Use of the infra hyoid musculo-cutaneous flap in soft palate reconstruction

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Abstract

Aims: To review a series of 23 consecutive patients with squamous cell carcinomas arising from oropharynx who underwent infra hyoid musculo-cutaneous flap reconstruction including soft palate in alternative to free radial forearm flap or maxillofacial prosthesis. Post operative radiotherapy was performed for all patients.

Results: Every reconstruction healed quickly without major wound complications. The functional results evaluated by speech and swallowing capacities, were good for 17 patients, fair for 4 patients and bad for 2.

Conclusions: The infra hyoid musculo-cutaneous flap is a versatile, reliable and convenient flap suitable for repairing small and medium sized defects; it can be used in combination with other flaps, and in selected cases obviates the need for a microvascular free radial forearm flap or maxillofacial prosthesis.

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Introduction

Velopharyngeal function is often compromised by the resection and reconstruction of oropharyngeal and palatal tumours. While free tissue transfer has improved the outcomes of head and neck reconstruction, in general, palatal reconstruction remains a challenge.1

The use of microvascular free flaps is the most widespread method currently employed for the reconstruction of extensive defects after resection of head and neck cancer, so that they represent today the golden standard in many cases because of their versatility and reliability. The flap most commonly used for head and neck reconstruction is the free radial forearm flap (FRFF).2 This FRFF can be used alone or combined with other local flaps. The study of Brown et al.3 shows that the addition of the superiorly based pharyngeal flap to the FRFF in soft palate reconstruction results in improved speech and swallowing. Brown et al.3 recommend the use of the additional flap in resections in which more than one quarter of the soft palate is included.

The evidence that not all the patients are suitable for a free flap reconstruction, and also that not every defect strictly requires a free flap transfer to achieve a good functional result, rises the necessity to find good alternatives.

Pectoralis major flap and temporalis flap are the most used pedicled flaps in head and neck reconstruction, but the infra hyoid musculo-cutaneous flap (IHMCF) is one of the alternatives to be considered for the reconstruction of moderate defects following resection of the oral cavity, oropharynx or hypopharynx cancers in selected cases. It obviates the need for a microvascular free flap or other local flaps in many cases.4

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Here we report our experience of a series of 23 reconstructions for selected tumours of the soft palate by using the IHMCF, as a valid alternative to FRFF reconstruction or maxillofacial prosthesis.

Patients and methods

The infrahyoid muscles including sternohyoid (SH), thyrohyoid (TH), sternothyroid (ST) and omohyoid (OH) constitute the anatomical substratum of the flap, completed by the platysma and the overlying skin.

Design of flap

The IHMCF is designed as an oval vertically shape in a paramedian situation and can measure up to 10 cm in its greatest length and up to 5 cm widthways (Figs. 1 and 2). The extent of the resection goes from 1/4 to 1/2 of the soft palate. Patients for whom the resection reaches more than the half of soft palate were excluded from this series. The flap is dissected in order to separate it from the median cervical fascia. The inferior muscular part of the flap is defined by sectioning the muscles downwards (SH and ST) and outwards (intermediate tendon of OH). The venous drainage has two systems through the anterior jugular vein and the superior thyroid vein. Then the strap muscles are separated from the thyroid plane in order to identify the superior thyroid artery and vein pedicle (Fig. 3). Collateral veins and superior laryngeal artery (carefully separated from the superior laryngeal nerve) can be ligated, allowing securing the flap to the external carotid artery and the facial vein, or perhaps the internal jugular vein. The SH is usually upwardly sectioned at the insertion to the hyoid bone. The flap is then placed to repair...
the defect site (Fig. 4). Cutaneous closure of the donor site is performed without important difficulties (Fig. 5).

**Patients and treatments**

From 1996 to 2005, 23 consecutive patients, 19 men and 4 women, underwent IHMCF reconstruction after oropharynx cancer ablation — including a part of soft palate — and neck dissection, in one stage procedure. The extension limits of the tumour had not to go beyond the midline of the soft palate. The ages of the patients ranged from 39 to 71 years, with median age of 58 years. The series accounts 23 squamous cell carcinomas (100%) arising from the mucosa of the oral cavity and oropharynx. The localization was velotonsil area for 20 patients and retro molar trigon for 3 patients. Twenty one patients (91%) admitted to tobacco consumption and alcohol abuse. The disease was staged according to the VIth edition of the TNM classification established by the UICC/AJCc. Four tumours were noted T1, 9 T2, 7 T3 and 3 T4. Nodes were staged as 5 N0, 5 N1, 3 N2a, 6 N2b, 3 N2c and 1 N3. Post operative radiotherapy was performed for 23 patients. All patients underwent speech and swallowing evaluation and reeducation after surgery and radiotherapy.

