Supraclavicular artery pedicled flap in reconstruction of pharyngocutaneous fistulas after total laryngectomy

Uszypułowany płat na tętnicy nadobojczykowej w rekonstrukcjach przetok skórno-gardłowych po zabiegach całkowitego usunięcia krtani

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ABSTRACT: The aim of the study was to analyze the efficacy of treatment of closure of cutaneopharyngeal fistulas, following total laryngectomy, using a fasciocutaneous flap. In the group of 6 patients treated in years 2013-2014, in 4 (67%) patients the healing process was successful, in one patient complete flap necrosis was noted on the 6th day, in another patient a small cutaneopharyngeal fistula was recognized, which closed secondarily with no intervention. Flaps of this type, having a small risk of local complications at donor site and satisfactory functional and aesthetic results, may be an alternative form of flap to others used in the reconstruction of superficial deficits in the head and neck areas.

KEY WORDS: reconstruction surgery, supraclavicular artery pedicled flap, cancer of head and neck

INTRODUCTION

Large defects that occur following large oncological surgical procedures in the areas of the head and neck require closure with the use of flaps, either local, regional, or free. The benefits of free flaps (forearm flap, anterolateral thigh flap) are undisputable and are the standard reconstruction therapy. However, they require a well-trained operator, achieving ability of vascular anastomosing and are often associated with long surgical duration times. The use of local flaps, despite many advantages, is limited in terms of achieving appropriate size and shape in case of large tissue defects. Pedicled myocutaneous regional flaps with axial vascularity, usually represented by the pectoralis major muscle, deltopectoral or subhyoid flaps, due to their...
thickness, have a limited application. For these reasons, a regional pedicled fasciocutaneous supraclavicular flap, owing to its satisfactory aesthetic properties (similar color) and location advantages – located far from the irradiated areas – provides an alternative for other flaps in reconstruction therapy, especially with regard to superficial defects [1]. The aim of the study was to analyze our own results of treatment of patients with cutaneopharyngeal fistulas following total laryngectomy.

MATERIALS AND METHODS

A number of six patients treated in 2013-2014 for large secondary cutaneopharyngeal fistulas which occurred following total laryngectomy in the course of squamous cell carcinoma of the larynx. In all six patients subjected to surgery, the clinical stage of the tumor was T4. All patients had been treated with primary radio- or chemotherapy. In four patients (67%) a unilateral and in two patients (33%) a bilateral selective cervical lymphadenectomy was performed. In the postoperative period, five patients (83%) were fed through an esophageal tube; one (17%) was fed through a previously performed gastrostomy. The patients were predominantly male, 57-72 years of age. The median time after laryngectomy was 6 months to 2 years.

RESULTS

In four patients (67%) the healing process was successful. The performed drinking test after 14 days showed no presence of fistulas in the neck. In one patient, complete flap necrosis was seen on the sixth day, and in another one a small cutaneopharyngeal fistula that closed with no intervention in the fourth postoperative week. The time of flap harvesting was 70 min-

Fig. 1. Diagram of a supraclavicular artery flap including vascular supply.

Fig. 2. Method of harvesting a supraclavicular artery flap.
utes, whereas the hospital stay of all patients ranged from 7 to 18 days (median: 16 days).

**Anatomy and flap-harvesting technique**

A pedicled cutaneous fasciocutaneous flap is supplied by the supraclavicular artery which is a branch of the transverse cervical artery [2, 3] (Fig. 1). Less frequently the origin of the supraclavicular artery is the suprascapular artery [4, 9]. The transverse cervical artery is located 4-5 cm above the sterno-clavicular joint, whereas the suprascapular artery branches at the distance of 6-8.5 cm from the forementioned joint. This artery is located in the triangle which is limited inferiorly by the clavicle, laterally by the sternocleidomastoid muscle and the external carotid artery and the location of penetration of the deep fascia is a space 2-4.5 cm thick [3]. The diameter of the suprascapular artery is 1.1-1.5 mm.

Harvesting of the flap requires marking a cutaneous island located in a space limited by the clavicle anteriorly, the trapezius muscle posteriorly and the deltoid muscle laterally. The maximum size of the flap was 24 cm long and 8 cm wide. The vessels of the pedicle were localized with the use of a Doppler device. The dissection of the flap is carried out subfascially from the distal end towards the neck and the vascular pedicle. The suprascapular artery is separated up to the point of the origin of the transverse cervical artery. This allows for mobilization of the pedicle along with the vessels, which becomes the rotation point for the flap (Fig. 2). The cutaneous island along with the pedicle can be transferred underneath the skin area of tracheostomy, thus avoiding additional incisions in the neck. The deficit is closed primarily by mobilizing the skin. In defects larger than 10 cm in diameter, a cutaneous transplant should be performed [3,4].

