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SOFT TISSUE REPAIR AROUND THE ANKLE A CLINICAL INVESTIGATION OF THE LATERAL SUPRAMALLEOLAR FLAP

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Abstract

Objective: To present the efficacy of the useful and underexploited lateral supramalleolar flap for the reconstruction of the soft tissue. This flap is used for the reconstruction of the soft tissue in the ankle region.

Methods: There were 40 flaps used in the reconstructive surgery of the soft tissues to treat the defects in the ankle region over the period of 3 years. The exact location, cause of the defect, outcome of the surgery and complication involved during and after surgery, and possible alternative flaps are discussed in this paper.

Results: The follow-ups were taken right from the first month to the eighteenth month. Except for the six flaps in the calcaneal tendon region, the remaining 37 survived. The flaps that did not survive were treated first the split skin late on, after the wound was debrided it was covered with granular tissue.

Conclusion: The reconstructive surgery in the ankle region with a supramalleolar flap for treating the soft tissue defect was useful except for the calcaneal tendon region.

Introduction

Recently the importance of early soft tissue reconstruction of the open fracture near the ankle region was studied by various plastic surgeons [1]. However, reconstructive surgeries in this region are difficult because of lack of the muscle groups to provide mobility, and the defects affect even the bones of this region. The failure rates of the reconstructive surgery of the soft tissues in this area are as high as 15-20% [2].

The lateral supramalleolar flap is a pedicle flap, and perforating branches of the peroneal artery vascularize it. The ascending branch can be used to design a mixed flow pattern whereas the descending branch gives a retrograde flow pattern [3-5]. The peroneal artery is least affected during atherosclerosis and diabetic vasculopathy thus the flap is never affected by any of the conditions. The

lateral supramalleolar flap is proven in various studies to be strong, reliable, and useful in various reconstructive surgeries of the ankle to cover the soft tissues. In a study conducted the lateral supramalleolar flap minimized the morbidity of the donor site compared to the conventional three flaps used before [6, 7]

The reconstructive surgeries performed on 40 patients using lateral supramalleolar flap as a pedicle flap to cover the soft tissue defects in the ankle region are retrospectively, analysed here. This study aims to present the efficiency of lateral supramalleolar flaps in reconstructive surgeries of the soft tissues near the ankle region.

Methods

The reconstructive surgeries to cover the defects in the soft tissue surrounding the ankle region were performed using flaps on 40 patients over a period of 3 years. All the patients were male and the cause of soft tissue ranged from trauma to infection including post-trauma sequelae. 34 patients had the defect in the left leg whereas 6 patients had the defect in their right leg. The region of the defect included the distal anterior region in 6 cases, the medial malleolus region in 6 cases, the lateral malleolus region in 8 cases, the dorsum of the foot in 4 cases, the distal medial leg in 8 cases, anterior aspect of the leg in 2 cases, and the calcaneal tendon region in 6 cases. The lateral supramalleolar artery in the anterior region and the perforated peroneal artery was marked with the hand Doppler signal in all the surgeries.

Amongst all the surgeries there were 4 cases in which the secondary reconstructive surgeries to repair the tendons were also performed. Out of the 4 surgeries 2 were for the repair of the Achilles tendon and another 2 were for the repair of the anterior tendon in the tibialis region. The clamped conditions were maintained while raising the flap. The largest and the smallest flap were of size 9*9 cm and 5*5 cm respectively. In 34 cases flap was supplied with prograde flow and in 6 cases flap was supplied with retrograde flow. The average duration of the surgery was one and a half hours which included the time from the debridement of the wound, marking and raising of the flap, and flap in setting, also the time for covering the donor site of the flap with split skin graft was included.

For 2 weeks plaster slab support was provided. On the third, the ambulation was started without bearing weight in all of the patients except for two patients who had fractures in their opposite tibia. The monitoring of the flaps was done every day after the surgery using a window made while dressing. On the fifth day of the surgery, the donor site of the flap was checked and after that weekly monitoring was performed. The period of the follow-ups ranged between 1 to 18 months.

Case reports

Case 1 –the defect of the right ankle in the lateral region

A male patient of 25 years had sustained a silencer burn in the lateral region of the right ankle, it did not heal for a month. On examining the area, it was observed that the area thickened and had a defect that measured about 7*5 cm. The peroneal perforator artery and the flap were marked using a hand Doppler signal. The surgery begins with the debridement of the wound, then the wound size was marked after which the lateral supramalleolar flap was raised. The flap was inset and it had prograde vascular supply, the split skin graft was used to cover the donor site. The surgery was completed, and during monitoring, it was reported that the flap settled well and the healing was complete at the donor site of the flap. For 18 months the patient followed up and reported no complication regarding the function of the flap as well as the appearance of the flap was satisfactory.

