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OPERATIVE TECHNIQUES

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Cross-legged modification for medial sural artery perforator flap harvest

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Abstract

When thin and pliable free tissue is needed, the medial sural artery perforator (MSAP) flap provides an excellent option with minimal donor site morbidity. However, among its pitfalls include difficult patient positioning and surgeon ergonomics throughout the harvest. We describe a novel positioning technique that may significantly improve surgeon ergonomics and ease of MSAP flap harvest. A cross-legged modification may eliminate many of the issues associated with the classic frog-leg position. While the patient is cross-legged, the surgeon is afforded a normal field of view that is closer to their body, while simultaneously providing support to the lateral side of the gastrocnemius muscle. This pictorial essay describes this positioning technique and subsequent harvest. By incorporating a more ergonomic cross-legged position during flap elevation, many of thedrawbacks of the MSAP flap could be eliminated.

KEYWORDS

calf flap, head and neck reconstruction, medial sural artery, MSAP flap, perforator flap

1 | INTRODUCTION

The medial sural artery perforator (MSAP) flap was first described by Cavadas et al. in 2001.[1] While it has largely been used as an option for limb reconstruction in the plastics literature, it is also an excellent option for oral cavity reconstruction when thin and pliable tissue is required, with similar utility to the radial forearm free flap (RFFF).[2] One of its greatest strengths is the minimal donor site morbidity incurred by the patient. Despite this utility, widespread adoption has been limited in part due to the tedious nature of the harvest. This can be attributed to the smaller caliber of the perforating vessels, but also due to the difficulty in patient positioning.

The most commonly described method for MSAP harvest has the patient in a frog-leg position. Though harvest can be done from either side of the bed, both options have significant ergonomic issues. When harvesting on the contralateral side (as is more common), there is a significant gap between the surgeon and operative field. Conversely, an ipsilateral harvest requires the surgeon to crane their neck over the leg, especially when performing the proximal portion of the dissection. In both instances, a lack of tension underneath the gastrocnemius muscle also makes dissection more difficult. Here we describe a simple and novel patient position that improves these issues.

2 | OPERATIVE TECHNIQUE

2.1 | Classic positioning

The classic positioning used for MSAP harvest is with the patient supine and hip abducted (Figure 1A). The knee is

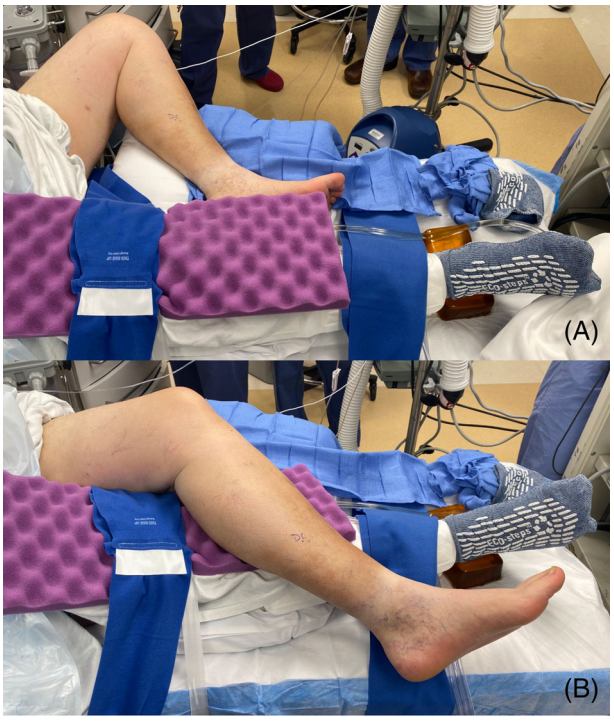

FIGURE 1 Demonstration of classic frog-leg position (A) for harvest of a left sided medial sural artery perforator (MSAP) flap and modified "cross-legged" harvesting position (B). In the "cross-legged" position, the left leg is crossed over the right, providing a natural cushion and medialization of the gastrocnemius muscle while simultaneously bringing the leg closer to the surgeon's operative field. [Color figure can be viewed at wileyonlinelibrary.com]