**DISCUSSION**

In 1903 Told, a German anatomopathologist, first described a cervical artery named superficial, which originates from the thyrocervical trunk located between the trapezius muscle and the sternocleidomastoid muscle [5]. In 1949 for the first time in history, a flap from the shoulder, supplied by forementioned vessels, was used (charretera or acromial flap), as described by Kazanjian and Converse [6]. In 1979 Mathes and Vasconez performed anatomical studies, describing the vascular supply of the flap (at that time called cervico-acromial flap) with the possibility of its practical use in the reconstruction in the areas of the head and neck [7].

In 1983, Lamberty and Cormack introduced a flap relying on the suprascapular artery, the name of which remains to this day [8]. However, the first experiences were not promising – several necroses of the flaps were reported [9]. Despite 30 years of experience, only the recent years reveal vast possibilities of using flaps in reconstructive surgery of the head and neck [10]. Based on the reports from recent years, the use of flaps was mainly the domain of plastic surgery treatment of contractures following burns to skin of the neck; less frequently were they used by laryngologists [11,12].

In reconstructive surgery the flap is especially recommend ed in reconstruction of the lower 1/3 of the face and neck, in patients with accompanying medical conditions which limit the use of free flaps (poorly controlled diabetes, obesity, mal-

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**Tab. 1. The viability of a flap and risk of local complications in relation to the reconstruction site.**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Reconstruction site</th>
<th>Study group</th>
<th>Flap viability / complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ernest S. Chiu, Perry H. Liu, Paul L. Friedlander 2009 [14]</td>
<td>Laryngopharynx, tracheostomy following total laryngectomy, skin over parotid gland, exposed mandibula</td>
<td>18</td>
<td>89% Partial and complete flap necrosis, fistula, cellulitis and skin defects in donor</td>
</tr>
<tr>
<td>Cranzow J.W., Suliman A., Roestaeanaer, Perry A., Boyd B. 2012 [12]</td>
<td>Exposed mandible, reconstruction plate, skin area over parotid gland, pterochinostomy fistulas, buccal skin, tongue</td>
<td>18</td>
<td>94.3% Fistula, partial flap necrosis</td>
</tr>
</tbody>
</table>
nutrition, cachexia). It is also used in reconstruction of neck cutaneous deficits: the tracheostomy site, parotid, earlobe and laryngopharynx. In these patients the viability of the flap is achieved in 90% [1]. Short- and long-term treatment results are not different from the results of treatment using other pedicled flaps [13]. The span of the reconstruction sites, the viability of the flap, and risk of local complications are represented in Table 1.

The flap, owing to its small thickness, plasticity, good vascularity and proximity to the primary operative site can be an effective alternative to other free and pedicled flaps. Additionally, it is characterized by a similar color to the surrounding tissues, therefore improving the esthetic results of the operated site, and a low rate of complications of healing of the donor site with a retained proper function of the arm [14]. Due to the ease of locating the pedicle and harvesting the flap, requiring about 60 minutes, it is especially recommended in patients with accompanying general medical conditions [4]. The span of contraindications to the aforementioned flaps is more limited than in the case of free flaps and covers earlier bilateral radical surgical procedures on the cervical lymphatic system and irradiation of the operated site [14].

Cutaneopharyngeal fistulas are the main complications following total laryngectomy, especially in patients who underwent primary radiotherapy or chemotherapy. According to various authors, the complication rate can be as high as 30-80% in the operated patients [15,16]. This condition extends hospital stay, requires feeding though an esophageal tube, or performing a temporary gastrostomy, decreasing significantly the quality of life of the patient. Additionally, the existence of fistulas facilitates infections of the wound and increases the risk of local bleeding from larger vessels of the neck [17].

In the studied group consisting of six patients operated on for cutaneopharyngeal fistulas which occurred following total laryngectomy, we achieved a viability success rate of 84% (5/6 patients); these rates do not differ from the reports of other authors [1, 18]. A satisfactory functional result with the possibility of restoring deglutition (with no signs of fistula) and substitute phonation was achieved in 5 patients (83%) (Fig. 3).

**CONCLUSIONS**

- The supraclavicular artery pedicled flap is an effective mode of reconstructive treatment in cutaneopharyngeal fistulas following total laryngectomy.
- It is a safe, quick, and easy method of harvesting a flap, with a small risk of complications at donor site.
- It facilitates achieving satisfactory functional and esthetic results in the operated site.
- It is an alternative to other pedicled flaps, especially free flaps in patients in poor general condition.

![Fig 3. The operative site on the 14 post-operative day.](image-url)
Bibliography


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