Case 2- the defect of the lateral malleolar flap

A male patient with diabetes and 75 years of age complained of a wound that did not heal for 2 months after the trivial trauma. This wound was over the lateral malleolus of the right leg. The hand Doppler signs of the perforator peroneal artery were good. The lateral supramalleolar flap of size 5*5 cm covered the soft tissue defect. The flap stuck well into the defect with the prograde flow. The healing of the donor site took place within 5 days. The patient followed up for a month.

Case 3- the defect in the foot's dorsum

The male patient who was 44 years old had a crush injury resulting from the fall of the heavy object. There was also a fracture in the second metatarsal, and it was pulled away from its position.

Before starting the reconstructive surgery for the soft tissue defect, the fracture was fixed using a K-wire and the defect was partially closed. The lateral supramalleolar flap of size 9*9 cm was used to cover the soft tissue defect of the dorsum of the foot. Although the flap was in place a thin line of epidermolysis was observed at the distal margin, it was later treated conservatively. The skin graft at the donor site healed within time. During the follow-ups for 4 months, the patient reported no issues in the functioning of the flap. However, the flap was bulky and so the patient required larger footwear compared to the other foot.

Case 4- the defect in the distal medial leg

A male patient of 50 years of age, underwent surgery utilizing an intramedullary nail to fix the 3rd fracture in the tibia of the left leg. An implant was placed in the region during the surgery which was later exposed. The area that was wounded due to the event was debrided, using a lateral supramalleolar flap of size 9*7 cm the soft tissues were covered completely, and healing of the donor site also took place within time. In the follow-ups for 3 months there were no complications reported.

Case 5 – the defect calcaneal tendon region

A male patient of 21 years had necrosis in the Achilles tendon and soft tissue defect in that area. Firstly, the tendon was reconstructed and then using a later supramalleolar flap of size 9*7 cm the tissue defect was covered. Although the flap settled and the donor site healed, later on, there was a loss of the flap which gradually took place over the period of 2 weeks. The wounded area due to the loss of flap was debrided, and it was allowed to granulate after which a graft of split skin was placed on it. During the follow-up for the next 18 months, the patient reported no functional issues.

Results

There were 40 reconstructive surgeries performed to treat the soft tissue defect in the region surrounding the ankle, the lateral supramalleolar flap was used in the surgeries. The follow-up of the patients ranged from 1 month to 18 months with an average follow-up of 4.8 months. In 34 cases the flaps settled well and the six surgeries performed in the region of the calcaneal tendon lost their flaps. The repeat surgery was performed for the patients who lost their flap, the wound was first debrided, granulation was allowed and the split skin graft was used to cover the area. The donor sites of the flaps healed well in all the patients.

Table 1. General data of 40 patients

Age	
Factors	**Frequency**
15-25	06
25-45	20
45-65	10
65<	4
Site of defect	
Tendocalcaneal	06
Anterior ankle	02
Lateral malleolus	08
Distal medial leg	08
Dorsum of foot	04
Lateral malleolus	08
Distal anterior leg	06
Etiology	

Trauma	28
Silencer burns	02
Implant infection	04
Diabetic infection	04
Pressure sore	02
Results	
Healed	34
lost	06
Side	
Left leg	34
Right leg	06
Repeat surgery	
Not required	34
Debridement and skin grafting	06
Duration of follow-up	
0 -5 months	30
5-10 months	06
10-15 months	00
15-18 months	04
Type of flow in the flap	
Retrograde	06
Prograde	34

Discussion

In the present study, the lateral supramalleolar flaps gave a good success rate in the reconstructive surgeries of the soft tissue surrounding the ankle area for a wide range of aetiology. The probable reason for the loss of the flap in the talocalcaneal region is due to the retrograde flow. In a study, venous congestion was a special complication that was reported [8, 9]. The venous congestion occurs due to valvular incompetence. Due to the position of the flap, it is possible that the arterial blood flow in the flap did not have enough pressure that could move the venous blood against gravity which caused stagnation of the blood. However, the reason for the flap loss in 2 cases out of six was the residual infection [10]. The four other cases of flap loss could be attributed to the above-mentioned reason which is venous stagnation.

Conclusion

From the study, we can conclude that the lateral supramalleolar flaps used in reconstructive surgeries for soft tissue defects in the region of the ankle are efficacious. The flaps have better efficacy when they have the prograde type of blood flow due to the contribution from the peroneal artery's perforated branch. This flap can be used for reconstructing the soft tissue defect that occurred due to a wide variety of etiology. However, when the flaps are used in calcaneal tendon regions with mixed or retrograde type of flow the special complication of venous congestion should be considered.

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