A new way to pre-expand the thoracodorsal artery perforator flap: Expansion under the muscle

Dear Sir,

Tissue expansion has been widely used as a tool of flap pre-fabrication to increase flap dimension and aiding donor site primary closure. Recently, its application has been extended to cutaneous perforator flaps. The current technique of perforator-based expansion is to place the expander near the perforator over the muscles, which increases the risks of vessel injuries, and also limits the flap expansion and flexibility of flap harvesting. To solve this problem, we introduced a new way to expand the TDAP flap, by which tissue expander being buried underneath the latissimus dorsi muscle. We found this technique simplified the procedures, meanwhile greatly increased the safety and flexibility of the flap harvesting.

Operative technique

Implantation of tissue expander

The patient was placed in a lateral decubitus position. The incision was made just anterior to the lateral border of the latissimus dorsi or above the superior border of the muscle, according to the donor site availability. The border of the latissimus dorsi was identified. The dissection was undertaken below the muscle. Care should be taken to preserve the tendinous insertion of the latissimus dorsi and protect the vascular bundle coursing under the belly of the muscle. A tissue expander of appropriate size was placed under the muscle. Inflation of the expander was commenced 14 days after the surgery on a weekly basis until adequate volume was achieved.

Pre-expanded perforator flap harvesting

Before the procedure, perforators in the expanded area were detected using an ultrasound Doppler. Then the one with the most prominent Doppler signals was selected as the preferred supply for the flap (Figure 1) Intraoperatively, the previous incision was made down to the deep fascia. Dissection was undertaken subfascially until the previously marked perforators are visualized. Once the reliable perforator was determined, the TDAP flap was designed according to the shape and size of the defect. Then the flap was raised and all other perforators were ligated. The retrograde dissection through the muscle was performed toward the source vessels. Multiple tiny muscular branches were carefully ligated or cauterized with a bipolar coagulator. The dissection proceeded until the hilus where the source vessels enter the muscle was met. The fibrous capsule around the pedicle was included in the pedicle to avoid damaging the vessels. The

Figure 1 Case 1. A 51-year-old female patient suffered severe postburn scar contracture of her left axilla and arm. Physical examination revealed the arm could only abduct 70° and severe circumferential scar contracture in the middle arm. An 800 ml expander has been adequately inflated and flap design marked on the back. A reliable perforator was identified and transmuscular dissection of the perforator derived from the lateral branches of the thoracodorsal artery was carried out. The TDP perforator flap was completely raised.
expander was then removed and the pedicle was dissected to obtain sufficient length to allow the flap transfer without tension. The donor site was closed primarily (Figure 2).

Discussion

The previous reports of pre-expanded TDAP flap are sparse and the expanders were all placed above the muscle. Placing the expander over the muscle around the perforator vessels was a straightforward operative design, but has obvious shortcomings. Firstly, the perforators have to be dissected and expanded prior to the flap transfer. Inadvertent injuries to the fragile perforators can easily happen. Secondly, the fixed location of the perforator restricts expander placement and thus limit expansion efficacy. Furthermore, it decreases the flexibility of flap design, leaving the surgeons few choices while the selected perforator is unfortunately damaged. Finally, the capsule formation during tissue expansion will increase the difficulty of the perforator identification and dissection in the second stage surgery.

Expansion under the muscle can solve all the problems mentioned above. Without the fixed perforator, the donor site can be expanded efficiently by choosing an expander as large as possible. Dissection under the muscle is safe and straightforward, preventing the incidental damage and capsule adherence to the perforators. Meanwhile, expansion under the muscle can still initiate delay effects, producing vessel dilatation, reorientation and revascularization.

The second stage surgery is like any routine perforator flap surgery. We can select any reliable perforators in the expanding dimension, either from the lateral or horizontal branches of the thoracodorsal artery. However, the flap based on the perforators deriving from the lateral branches of the thoracodorsal artery might be the flap design of choice, given the caliber of the perforator, convenience of pedicle dissection, and inconspicuousness of the donor site morbidity.

The perforator was dissected on a dome surface of expander with partial deflation to facilitate the dissection process. After the mother vessels penetrated the muscle, we found the vessels had an intimated relationship with the fibrous capsule. To simplify the dissection and avoid unnecessary vessel damage, we raised the capsule cuff with the vessel forming a vasculocapsule pedicle.

The essence of the perforator flap concept is the functional preservation of muscles in the donor site. One may concern the expansion under the muscle might compromise the muscle function. However, the patients did not complain of restriction of shoulder movement and function loss in those cases. An additional advantage of this technique is that we can harvest the flap without the capsule, in another word, no extra thickness and capsule contracture.

Conflict of interest statement

The authors have no conflict of interest or any financial and personal relationships with other people or organizations that could inappropriately influence (bias) their work. This clinical study was approved by the Ethical Committee of the Plastic Surgery Hospital. CAMS. PUMC.

References


Yuanbo Liu
Mengqing Zang
Qiang Ding
Lingling Guo
Tao Peng

Department of Plastic and Reconstructive Surgery,
Plastic Surgery Hospital, CAMS, PUMC, No. 33,
Badachu Road, Beijing 100144, China

E-mail addresses: ybpumc@sina.com,
liuyuanbo1967@yahoo.com.cn

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