects. Gradual thinning of the muscle due to Denervation of muscle gives better cosmetically acceptable outcome. Each patient with this procedure had a Donor site linear scar which thinned out in time. No obvious contour deformity from sacrifice of the muscle bulk was observed. In our centre we encountered two partial graft loss both of which were managed by regular dressing and healed secondarily

CONCLUSION:

Distally based Peroneus Brevis flap is a reliable option to provide robust and aesthetically satisfactory soft tissue coverage of TendoAchillies defects that are less than 4cm wide , with minimal donor site morbidity .

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