# REDUCING THE RISK OF VENOUS CONGESTION IN REVERSE SURAL ARTERY FLAP BY POSTOPERATIVE COMPRESSION BANDAGE TECHNIQUE

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**ABSTRACT**

**Objective:** To determine the role of postoperative compression dressing in reducing venous congestion in reverse sural artery flap.

**Methods:** This study was carried out at the Burns and Plastic Surgery Unit at Hayatabad Medical Complex, Peshawar. Study design was quasi experimental and duration of study was two years from December 2019 to December 2021. The sample size was 32. Patients of both genders of age 15-50 years were included. Patients in whom reverse sural flap was done were observed for two weeks for venous congestion. The collected data was organised and analysed.

**Results:** There were a total of 32 cases where the compression bandage technique was used. Mean age of the patients was 32.5 years. All of the patients presented with wounds around the ankle and dorsum of foot. Compression dressings were removed on the first follow-up visit to assess the flap. There was no flap loss. There was no distal flap necrosis in any of the flap. No venous congestion was observed in any of the flap.

**Conclusion:** Postoperative compression dressing technique was successful in decreasing the complication of venous congestion in reverse sural artery flap.

**Keywords:** compression, venous congestion, compression dressing.

## INTRODUCTION

Reconstruction in the lower limb wounds is usually very challenging. Every area of the lower limb has its own unique challenges. Soft tissue defects around the foot and ankle region often presents a problem. Tendons and bones are frequently exposed after trauma[1].

Sural artery flap is versatile flap[1,2.] The flap has reliable blood supply and consistent anatomy[2, 3]. The ease of surgical technique makes it the first choice in centres which lack microsurgical expertise.

The most dreaded complication of reverse sural artery flap is complete flap necrosis[4, 5]. Fortunately, it is not very common, however, partial marginal necrosis and venous congestion are very common complications of this flap[6, 7, 8]. Incidence of venous congestion reported by different studies can range from 26% to 50%[4, 7, 9, 10].

Venous congestion is commonly encountered in the reverse sural artery flap. This mostly occurs because the flap is turned at 180 degrees in most cases. This strains the venous outflow and gives rise to venous congestion. One study reported using special splint to counter this problem[11]. Splint may decrease the risk of venous congestion, but more work is needed eliminate this risk. Failure rate of the reverse sural artery flap can be decreased if the problem of the venous congestion is prevented. We describe a simple dressing technique which can help decrease the risk of venous congestion in patients who undergo reverse sural artery flap for heel defects.

The aim of this study is to observe the role of postoperative dressing in reducing venous congestion in reverse sural artery flap.

## METHODOLOGY

This Quasi experimental study was conducted at the Burns and Plastic Surgery centre, Hayatabad Medical Complex, Peshawar for a

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period of two years, from December 2019 to December 2021. A non-probability consecutive sampling technique was used to estimate the causal impact of our intervention (compression).Sample size was 32 under WHO calculator. Comparison between groups was done without randomization. After approval from hospital ethical committee and consent from patients, data was collected.

Patients with wounds around the ankle and foot in whom reverse sural flap was done were included. Patients with cardiovascular disease, hypertension, diabetes mellitus, recurrent foot wound and smoking history were excluded from the study.

**Technique** Based on the peroneal perforator, the flap can safely extend 5 cm distal to the popliteal skin crease. Flap planning implies thorough identification of perforators overlying the lateral malleolus using Doppler probe [12].

Patient is placed in the prone position and flap is marked on the skin; centred on the raphe between the two gastrocnemius muscle heads. The skin incision starts on the superior border of the flap and continued in the sub fascial plane until the sural nerve is identified. The incision then goes on the medial and lateral borders of the flap. The flap is then elevated sub fiscally, taking 2-3 cm of skin paddle up to the 5cm mark from the lateral malleolus. In cases which need debridement, the flap is delayed and inset after 72 hours. We prefer to graft the donor site instead of primary closure.

The role of elastic bandage is to supplement the physiological role of skin in the lower limb. Skin provides compressive force to the lower limb and helps with the venous return. During reverse sural artery flap, the compressive force of skin is compromised which decreases venous return. In our experience, when a window is created across the ankle for monitoring the flap, that window is a break in the pressure that is applied to the lower limb and predisposes the fragile blood supply of the flap to undue stress. Another factor that can hamper venous drainage is the tension applied while wrapping the elastic bandage around the leg. The tension across the elastic bandage translates into the compressive pressure on the leg. According to the Laplace's Law[13]), pressure is inversely proportional to the radius. This means that compressive force applied by the bandage decreases as the circumference of the leg increases, provided that the tension with which the bandage is applied remains constant. The aim of elastic bandage is to give a constant compressive force in order to help the venous drainage..