In this series IHMCF reconstruction has been chosen instead of FRFF reconstruction or maxillofacial prosthesis.

**Results**

Nineteen patients had cicatrisation without complications for the flap or the donor site. Local complications occurred in 4 patients. In 2 cases we observed a partial skin paddle necrosis. In the other 2 cases the patients demonstrated a minor cervical dehiscence of the skin requiring only local care.

17/23 patients were able to eat normally (good deglutition) with good speech evaluation (good intelligibility). The remaining 6 patients had to adapt their eating habits by mincing (2/6) (fair deglutition) or by mixing (2/6) (bad deglutition) their food. The last 2 patients had fair speech evaluation (fair intelligibility) (Table 1). These six patients, for whom function was classified fair or bad, had T4 (2/6) or T3 (4/6) tumours. The two bad results were noted for patients who had presented in the past laryngeal or pharyngeal tumours. The 1st was a second localization and the 2nd was a third localization. For fair results, the delay of surveillance after surgery was too short for three patients (less than 12 months), one presented a second localization and the last obtained only fair results after reeducation. The extent of soft palate resection was varied: from the quarter to the half with no clear relation between the extent of the resection and the function quality (Table 2).

The delay of surveillance after surgery ranged from 6 months to 9 years, with median delay of 2 years and 9 months.

**Discussion**

Since 1979, Wang et al. performed a long series of IHMCF. Earliest studies were published from 1986 to 1994. Wang et al. reported 112 flaps which were successful in 90% of the cases (101 of 112 cases). The same success rate of IHMCF is noted by Zhao et al. who have concluded that cervical pedicle flaps have clinical value in selected patients needing reconstruction of small — and medium — sized defects after intraoral cancer surgery. IHMCF is a versatile, reliable, and convenient flap suitable for repairing the defects in and around the oral cavity, particularly in the oropharynx, even in aged and weak patients. Since 1994, we performed routinely IHMCF to reconstruct mucous defects in the head and neck region with this technique, which we subsequently modified for head and neck surgery and immediate reconstruction.

At best, the flap extremity can reach a distance of 15 cm (theoretical) around its rotation axis. The effective region includes the cervical trachea up to the velotonsil, including the inferior facial cutaneous covering (under the labial — tragus commissura). For soft palate, the maximum size of
defect that could be safely reconstructed with the IHMCF is the half. Functionally, flap resection does not induce phona-
totary, respiratory or swallowing complications. The size of
the cutaneous flap sampled was always compatible with
a direct suture of the donor site without cicatrisation
complication.

In our experience, the results were comparable with
those published in the literature.4,11–13 The lack of ability
to reconstruct the dynamic function of the soft palate con-
tinues to be disappointing. Limited studies have shown
promise in soft palate reconstruction without the complica-
tions of velopharyngeal insufficiency. The lack of a uniform
classification for palate defects has limited prospective
comparison of reconstructive methods.16 The usual respect
of contraindications helped avoiding the complications en-
countered by other authors.11 Contra indications of IHMCF
such as previous thyroid surgery or radical neck dissection
must be respected; relative contra indication is represented
by previous cervical radiotherapy. It is acceptable to use
material from a metastatic neck for defect cover in the
cases where the vascular pedicle of the flap and the IHMCF
itself are not in the tumour and are at least at 30 mm of can-
cerous tissue.

In case of soft palate reconstruction, it is useful to pre-
serve the motor innervation of the infrahyoid muscles pro-
vided by the descending branch of the hypoglossal nerve
(the ansa cervicalis), that is kept with the flap during its
new positioning. The main advantage of this voluntary in-
nervated flap is the prevention of atrophies and the
improvement of scarring qualities of the reconstructed
soft palate.17 The function qualities are also improved by
this innervation conservation which allows synchronous
contraction of the two sides of soft palate during swallow-
ing. As Wang et al. published,11 a minor motricity reappe-
rars within 12 months after intervention.

The IHMCF is a versatile, reliable and convenient flap,
with interesting plastic qualities, suitable for repairing
small and medium sized defects;15 this is an additional
tool in the therapeutic possibilities for cervicofacial recon-
struction. It can be used in combination with other flaps,
and in selected cases, as soft palate reconstruction, obviates
the need for a microvascular FRFF or maxillofacial pros-
thesis. This flap is thin, pliable, so that is particularly useful
in oral cavity reconstructions and, in our experience, the
functional results are comparable to those of the FRFF re-
construction for small and medium sized defects. The
IHMCF has the particularity to remain the anatomy after re-
construction, which is less possible with FRFF or maxillo-
facial prostheses.

