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No need to cut the nerve in LD reconstruction to avoid jumping of the breast: A prospective randomized study☆

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Summary *Background and aim:* It has been shown that the myocutaneous latissimus dorsi flap volume and consistency remain mainly the same regardless the nerve is cut or not in breast reconstruction. It is controversial how big an impact the flap innervation has on the muscle activity of the flap. The aim of the study was to prospectively evaluate the influence of latissimus dorsi flap innervation on the functional and aesthetic outcome of delayed breast reconstruction.
Methods: Between 2007 and 2008, 28 breast reconstructions were performed and randomly divided into denervation group (surgical denervation by excision of 1 cm of proximal thoracodorsal nerve, $n = 14$) and innervation group (thoracodorsal nerve saved intact, $n = 14$). Patients were clinically evaluated and a questionnaire considering functional and aesthetic outcome was filled 1-year after operation. Muscular twitching, pain, tightness, shape and symmetry of the breasts were evaluated. In addition, the mobility of the shoulder joint on the operated side was evaluated and the patients self-estimated the activities of daily living.
Results: There was no significant difference in latissimus dorsi flap twitching, pain and tightness of the breast and symmetry and shape of the breasts between denervated and innervated groups. The shoulder joint mobility was not found to be changed significantly in either of the groups and there were no limitations in activities of daily living.
Conclusions: Thoracodorsal nerve division or preservation does not significantly affect muscle contraction activity of the latissimus dorsi flap and distortion of the breast when latissimus dorsi muscle humeral insertion is also detached. Therefore, both cutting and saving the nerve are

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justified in latissimus dorsi flap breast reconstruction depending on whether the humeral insertion of the muscle is preserved intact or divided and the flap islanded. The study shows that there is no tangible benefit in dividing the nerve when the flap is islanded.

Clinical trial has been registered in public trials registry. Trial registry name is 'The significance of latissimus dorsi flap innervation in delayed breast reconstruction'. Registration number is NCT01239524 and URL is https://register.clinicaltrials.gov.

Introduction

Breast reconstruction with a pedicled myocutaneous latissimus dorsi (LD) flap is a widely used safe reconstruction method with minimal donor-site morbidity.[1–11] It is an appropriate method for a wide group of patients, including very thin women in whom abdominal tissue is not available, or for patients with co-morbidities such as diabetes and smoking that present a higher risk for abdominal flap procedures. It has been found that patients generally express a preference for autologous material and an excellent aesthetic result when choosing the type of breast reconstruction.[12] However, autologous tissue combined with an implant has been found less popular when compared with autologous tissue alone. Short operation time has been preferred over a long operation. Short-term and long-term complication rates are also found important by the patients. Based on these findings, extended LD flap reconstruction, for example, offers the advantages of autologous tissue, while operation times are shorter when compared with those of free-flap breast reconstruction, and long-term complications associated with the use implant material are avoided.

It is controversial if surgical denervation by transecting the thoracodorsal nerve should be performed or not. Some surgeons consider that resection of the thoracodorsal nerve may lead to pedicle injury, especially in delayed breast reconstruction.[9,13,14] It has been assumed that, after denervation, the LD muscle will significantly atrophy and, thus, lose its volume.[7,14–16] In a previous study, we have showed that denervation of the LD flap causes more significant myofiber atrophy than when the flap is innervated.[17] However, marked atrophy was also observed in the innervated flaps, which can be explained by the inactivity of the muscle. The completely detached LD muscle is no longer stretched between the origin and insertion. Interestingly, it was also shown that there was no significant difference in the LD flap thickness between the denervated and innervated groups. This was explained by more pronounced fatty tissue infiltration in denervated flaps. It seems that the volume and consistency of the flap remain more or less the same regardless of whether the thoracodorsal nerve is cut or not. Currently, some surgeons believe that the discomforting signs and symptoms from muscle contraction can be avoided if surgical denervation is performed.[3,6,13,18]

In this prospective, randomized study, the aim was to examine the functional and aesthetic effects of both innervation and denervation of the LD flap, in association with complete division of the LD tendon, in delayed reconstruction.

Materials and methods

Patients

Delayed unilateral breast reconstructions with a pedicled myocutaneous LD flap were performed during the years 2007–2008. The research protocol was accepted by the ethical committee of Tampere University Hospital. Written informed consent was obtained from the patients.

Twenty-eight patients were randomized into two groups: denervated group ($n = 14$) and innervated group ($n = 14$). The average age of the patients was 53 years (range 41–62 years). Average time after primary mastectomy was 2.8 years (range 1–10 years). Sentinel node biopsy was done for eight patients (six in denervated group and two in innervated group) and axillary node clearance for 20 (eight in denervated group and 12 in innervated group) patients. Eight patients (two in denervated group and six in innervated group) underwent postoperative radiation therapy after the initial mastectomy, 18 (six in denervated group and 12 in innervated group) had chemotherapy and 17 (eight in denervated group and nine in innervated group) were given additional hormonal medication.

Surgical technique

The surgical technique for extended LD flap harvest was used.[2–4,19] Muscle was completely transected at both the origin (the humeral insertion) and the distal insertion. In the denervated group, 1 cm of proximal thoracodorsal nerve was excised through a dorsal approach. In the innervated group, the nerve was saved intact. The back wound was closed in two layers and no quilting sutures were used. The insertion of the flap was fixed to the lateral border of the pectoralis major muscle when shaping the breast. A silicone implant was inserted when extra volume was needed (eight in denervated group and five in innervated group). Implant was located on top of the pectoralis major muscle and covered totally or partially with the LD flap.