The mechanism behind the mechanical compression is related to decrease in the transmural pressure within the vein wall by increasing the peri-venous tissue pressure. This external pressure provides force to move fluid from the interstitial space back into the intravascular space as well as prevent reflux[14].

In a recent study by Mosti et al where compression pressure was applied for lower extremity ulcer treatment, it was concluded that with pressure (20-40mm Hg) blood flow actually increases close to ulcer, improve transcutaneous oxygen measurements and venous return.

We hypothesize that venous congestion can be prevented by keeping the pressure of the elastic bandage constant. This was done by applying more tension while wrapping the compression bandage across the foot, the tension was further decreased across the ankle region and it was incrementally decreased as the diameter of the leg increased. We propose that this incremental decrease in the tension of the compression bandage keeps the pressure on ankle and leg constant and decreases the risk of venous congestion.

## RESULTS

There were total of 32 cases in which 30(93.7%) were males while 2(6.25%) were females.Mean age of the patients was 32.5 years.All of the patients presented with injuries around the ankle and foot and all of them have compression technique after reverse sural artery flap. Compression dressings were removed on the first follow-up visit to assess the flap along with stich/suture removal. There was no flap loss. There was no distal flap necrosis in any of the flap. No venous congestion was observed in any of the flap. Post operatively after two weeks donor site skin graft dressing was removed. Pedicle was divided three weeks post operatively.

**Table 1. Post compression bandage assessment**

| Assessment | n(%) |
|---|---|
| Flap loss | 0(0%) |
| Flap necrosis | 0(0%) |
| Venous congestion | 0(0%) |

**Figure 1: One week post op of wound**

**Figure2: Dorsum of foot**

**Figure 3: Wound at Left heel**

**Figure 4: Immediate post op sural flap at Right heel**

**Figure 5: Showing compression bandage per op**

**Figure 6: Two days follow up**

## DISCUSSION

In our study, there was significant decrease in the incidence of venous congestion following postoperative incremental compression bandage in reverse sural arterial flap. Same findings are reported by Suh HP et al[18] .Some studies have reported surgical modifications to address this issue [10, 15]. We have used the conventional surgical techniques but the only difference was the change in technique of pressure dressing. Some researchers found that flap failure has significant statistical association with peripheral vascular diseases, smoking and diabetes mellitus [16]. However, patients with these risk factors represent a significant demographic of the population needing this flap and due to those risk factors, they are poor candidates for free flap. These are the risk factors that usually leave the surgeon with no other option for foot and ankle defects except for the sural flap.

The decrease in cases of venous congestion can also have an impact on the rate of flap loss and may help guard against minor complications like infection of the flap. This statement is supported by other study too [20].

Tight compression bandage was studied in relation to the arterial perfusion of the leg in patients with atherosclerotic disease and venous ulcers. It was shown that the tight compression bandage improves the blood flow to the ulcer. The amount of increase was greater with bandages applying 20-40mmHg of pressure[19].This study also reveals that for patients with an ABI >0.5 and an ankle pressure >60mmHg bandage, applying up to 40mmHg did not reduce arterial perfusion and actually improved laser Doppler flowmetery (LDF) at the local ulcer level. 20 – 40 mmHg pressure can easily be applied by the elastic bandages and tolerable by the patient [16].

This study is limited in the scope of its results by the fact that it is not a comparative study. Further observational studies and interventional studies need to be done in order to establish the causal link between the risk reduction of venous congestion and elastic bandage incremental tension technique. There is also need to study incremental tension bandage technique in patients undergoing different surgical modifications of sural artery flap.

## CONCLUSION

Compression dressing is successful in decreasing the complication of venous congestion in reverse sural artery flap.

**Role and contribution of authors**:

Dr Fahimullah (Manuscript Writing, Data Collection, Drafting)

Dr Shahzad Ahmad (Manuscript Writing, Statistics Analysis, Proof Reading, Drafting).

Dr Qazi Amad Ali (Data Collection, Proof Reading).

Dr Nayab Orakzai (Data Collection, Statistic Analysis, Computer Work).

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