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Septum-based cervical lymph-node free flap in rat: a new model



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ABSTRACT

Background: A limited number of lymph node flap models are available in rats, and none of them include a skin paddle. The aim of this study was to describe a new cervical lymph node-adipo-cutaneous flap model in the rat for future experimental studies.

Material and Methods: Fifteen Wistar rats were used. In four, neck anatomy was investigated with special focus on cervical lymph nodes. In eleven rats, a lymph node flap with a skin paddle of 1.5 × 0.5 cm centered along the surface projection of the innominate septum was harvested and transferred to the inguinal region. The rats were followed-up for 7 d. At 30-d postoperatively, the lymphatic flow restoration with the recipient limb lymphatics was assessed with methylene blue, and histology was performed on excised flaps.

Results: According to the anatomic findings, the flap was based on an innominate septum which was a well-defined adipofascial structure containing glandular vessels to the surrounding tissues and located between submandibular-sublingual glandular complex and parotid gland. Flap's microvascular and lymph node anatomy (two to three lymph nodes) was constant. Donor-site morbidity was minimal, and all flaps survived. At 30-d postoperatively, the restoration of the lymphatic flow with the recipient limb lymphatics was observed, and histology revealed viable lymph nodes.

Conclusions: The constant anatomy, the possibility to include a skin paddle and the minimal donor-site morbidity, make this flap a safe, reliable, and versatile lymph node flap supermicrosurgical model for autologous transplant in the rat for future experimental studies.

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1. Introduction

In the last decade, an increasing attention toward new microsurgical treatments for lymphedema, such as lymphaticovenous anastomosis (LVA) and lymph-node flap (LNF) transfer, has been paid by plastic surgery community [1–10]. However, the rate of success of these new surgical treatments is variable among different centers, and there is still a lack of proper guidelines for surgical timing and indications. These limitations are very likely due to the scarce knowledge on the exact pathophysiology of the lymphedema itself as well as to a very limited experimental and clinical research on the surgical treatment for lymphedema.

Therefore, experimental research on this topic is of high interest for the plastic surgery community. Experimental LNF has been described in small and large animals both as non-vascularized graft and as pedicle or free flaps [11]. However, a limited number of LNF anatomic models are available in rats, and none of them carries a reliable skin paddle [12–17].

The purpose of this study was to report the applied anatomy and step-by-step surgical technique of harvesting a new supermicrosurgical cervical lymph node flap with skin paddle for future experimental studies.

2. Materials and methods

2.1. Materials and methods

Fifteen Wistar rats were used in this study. The average rat weight was 365 g (ranging from 280–460 g). Of these, four rats were used to investigate the neck anatomy with particular focus on cervical lymph node and to design the flap.

In 11 rats, the new cervical lymph node-adipo-cutaneous flap was harvested and transferred to the inguinal region. Before transferring the flap, an inguinal lymph node clearance was performed to follow-up the lymph node flap without having bias from inguinal lymph nodes. At the end of

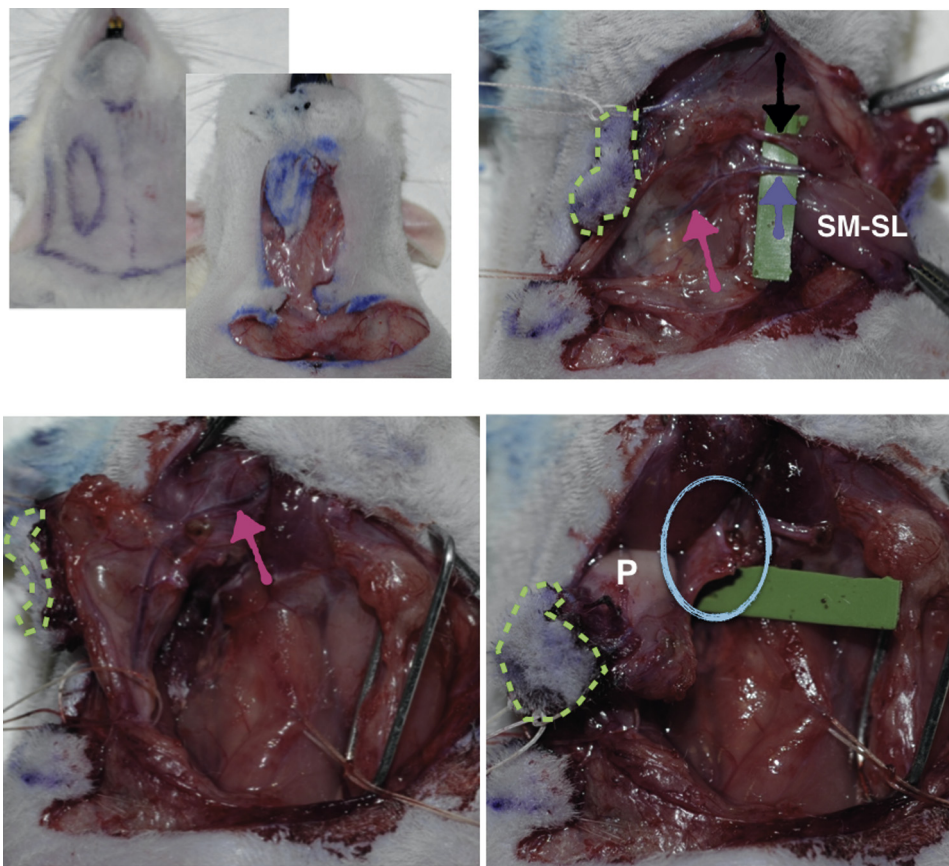


Fig. 1 – Step-by-step illustrative description of the surgical technique for harvesting innominate septum-based lymph node-adipo-cutaneous flap in rat (Top, left). Skin paddle was marked on the right hemi neck with the axis centered along an imaginary line passing longitudinally at the level of lip commissure. Skin-platysma incisions were carried out, and two lateral skin-platysma flaps were undermined (Top, right). The submandibular-sublingual glandular complex (SM-SL) was dissected, and the feeding vessels (violet arrow) were ligated as well as the salivary duct (black arrow). Green asterisk indicates the flap (center, left). After SM-SL excision, the floor of the innominate septum was visible as well as the inferior glandular vessels (pink arrow; center, right). After ligating the facial artery and vein, the innominate septum was dissected in a retrograde fashion (light blue circle). Parotid gland (P) was partially dissected from the septum. (Color version of figure is available online.)

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