Anatomic bases of medical, radiological and surgical techniques

Anatomic basis of vascularized nerve graft using the long thoracic nerve

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Received in February 18, 1998 / Accepted in final form November 16, 1998

Key words: Vascularized nerve graft – Free pedicled myocutaneous flap – Long thoracic nerve

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Abstract

Vascularized nerve transplants can lead to satisfactory functional reconstruction for nerve defects. These include defects following traumatic nerve severance, iatrogenic severance during tumour resection and extensive defects in poorly vascularized transplant sites. No previous description of the long thoracic nerve as a vascularized nerve graft is available. The aim of this study was to demonstrate the anatomic and initial clinical application of such a graft. The long thoracic nerve was dissected in 84 cases to examine its length, diameter, ramification and type of perfusion. On removal of the nerve, adequate perfusion through the thoracodorsal artery and a constant anatomic course with minimal loss of function were found. The long thoracic nerve is accessible anatomically, easily dissected and removed. This may be carried out together with the thoracodorsal vein and artery and even with a pedicled myocutaneous latissimus dorsi transplant, an osseo-myocutaneous scapulo-latissimus dorsi transplant or an osseous scapular transplant. The long thoracic nerve transplant can be employed for extensive facial defects together with simultaneous osseous and myocutaneous transplants of the shoulder region.

The use of microvascular and microsurgical neuronal anastomosis techniques seems to ensure neuronal regeneration and functional rehabilitation [11]. In this context the vascularized long thoracic nerve graft employed in facial defects in conjunction with transplants of the shoulder region for coverage of extensive resection defects was examined. The anatomy of the graft site and the peripheral nerve were examined in the context of future surgical procedures.

Material and methods

The axillae of 42 adult cadavers were dissected and the 84 long thoracic nn. exposed bilaterally in their course from the axilla to penetration of the serratus anterior m. The neuronal blood-supply was examined and length and diameter measured by slide rule. The subscapular a. arising from the axillary a. and dividing into the circumflex scapular and thoracodorsalis aa. with subsequent serratus ramification supplying. The long thoracic n. was exposed.

Results

The average height of the cadavers examined was 172 cm. In the course of the thoracodorsal a. one to three arteries were found of 1 mm diameter embedded in fascia and fat supplying the long thoracic n. (Fig. 1). The long thoracic n. was constantly found in this well-vascularized connective tissue 1.5 cm (SD 0.1) lateral to the axillary line on the fascia of the serratus anterior m. In the fascia of the dissected long thoracic n. multiple
vessels were seen macroscopically. The nerve divided into 3 branches in 96% of cases to the middle and lower segments of the serratus anterior m. (Fig. 2). This division was found approximately in the middle segment of the muscle about 4 cm (SD 0.6) below the mamillary line. In this region the nerve was encompassed by a dense arterial network arising from a terminal branch of the thoracodorsal a., always accompanied by a venous plexus. The neural and vascular anatomy of the cadavers examined was constant except for a 4% irregularity (Figs. 3, 4, 5). Thus in three cases the vessels were not directly adjacent to the nerve but at a distance of more than 5 cm.

Fig. 1
Arterial blood supply to the long thoracic n. 1, long thoracic n.; 2, arteries from the thoracodorsal a. to the long thoracic n.

Fig. 2
Division of the long thoracic n. within the serratus anterior m. 1, division of the long thoracic n.; 2, serratus anterior m.

Fig. 3