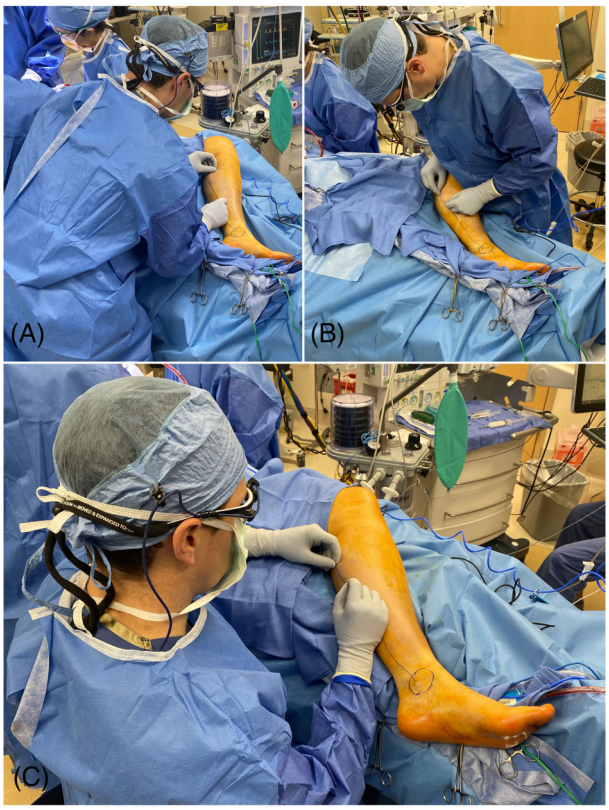

FIGURE 2 Demonstration of intraoperative ergonomics during medial sural artery perforator (MSAP) flap harvest in the classic frog-leg position from the contralateral side (A) and ipsilateral side (B), as well as modified "cross-legged" harvesting position (C). [Color figure can be viewed at wileyonlinelibrary.com]

flexed at an approximately 90° angle and kept in a frog-leg position.[3,4] Harvest is typically done from the side contralateral to the harvested leg, but can also be done from the ipsilateral side. Each position has its own ergonomic challenges—harvest from the contralateral side results in a significant gap between the surgeon and the operative field (Figure 2A), while harvest from the ipsilateral side creates a difficult angle for the surgeon to visualize the proximal pedicle (Figure 2B). Both cases result in awkward ergonomics that can cause strain on the operator's neck and back. Other positioning techniques have tried to mitigate these issues through the use of a split operating table,[5] however this comes with its own set of challenges with regard to room preparation and setup.

2.2 | "Cross-legged" position

We have used a simple positional modification that may significantly mitigate the difficult ergonomics that surgeons encounter during MSAP harvest. By placing the patient in a cross-legged position, with the operative leg placed in a lazy cross-over atop the nonoperative leg, several existing harvest issues are addressed (Figure 1B). Here, the hip of the operative leg is kept neutral or placed in light abduction. The knee is slightly flexed and the operative lower leg is draped over the contralateral leg. In doing so, the contralateral leg creates a natural bolster underneath the operative leg, helping to keep the operative field medialized and in view. Only the lateral aspect of the operative calf is in contact with the contralateral leg. Still, to ensure no pressure injury or damage to the peroneal nerve is seen, foam padding is placed between the contralateral knee and operative leg. Care should also be taken to properly position the genitals in male patients to avoid pressure injury. The entire operative leg is prepped and a drape is placed over the contralateral leg. A tourniquet can be applied to the thigh per surgeon preference. Once the harvest is complete, the leg can be easily repositioned and returned to a straight resting position.

2.3 | Flap harvest

Typical landmarks for the MSAP flap include a line drawn between the mid-popliteal fossa and posterior

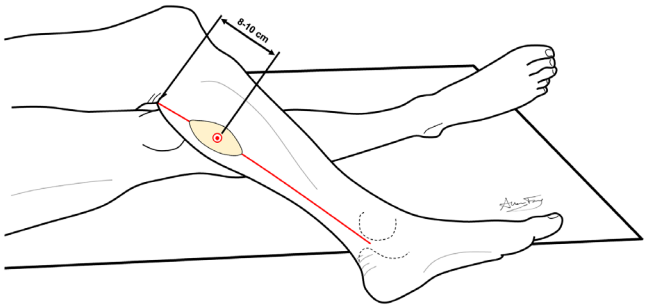

FIGURE 3 Graphic representation of the modified "cross-legged" harvesting position for the medial sural artery perforator (MSAP) flap. A line connecting the mid popliteal crease to the posterior aspect of the medial malleolus (anterior to the calcaneus) approximates axis along which dominant perforators may be found. Dominant perforators are typically seen along this line, 8–10 cm from the popliteal crease. Elliptical skin paddles incorporating the perforators are designed along this line. [Color figure can be viewed at wileyonlinelibrary.com]

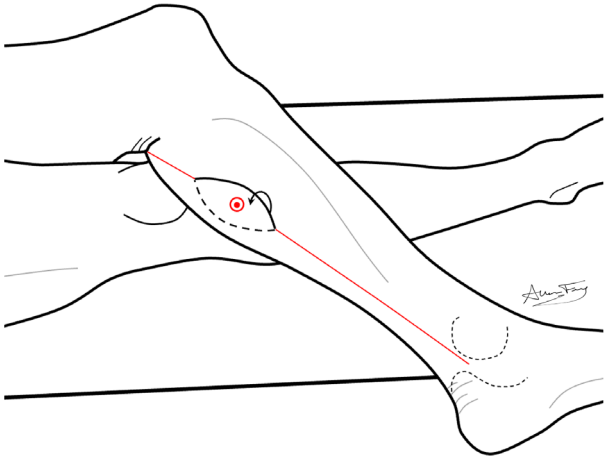

FIGURE 4 Graphic representation of the initial steps of medial sural artery perforator (MSAP) flap dissection. The solid line along the anterior skin paddle represents the initial cut—this is reflected posteriorly to reveal the perforators during subfascial dissection along the gastrocnemius muscle. [Color figure can be viewed at wileyonlinelibrary.com]

