



## A novel approach to the treatment of lower extremity lymphedema by transferring a vascularized submental lymph node flap to the ankle<sup>☆</sup>

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### ABSTRACT

**Objective.** Vascularized groin lymph node flaps have been successfully transferred to the wrist to treat post-mastectomy upper limb lymphedema. This study investigated the anatomy, mechanism and outcome of a novel vascularized submental lymph node (VSLN) flap transfer for the treatment of lower limb lymphedema.

**Methods.** Bilateral regional submental flaps were dissected from three fresh adult cadavers for histological study. A unilateral submental flap was dissected in another six fresh cadavers after latex injection. The VSLN flap was transferred to the ankles of seven lower extremities in six patients with chronic lower extremity lymphedema. The mean patient age was  $61 \pm 9.4$  years. The average duration of lymphedema symptoms was  $71 \pm 42.2$  months.

**Results.** There was a mean of  $3.3 \pm 1.5$  lymph nodes around the submental artery typically at the junction with the facial artery, on the six cadaveric histological sections. Mean of  $2.3 \pm 0.8$  sizable lymph nodes were dissected and supplied by the submental artery in six cadaveric latex-injected submental flaps. All seven VSLN flaps survived. One flap required re-exploration for venous congestion but was successfully salvaged. There was no donor site morbidity. At a mean follow-up of  $8.7 \pm 4.2$  months, the mean reduction of the leg circumference was  $64 \pm 11.5\%$  above the knee,  $63.7 \pm 34.3\%$  below the knee and  $67.3 \pm 19.2\%$  above the ankle.

**Conclusion.** The transfer of a vascularized submental lymph node flap to the ankle is a novel approach for the effective treatment of lower extremity lymphedema.

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### Introduction

Lymphadenectomy in uterine cancer is important for surgical staging and for cancer treatment by decreasing metastasis via lymphatic channels [1]. The incidence of lower extremity lymphedema post uterine cancer ablation, pelvic lymph nodes dissection and subsequent radiation treatments was reported from 1% to 48% [2–6]. Abu-Rustum reported that lower limb lymphedema mainly develops due to the pelvic lymph nodes dissection, especially when more than 10 nodes are removed [2–6]. The widely ranged incidence might result from the different diagnostic criteria of the lymphedema, numbers of pelvic lymph nodes excised, and the dosage of radiation therapy. The

incidence is higher after cancer resection and lymph node dissection in vulva cancer followed by cervical and ovarian cancer [7]. Recently, sentinel lymph node biopsy was selectively applied in gynecological cancer surgery to reduce the lower limb lymphedema [8–10].

Treatments of lymphedema are aimed to control infection, to reduce the swelling of the extremity and to improve the quality of life. Basic treatments of lymphedema start with conservative physical therapy, including manual lymphatic drainage and compression bandage-centered decongestive lymphatic therapy. The efficacy of conservative physical therapy presents only when the patients are compliant with the treatment program. However, it also carries risks of intravascular cancer metastasis and thrombosis formation. When the conservative treatment fails, surgical treatments present as alternatives. Debulky surgery and circumferential suction-assisted lipectomy can be performed to reduce the severely, non-pitting lymphedematous extremity [11]. More technical demanding surgeries, such as lymphatico-lymphatic anastomosis [12] lymphatico-venous anastomosis were introduced in the past [13–20]. Although there were some good results from variable reports, the disadvantages of these techniques include: 1) difficulty finding the thin-walled minute

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