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Reverse sural flap – A feasible option for oncological defects of the lower extremity, ankle, and foot: Our experience from Northeast India

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Abstract

Background: Soft-tissue management around the lower third of the leg and foot presents a challenge to the surgeon. To achieve local control of tumor, additional surgical margins are required, thus creating large soft-tissue defects. The reverse sural artery flap (RSAF) is a popular option for many of these defects. **Materials and Methods:** This is a retrospective study of 26 patients who underwent resection of tumor around the lower leg, ankle, and foot, and reconstruction with RSAF was performed at our institute from 2012 to 2018. **Results:** Among the 26 studied patients, aged between 22 and 71 (mean age: 50.8) years, 5 were female and rest were male. The most common site of involvement by tumor was heel (42.3%), followed by sole (26.9%). The most common histopathological diagnosis was melanoma (61.5%), followed by squamous cell carcinoma (26.9%) and soft-tissue sarcoma (11.5%). **Conclusion:** The distally based sural flap is a reliable flap for the coverage of soft-tissue defects following oncological defects of the distal lower extremity and foot.

Key words: Free flap, melanoma, reverse sural flap

Introduction

Soft-tissue management around the lower third of the leg and foot presents a challenge to the surgeon. To achieve local control of tumor, additional surgical margins are required, thus creating large soft-tissue defects. Defects located in the weight-bearing areas are difficult to be reached by conventional local flaps. The ideal reconstruction should provide sufficient tissue with minimal morbidity and acceptable recovery. Free flap transfer has often been accepted as the operation of choice in cases where the local tissues of the foot and ankle were severely compromised.[1] Further progress in the studies of the microsurgery, especially the concept of angiosomes,[2,3] neurovascular flap technique, and neuroadipofascial pedicled flaps,[4] has been alternative popular solutions. The reverse sural artery flap (RSAF) is a popular option for many of these defects. The distally based sural artery flap, first described as a distally based neurocutaneous flap by Masquelet *et al*.,[5] is skin island flap supplied by the vascular axis of the sural nerve.

Materials and Methods

This is a retrospective study of 26 patients who underwent resection of tumor around the lower leg, ankle, and foot, and reconstruction with RSAF was performed at our institute from 2012 to 2018.

Surgical technique

The sural neurovascular flap[6-9] is a fasciocutaneous flap that is raised along the course of the sural nerve [Figure 1]. Its blood supply depends on a constant sural artery that accompanies the nerve along its very proximal course. Distally, it depends on perforators coming from the peroneal artery. The flap is designed in the proximal posterior region of the leg, and the pivot point for this flap should be 5 cm posterior and superior to the lateral malleolus.[9,10] The true pivot point was intraoperatively decided based on the direct identification of perforators. We do not use routine Doppler ultrasound to identify perforators and rely on the anatomical landmarks. Initially, we used to tunnel the pedicle, but as it causes more pressure on the pedicle, we stopped using tunneling and put split-thickness skin graft (SSG) to cover the pedicle. The donor site was closed primarily or using SSG based on the size of the defect.

There was no plastic surgeon at our institute till June 2018, so flap reconstruction was done by surgical oncologists in 24 cases.

Results

Among the 26 studied patients, aged between 22 and 71 (mean age: 50.8) years, 5 were female and rest were male. The most common site of involvement by tumor was heel (42.3%), followed by sole (26.9%), lower leg, and medial aspect of the foot [Figure 2]. The most common histopathological diagnosis was melanoma (61.5%), followed by squamous cell carcinoma (26.9%) and soft-tissue sarcoma (11.5%) [Figure 3]. Out of these, 3 cases of recurrent melanoma were there [Table 1]. Surgical site infection occurred in 2 patients (7.6%) that was treated by antibiotics and dressing. Partial necrosis occurred in 4 patients (15.4%) that was managed by debridement and dressing and it was healed by secondary intention. Venous congestion occurred in 10 patients mostly with tunneling of flap and it was managed conservatively using limb elevation. One patient developed a chronic ulcer due to some trivial trauma that was not noticed because of numbness. It was managed conservatively and took 3 months to heal [Table 2].

Discussion

Reconstruction of defects in the lower leg, ankle, and foot is a big challenge for a surgeon. Resection of tumor with oncological safe margins in this area creates a large defect with very few options available for reconstruction. Free flaps are an acceptable but complex reconstructive option.[11] It is costly,

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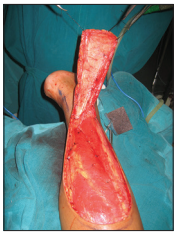

Figure 1: Elevation of reverse sural flap

Figure 2: Defect over medial aspect of tumor after tumor excision and after 6 months

Figure 3: Melanoma over the heel, after flap reconstruction, after 6 months of follow-up

Table 1: Clinicopathological factors

Variable	Result
Age in mean years (range)	50.8 (22-71)
Sex	
Males	21
Females	5
Site	
Heel	11
Sole	7
Lower leg	5
Medial part of foot	3
Histopathological diagnosis	
Malignant melanoma	16
Squamous cell carcinoma	7
Soft-tissue sarcoma	3
Primary versus recurrent	
Primary	23
Recurrent	3

Table 2: Complications

Variable	Result
Surgical site infection	2
Partial necrosis	4
Chronic ulcer	1

needs special instruments and microsurgery training, and is also time-consuming. These factors are very important while choosing reconstructive options at many centers, especially in developing countries, because resource constraint always an issue there.

The reverse sural flap is a good and viable option for reconstruction of these defects. Advantages of the RSAF over more complex options include ease of dissection, high reliability, low profile and bulk, and preservation of the major lower extremity arteries.[8,10,12] Compared with other local and regional flaps, the reverse superficial sural artery flap has a larger arc of rotation than the extensor digitorum brevis and peroneus brevis muscle flaps,[13-15] and long periods of immobilization and difficult positioning are avoided unlike the cross-leg flap.[16-18] On reviewing the available literature, we can find many authors who recommend the use of the reverse sural flap,[19-23] while others inform poor results.[24]

In our study, most of the flaps were done by surgical oncologists and not by a plastic surgeon. The rate of complications in our study was similar as given in literature. In our opinion, it is a very useful and easy to learn procedure that can be done by a surgical oncologist at peripheral centers also where a plastic surgeon is not available. Many authors believe that the RSAF is not suitable for the weight-bearing area due to the numbness of the heel. One of our patients developed chronic ulcer because of numbness. Proper counseling of the patients before surgery helps the patients to overcome this problem, which finally becomes less problematic in few months. It is also very important for patients in India where many people walk barefoot in many regions of the country. Hence, they should use slippers while walking and check the area even for trivial trauma.

On reviewing the literature, we found that most of the RSAFs were done in cases of trauma and other nonmalignant causes[25,26] though some authors[21,27] have described it for melanoma of the foot. We have done RSAF for soft-tissue tumor and squamous cell carcinoma as well.

Tips

1. Raise the short saphenous vein with the flap
2. Pedicle width should be at least 4 cm
3. Raise the flap using meticulous dissection
4. Avoid tunneling and cover the pedicle with SSG to decrease the pressure
5. Preoperative counseling to overcome the issue of numbness.

Conclusion

The distally based sural flap is a reliable flap for the coverage of soft-tissue defects following oncological defects of the distal lower extremity and foot. It is an easy to learn flap and can be done in resource constraint scenario.

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Conflicts of interest

There are no conflicts of interest.

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