A Prospective Clinical Assessment of Anatomic Variability of the Submental Vascularized Lymph Node Flap

MING-HUEI CHENG, MD MBA,[1]* CHIA-YU LIN, MSc,[1] AND KETAN M. PATEL, MD[2]

[1]*Department of Plastic Surgery, Chang Gung Memorial Hospital, Taoyuan, Taiwan*
[2]*Department of Plastic Surgery, Keck School of Medicine, University of Southern California, Los Angeles, California*

Introduction: The vascularized submental lymph node (VSLN) flap has become a popular choice for the treatment of lymphedema. Despite its favorable characteristics, anatomic variability exists, making the harvest of this flap challenging. Knowledge and characterization of anatomic variability can aid the surgeon in safe and effective flap harvest.

Methods: A prospective analysis of all patients who underwent VSLN flap transfer for lymphedema was performed. Demographics, operative details, and post-operative recovery were analyzed for included patients. Intraoperative videography and detailed anatomic drawings of each case were reviewed to accurately account for anatomic variability and details.

Results: Forty-two patients were identified during the study period. Arteriovenous anatomic variability (A1–A2 and V1–V4) existed, with most patients having the artery and vein present superior to the submandibular gland (A1V1; 31%), with other combinations occurring less frequently. Flap harvest time was found to be significantly increased with an intraglandular arterial course ($P < 0.01$).

Conclusions: The VSLN flap can be safely and effectively harvested with knowledge of arteriovenous anatomic variability. Most commonly, the artery and vein travel together superior to the submandibular gland, but other variations exist, which may add time to surgical flap harvest and increased need for dissection.

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INTRODUCTION

Surgical treatment of lymphedema continues to expand with the development of new and novel treatment strategies and techniques. Among these techniques include vascularized lymph node (VLN) transfer and lympho-venous bypass [1–4]. Specifically, increasing popularity in these innovative techniques have lead to the development of new VLN flaps. In addition to the common and popular groin VLN flap [3,4], descriptions of the supraclavicular [5], transverse cervical [6], and submental [7] VLN flaps have recently been reported as valuable surgical treatment options in the setting of lymphedema.

In the initial reported experience with the submental VLN flap, the senior author (MHC) found this option to be valuable in the treatment of lower extremity lymphedema. Seven VLN transfer procedures for stages II (3/7) stage III (4/7) lymphedema to the ankle region were performed. Improved results were found in both limb circumference measurements and patient quality of life [7]. As a result of these findings, continued use and confidence in this treatment option has resulted in a vast experience with elevation of the submental VLN flap.

The submental flap has been described and utilized mainly in facial reconstruction. In the earliest descriptions, reliable vascular anatomy of the submental artery in relation to the lower mandible, submandibular gland, and skin perforators have been extensively reported [8,9]. Focus of recent reports has been related to skin perforator flap techniques to avoid inclusion of the digastric muscle [10,11]. But, in the setting of VLN flap harvest, different considerations are mandated as attention to lymph node inclusion and appropriate arterial and venous connections take priority. Therefore, detailed descriptions related to these factors will allow for safe and effective harvest of the submental VLN flap. With this goal in mind, we evaluated the detailed experience of the senior author (MHC) in elevation of the submental VLN flap in order to provide a thorough and detailed anatomic basis of this flap.

PATIENTS AND METHODS

Study Population and Design

An IRB-approved review of a prospectively maintained database was performed at Chang Gung Memorial Hospital. All patients who underwent submental VLN flap transfer for symptomatic lymphedema were identified. Intraoperative videography and detailed anatomic drawings of each case were reviewed. Anatomic factors evaluated included the detailed route of the artery and veins associated with this flap. In addition, lymph node location and quantity were documented. In order to provide exact measurements of depth of lymph nodes, pre-operative duplex ultrasonography was used in all patients.

Classification of Anatomic Details

Arterial anatomy was detailed from the origin of the submental artery from the facial artery to the terminal branches at a level medial to the anterior belly of the digastric muscle. Relationship with the