The realisation of a maxillofacial prosthesis is another
solution for these patients. Prosthetic treatment of soft pal-
ate defects varies based on the extent and site of the defect.
The goal of treatment is to attain velopharyngeal closure
during function, which allows normal speaking and swal-
lowing and keeps the patient relatively comfortable. While
maxillofacial prosthetic treatment is not a substitute for
plastic and reconstructive surgery, in certain circumstances
it may be an alternative. Certain patients may simply not be

Table 1
Series description

<table>
<thead>
<tr>
<th>Classification</th>
<th>Localization</th>
<th>Post operative treatment</th>
<th>Local complications</th>
<th>Function evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 T1</td>
<td>5 N0</td>
<td>20 velotonsil</td>
<td>23 radiotherapy</td>
<td>17 good</td>
</tr>
<tr>
<td>9 T2</td>
<td>5 N1</td>
<td>3 retro molar</td>
<td>23 speech and</td>
<td>4 fair</td>
</tr>
<tr>
<td></td>
<td></td>
<td>trigon</td>
<td>swallowing reeduca-</td>
<td></td>
</tr>
<tr>
<td>7 T3</td>
<td>3 N2a</td>
<td></td>
<td>2 minor cervical</td>
<td>2 bad</td>
</tr>
<tr>
<td>3 T4</td>
<td>6 N2b</td>
<td></td>
<td>dehiscence</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3 N2c</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1 N3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2
Fair or bad function description

<table>
<thead>
<tr>
<th>Classification</th>
<th>Extent of soft palate resection</th>
<th>Function impairment</th>
<th>Main reason of function impairment</th>
<th>Delay of surveillance after surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fair result #1</td>
<td>T3 N1 M0</td>
<td>Quarter of soft palate</td>
<td>Fair intelligibility</td>
<td>Delay too short for complete reeducation</td>
</tr>
<tr>
<td>Fair result #2</td>
<td>T3 N1 M0</td>
<td>Quarter of soft palate</td>
<td>Fair deglutition</td>
<td>Fair reeducation results</td>
</tr>
<tr>
<td>Fair result #3</td>
<td>T3 N2a M0</td>
<td>Third of soft palate</td>
<td>Fair deglutition</td>
<td>Delay too short for complete reeducation</td>
</tr>
<tr>
<td>Fair result #4</td>
<td>T3 N2c M0</td>
<td>Quarter of soft palate</td>
<td>Fair intelligibility</td>
<td>Second localization and delay too short for complete reeducation</td>
</tr>
<tr>
<td>Bad result #1</td>
<td>T4 N1 M0</td>
<td>Half of soft palate</td>
<td>Bad deglutition</td>
<td>Third localization</td>
</tr>
<tr>
<td>Bad result #2</td>
<td>T4 N2a M0</td>
<td>Third of soft palate</td>
<td>Bad deglutition</td>
<td>Second localization</td>
</tr>
</tbody>
</table>
good candidates for plastic surgery because of their advanced age, poor health, very large deformity, or poor blood supply to irradiated tissue. Moreover, maxillofacial prosthetic treatment is indicated when anatomical parts of the head and neck are not replaceable by living tissue or when recurrence of malignancy is likely.

Nevertheless, in patients with soft palate defects, it is difficult to obtain sufficient retention, support, and stability of the obturator prosthesis. In addition, its mobility during various functions is considered to be large.

Although the system of speech evaluation was subjective in our series, but standardized by the same speech therapist, the results obtained seemed equivalent to those obtained by Wang et al.11 and Zuydam et al.18 Four fair results and two bad results were observed. On the one hand, these results seemed to be related to the tumour stage (T3 or T4) and not to the extent of soft palate resection (for some cases, good results have been obtained after resection of the half of soft palate) and on the other hand, three out of four fair results had a delay of surveillance after surgery less than 12 months, which can also explain these functional results. The two bad results were noted for T4 tumours.

The indications of this flap remain numerous for the upper aerodigestive tract allowing the repair of large mucous or cutaneous defects with acceptable functional or aesthetic sequelae.

Our surgical technical research has led us to the laryngeal and pharyngolaryngeal reconstruction (i.e. after near total resection) with the IHMCF and in some specific case, partial reconstruction of cervical esophagus. Our primary results seem to confirm the elective choice of this flap for these indications.

References