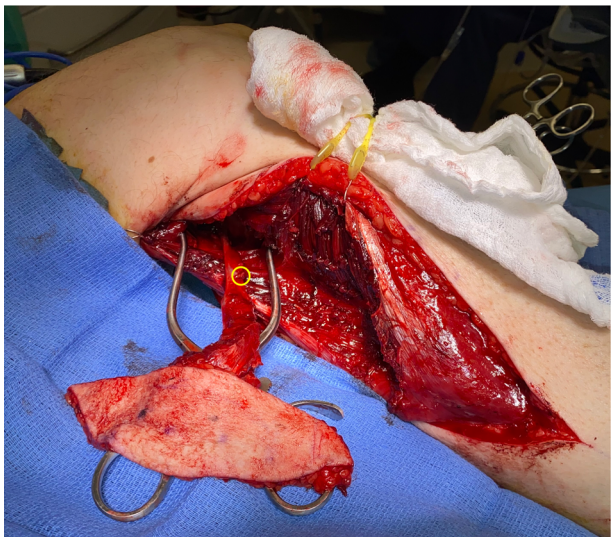

FIGURE 5 Close up view of a dissected medial sural artery perforator (MSAP) flap depicting the ligated medial branch of the medial sural artery (yellow circle) at the branching location of medial and lateral branches. A weitlaner retractor is used during proximal dissection to aid with retraction and visualization. [Color figure can be viewed at wileyonlinelibrary.com]

FIGURE 6 Completed dissection of medial sural artery perforator (MSAP) flap in the "cross-legged" position. [Color figure can be viewed at wileyonlinelibrary.com]

aspect of the medial malleolus. The dominant perforators can typically be found on this line, 8–10 cm from the popliteal crease (Figure 3).[2,6] While only one perforator is necessary, multiple perforators can be incorporated into the skin paddle to increase blood supply or to allow the design of a chimeric flap.[7] An elliptical skin paddle that encompasses the desired perforator can be created on this line. Should greater pedicle length be required (up to 15 cm), the perforator can be placed eccentrically along the skin paddle by designing the skin paddle more distally. In general, the maximum width of this skin paddle that will allow primary closure is around 6 cm. However, if a wider skin paddle is required, this can be readily skin grafted with a negative pressure dressing. The harvest is started by cutting the anterior aspect of the skin paddle and reflecting this posteriorly (Figure 4). A subfascial dissection plane along the gastrocnemius is typically used for our purposes as this provides improved visualization of the perforators. Once the perforator is isolated, skin incision can be continued along the perforator axis toward the popliteal crease. During perforator dissection, care should be taken here as the perforators are small and take a tortuous path through the muscle. Dissection is

FIGURE 7 Depiction of an inset medial sural artery perforator (MSAP) flap for partial glossectomy. In this case, the patient had prior cutaneous malignancies throughout both arms, precluding the use of his upper extremities as donor sites. [Color figure can be viewed at wileyonlinelibrary.com]

continued along the medial sural artery and should be continued proximal to the branching point of the medial and lateral branches to ensure both adequate pedicle length and vessel caliber (Figure 5). In this area, weitlaner retractors are useful as dissection continues toward the popliteal vessels. Figure 6 shows the finished dissection performed in a cross-legged position. In the authors' experience, a total of 8 simultaneous MSAP harvests were performed in the modified "cross-legged" position with 100% success rate. Notably, one additional patient could not be positioned for an MSAP due to bilateral hip and knee replacements—here a RFFF was used. All patients underwent postoperative physical therapy evaluation with full mobilization on postoperative day 1 and no peroneal nerve injury or deficits during hospitalization or at initial postoperative visits.

3 | DISCUSSION

When considering the reconstructive surgeon's armamentarium, the MSAP flap represents an excellent option when thin and pliable tissue is needed. It has been described for many purposes, but is especially useful for oral cavity reconstruction when the donor site morbidity of the RFFF is unacceptable (Figure 7). Although other perforator flaps like the anterolateral thigh free flap may have minimal donor site morbidity and simple harvesting positions, the MSAP flap's thin profile may be better suited for certain defects.[8] Despite its many advantages, optimizing patient positioning during MSAP flap harvest has been a persistent issue that has limited more widespread adoption. Some solutions have been proposed, but these have often required specialized equipment or significant changes to the preoperative setup. Some groups have advocated for a prone position during harvest, but this would require a single team approach, complete patient repositioning (in head and neck cases), and create a significant increase in total operative time.[9] Others have advocated the use of a split operating table to improve access during harvest. However, this also has the added burden of operating room equipment that may not be widely available and added setup time.[5] By implementing a simple cross-legged position for the harvest, no additional equipment or preoperative setup is needed. Many of the ergonomic challenges associated with MSAP harvest are also eliminated while allowing ample room for a 2-team approach.

4 | CONCLUSION

The MSAP is an excellent free flap option when thin and pliable tissue is required. Difficulty with patient positioning and surgeon ergonomics have played a role in its more limited use when compared to other donor sites. Herein we describe a simple and novel positioning method—a "cross-legged" modification—to optimize surgeon comfort and ease of dissection.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

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