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IDEAS AND INNOVATIONS

A novel technique for the safe transfer of the pedicle of a free flap in head and neck reconstruction using a nasopharyngeal airway connected to a negative pressure suction

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Abstract
Microsurgical free flaps are the accepted standard of care for head and neck reconstruction after tumor resection. In many cases, the pedicle of the free flap needs to be tunneled under bone and/or soft tissues to reach the recipient vessels in the site of anastomosis, most often located in the neck. Passing the pedicle through the dissected tunnel is always a blind procedure that increases the risk of shearing, turning, twisting, or kinking and in the worst case disconnection. We hereby demonstrate a novel and simple technique for a safe delivery of the pedicle to the anastomosis site in the neck using a nasopharyngeal airway (nasal airway) connected to negative pressure suction. In all of our cases, no complications were noted during the pedicle delivery to the neck while using this method.

Level of Evidence: Level IV, therapeutic study.

Keywords Free flap pedicle · Pedicle tunneling · Pedicle transfer · Nasal airway tube · Negative pressure suction · Head and neck reconstruction

Introduction

Microvascular free flap transfer for head and neck reconstructive surgery is a challenging procedure due to the complexity of the anatomy and function of the regions. The employment of free flaps to transfer a large volume of tissue-containing skin, muscle, or well-vascularized bone offers good functional and esthetic outcomes for patients. Currently, the microsurgical free flaps are the accepted standard of care for head and neck reconstruction after tumor extirpation [1, 2].

Free flap reconstruction in the head and neck normally requires vessel microsurgical anastomosis in the neck. The pedicle needs to be tunneled under bone and/or soft tissues to reach the recipient vessels in the site of anastomosis. Passing the pedicle through the dissected tunnel is always a blind procedure that increases the risk of shearing, turning, twisting, or kinking and in worst cases disconnection [3, 4].

Various creative techniques to avoid twisting of the pedicle during the passage have been described, including segmental marking or streaking of the pedicle [4, 5], placing sutures to a fascial/connective tissue component or a tied-off stump of the main pedicle [6, 7], and securing a medical gauze around the pedicle [8].

Two techniques have been described to overcome the 'Blind pedicle tunneling problem' in maxillary and oral

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Fig. 1 Insertion of the nasal airway tube through the dissected tunnel while its distal end is pointing towards the oral cavity

cavity reconstruction. Yadav et al. have used a surgical glove to wrap the pedicle during its transfer through the tunnel while guided by an artery clamp holding onto the glove [9]. Moschella et al. have used an endotracheal tube by pulling the pedicle inside it by using a suture stitched to the connective tissue which is left around the pedicle and passing the tube through the tunnel [3].

Herewith, we demonstrate a novel and simple technique to deliver in a safe way the pedicle of a free flap to the anastomosis site in the neck using a nasopharyngeal

airway (nasal airway) connected to negative pressure suction.

Method

After bluntly dissecting the tunnel with large Metzenbaum scissors, a nasopharyngeal airway (Rusch® Nasal Airway, Robertazzi Style, Teleflex Incorporated, USA) of appropriate diameter is introduced into the tunnel. Normally, a nasal airway with a diameter of 30 Fr is appropriate except for pedicles of a free fibula flap that contain larger veins. In these cases, we recommend using a 32 Fr nasal airway. The tube is trimmed 2–3 cm longer than the tunnel. The tube is inserted while its distal end is pointing towards the oral cavity (Fig. 1). It is important to make sure that the tube is moving freely inside the dissected tunnel without compressing adjacent vital anatomical structures. After the pedicle is divided, the distal end of the pedicle is inserted into the proximal end of the nasal airway while irrigating it with normal saline. Once the distal end of the pedicle is safely located within the proximal end of the nasal airway, negative pressure suction (−200 mmHg) using a 28 Fr suction connecting tube (Jiangsu Weikang Jiejing Medical Apparatus Co. Ltd., China) is applied at the distal end of the tube until the pedicle is fully delivered through it. The nasal airway is hastily passed through the tunnel towards the anastomosis site in the neck. Thereafter, the tube is safely removed over the pedicle (Fig. 2).

Results

The senior author (A.A.) has used this technique for the past 20 years in over 300 cases of head and neck reconstruction using free-vascular flaps which are mainly the free anterolateral thigh, free radial forearm, and free fibular flaps.

Discussion

The presented technique is a novel, simple, and easy to handle. It is felt that this method is less cumbersome and safer than the other techniques mentioned above. The negative pressure vacuum causes the pedicle to locate itself within the nasal airway in its most natural position avoiding any kinks or twists. Direct contact of negative pressure wound therapy (NPWT) with exposed vasculature can result in complications, including bleeding. Yet, in cases where NPWT needs to be applied in close proximity to exposed vascular structures, it has been found safe to apply NPWT after covering them with a non-adherent barrier layer such as petroleum gauze and non-adherent dressings [10]. In our technique, the negative pressure suction is not applied directly on the vascular pedicle but is mediated by the nasal airway tube, thus the actual pressure is lower. In addition, our vast experience with the technique proves that rupture of the blood vessels is surely not an often complication.

The smooth internal surface of the nasal airway, augmented by the saline irrigation, prevents shearing or tearing of the pedicle and its associated anatomical structures. In addition, the dissection of the tunnel in the precise size which is needed to enforce the passage of the tube helps to avoid the creation of a dead space. An option for simplifying supplies, one low cost universal tube that can accommodate all pedicles would be sufficient.

This method can be effectively added to the armamentarium of existing techniques for the safe pedicle transfer to the neck during head and neck microsurgical free flaps reconstructions.

Compliance with Ethical Standards

Funding None

Conflict of interest Shay Tamir MD, Har-Shai Lior MD, Ad-El Dean D. MD, and Amir Aharon MD declare that they have no conflict of interest.

Ethical approval Not applicable.

Informed consent Informed consent was obtained from all individual participants included in the study.

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