Secondary contouring of flaps

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Perforator flaps are becoming increasingly common, and as primary thinning techniques are being developed, the need for secondary contouring of flaps is decreasing. However, many reconstructive flap procedures still incorporate secondary debulking to improve the functional and aesthetic outcomes. Direct excision, liposuction, tissue shaving with an arthroscopic cartilage shaver, and skin grafting are the four major methods used for secondary debulking.

Direct excision is primarily applied in flaps where the skin is redundant, even though the volume is not excessive. However, due to the limited range of excision, performing a staged excision is recommended. Liposuction can reduce the amount of subcutaneous tissue of the flap and protect the vascular pedicles. However, the main drawback of this method is its limited ability to remove fibrotic tissues, for which the use of a shaver may be more convenient. The main drawback of using a shaver is that it is difficult to simultaneously remove excess skin. Skin grafting enables the removal of sufficient excess tissue to recover the contour of the normal limb and to improve the color match, facilitating excellent aesthetic results.

Keywords Surgical flaps / Perforator flap / Lipectomy / Reoperation / Contouring

INTRODUCTION

The advent of the perforator flap technique has significantly improved the aesthetic results in reconstructed areas by enabling the use of relatively thin flaps. The need for secondary contouring of flaps is decreasing. However, many reconstructive flap procedures still incorporate secondary debulking to improve the functional and aesthetic outcomes. Direct excision, liposuction, tissue shaving with an arthroscopic cartilage shaver, and skin grafting are the four major methods used for secondary debulking.

Direct excision is primarily applied in flaps where the skin is redundant, even though the volume is not excessive. However, due to the limited range of excision, performing a staged excision is recommended. Liposuction can reduce the amount of subcutaneous tissue of the flap and protect the vascular pedicles. However, the main drawback of this method is its limited ability to remove fibrotic tissues, for which the use of a shaver may be more convenient. The main drawback of using a shaver is that it is difficult to simultaneously remove excess skin. Skin grafting enables the removal of sufficient excess tissue to recover the contour of the normal limb and to improve the color match, facilitating excellent aesthetic results.
posuction is generally performed, but fat or muscles may also be partially excised if the flap has excessive subcutaneous tissue or muscle tissue. If the flap tissue is excised too early after the operation, the risk of necrosis of the flap increases. The excision of pedicles or perforators must be done carefully, as this may also cause necrosis of the flap. The authors recommend direct excision of redundant flap tissue with incision of the flap along the long axis. It is not recommended to perform incision on the tip of the flap as a U or V shape. If excision is necessary in multiple directions, a staged excision is recommended, with an interval of at least 6 months between each procedure (Fig. 1).

LIPOSUCTION

Liposuction should be performed after all wounds and edema from the flap operation have subsided to avoid excessive correction. Liposuction is safe to perform after a minimum of 3 months postoperatively and when the flap is viable without its main vascular pedicles [1,4]. However, liposuction around the pedicles must be performed with care, as reports have described flap necrosis due to damaged vascular pedicles as long as 3 months after the operation [5]. Tumescent fluid containing epinephrine is injected preoperatively to reduce bleeding. The fluid...
must be injected evenly throughout the subcutaneous fat layer of the flap, until the contour of the flap starts to harden and the color of the skin starts to become blanched (Fig. 2) [1]. Liposuction must avoid the pedicle area and the anastomotic site. Prominent excessive skin after liposuction should be excised partially around the margin of the flap so that the blood flow from the periphery is not blocked (Fig. 3) [6,7]. Such an excision may be performed after waiting a couple of months post-surgery to see if the contour improves naturally from contraction of the skin, rather than performing the excision immediately after liposuction [5]. Liposuction can be safely performed when secondary debulking is planned with an adipofascial flap and skin graft, or with a local flap, such as a distally-based sural flap. Ultrasound-assisted liposuction causes less damage to the tissue and blood flow from negative pressure and mechanical stimulation, although it may cause damage due to the heating effect (Fig. 4) [1,8,9]. The advantages of flap contouring through liposuction are reducing the amount of subcutaneous tissue throughout the flap and protecting the vascular pedicles [1]. It could also maintain dermal blood flow and help manage the contouring of the surrounding tissues. The drawback of this method is its limited ability to remove highly fibrotic tissues [1,10]. Gentle compressive dressing or 3 to 5 days of suction draining should be performed postoperatively to prevent seroma and hematomas.
Tissue shaving with an arthroscopic cartilage shaver may be more convenient than liposuction for removing fibrotic tissues [11,12]. This method is particularly useful on head and neck areas treated with radiotherapy. When contouring the flap with a shaver, 3–5 mm of subcutaneous tissue should be left to prevent bleeding, skin necrosis, and depressions [11]. Operating in the oscillating mode is more convenient than doing so in the rotating mode, and the tip of the shaver should face downward during the operation [3]. Cutting the pedicle area should be avoided to prevent hemorrhage. The drawback of this method is that it is difficult to remove excessive skin at the same time. Removing the skin simultaneously is highly likely to lead to skin necrosis, as hypodermic microvessels are removed together. The excessive skin may contract during the healing process, so excision is recommended if the redundant skin is still visible 3 weeks after shaving (Fig. 5) [11,12].

SKIN GRAFTING

Common complications after free flap operations include excessive flap volume, inconsistent skin color, reduced flexibility of the skin surface, and reduced sensation of the skin. In theory, a free flap can be as thin as 3–4 mm, but that is not always possible. Secondary measures such as staged excision and liposuction may resolve these complications to a certain degree, but successful results may not be possible in a single-stage operation. Liposuction and excision require leaving at least 5 mm of tissue to avoid necrosis of the flap, which may seem thick in areas such as the head, ankles, and dorsum of the foot. Another way to cut down on excess in the flap is to remove all layers of skin from the flap, followed by removing the fat or muscle tissues under the flap and re-grafting the skin of the flap, which can be done in a single stage [13,14].

Direct excision of the subcutaneous tissue and fat from the fascial layer should be performed after applying a tourniquet and...
harvesting full-thickness skin from the flap. Tangential excision is performed on the muscular part of the myocutaneous flap, if necessary. The tourniquet is loosened to confirm the vascularity of the recipient bed through the presence of numerous pinpoint bleeding spots in the debulked flap area. Vascular pedicles can be well preserved if the fascial layer is included in the flap when it is elevated, and if the fascia is left in place after removing subcutaneous tissues [15]. Grafting of the harvested full-thickness skin onto the raw surface of the fascia is performed after hemostasis. The full-thickness skin grafting procedure enables the sufficient removal of excess tissue to recover the contour of the normal limb and to improve the color match, enabling excellent aesthetic results. The skin also maintains its softness and pliability, as the flap preserves the fascial layer [16]. Sensory outcomes, as checked by 2-point discrimination, have also reported to be enhanced (Fig. 6).

CONCLUSIONS

Functional and aesthetic issues may arise due to the thickness of the flap after reconstructive flap surgery, and secondary debulking can contribute to improved outcomes. This paper has suggested the use of four of the many methods of secondary contouring (Table 1). Using a thin flap in the first place may be ideal for the operation, but when impossible, secondary flap debulking can enhance both functional and aesthetic outcomes.

NOTES

Conflict of interest
No potential conflict of interest relevant to this article was reported.

Ethical approval
The study was performed in accordance with the principles of the Declaration of Helsinki.

Patient consent
The patients provided written informed consent for the publication and the use of their images.

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