

The Surgical Anatomy of the Supraclavicular Lymph Node Flap: A Basis for the Free Vascularized Lymph Node Transfer

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Background: Vascularized lymph node transfer is an effective surgical method in reducing lymphedema. This study provides the first detailed description of the surgical anatomy of the supraclavicular lymph node flap in regard to pedicle length, pedicle diameter, and the number of lymph nodes and their exact location inside the flap.

Methods: Bilateral supraclavicular dissections of nine fresh cadavers (five female) were performed. Before the dissection, the exact number of lymph nodes was determined sonographically by an experienced radiologist, and their distance from the jugular notch was measured. After anatomic dissection, the vascular pedicle's diameter and length were measured.

Results: The mean number of lymph nodes was 1.5 ± 1.85 on the right side and 3 ± 2.26 on the left. Their mean distance from the jugular notch was 8.29 ± 2.15 cm on the right and 6.10 ± 1.21 cm on the left. The pedicle's length was 4.72 ± 1.03 cm on the right and 4.86 ± 0.99 cm on the left, and its diameter 2.03 ± 0.83 on the right and 1.80 ± 0.77 on the left.

Conclusion: The pedicle length and diameter of the supraclavicular lymph node flap are suitable for a microvascular tissue transfer.

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KEY WORDS: lymphedema; vascularized lymph node transfer; supraclavicular flap

INTRODUCTION

Lymphedema is characterized by insufficient drainage of lymph fluid to the thoracic duct and subsequently the bloodstream. Its causes can be hereditary, known as primary lymphedema, or acquired by injury to the lymphatic vessels, described as secondary lymphedema. The latter frequently results from lymph node dissection in the course of cancer treatment, most notably breast cancer, with an estimated incidence of 21% [1].

Apart from conservative treatment, which mainly consists of physiotherapy and the application of compression garments, vascularized lymph node transfer is performed as an effective surgical method for lymphedema reduction [2,3]. The basic mechanism of this procedure is to bypass the damaged lymphatic vessels by transferring a lymph node flap to the affected extremity, directly draining lymph fluid to the venous system [4–6]. Effects on a cellular and molecular level are yet to be further investigated. Main factors influencing donor site selection are avoidance of iatrogenic secondary lymphedema and the best possible cosmetic result. The supraclavicular region offers a promising alternative to more established donor sites, such as the groin and the submental area.

Therefore, the goal of our study was to describe the surgical anatomy of the supraclavicular lymph node flap and to provide a reliable dissection guide.

MATERIALS AND METHODS

Bilateral supraclavicular lymph node flaps were raised in nine fresh cadavers (five female) with an average age of 84 years (range 68–93 years). An ellipsoid skin paddle was marked above the clavicle between

the sternocleidomastoid muscle and the trapezius muscle, with a size of 10×5 cm (Fig. 1). To avoid interobserver variability, the number of lymph nodes within these borders was counted by a single expert in small part ultrasonography. All examinations were performed in a supine position with a ZS3 Ultrasound system (Zonare, Mountain View, CA). The location of the lymph nodes was immediately marked on the skin paddle with a felt-tipped pen, a perpendicular line was drawn to the clavicle, and the distance to the jugular notch was measured from this point. Then, the supraclavicular lymph node flap was carefully raised and the transverse cervical artery exposed. A vernier caliper was used to measure the pedicle's diameter and length from the first perforator to its origin on the thyrocervical trunk. In addition, the sternocleidomastoid

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