The “Kite-t-FAMMIF”: A Novel Technique for Reconstruction of Extensive Soft Palate Resection

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Summary: Total soft palate reconstruction is a challenge for the head and neck surgeon. Velopharyngeal incompetence resulting from soft palate resection impairs both speech and swallowing and significantly affects the quality of life of the patients. Radial forearm free flap is the reconstructive technique most used worldwide, but it requires microsurgical skills, is associated with high donor site morbidity, and shrinks during the healing process, especially after adjuvant radiotherapy. We present a novel technique using a single “kite-shaped” tunnelized-facial artery myomucosal island flap (t-FAMMIF) and report very favorable functional outcomes. Three patients in whom a kite-shaped flap was used to reconstruct a total soft palate defect after squamous cell carcinoma resection were included. In two of them, the resection included both tonsils due to cancer spreading to the tonsillar fossae. The mucosal and muscular sides of a single t-FAMMIF flap were able to restore the oral and nasal lining of the palate, respectively, without the need to fold the flap. All patients were able to tolerate an oral soft diet 10 days after surgery. No complications were detected. A complete mucosalization on the nasal lining was observed by video-endoscopy 3 weeks after surgery. No case of shrinking of the flap was observed during the follow-up, and speech and swallowing functions were not impaired after complete wound healing. Kite-shaped t-FAMMIF represents an excellent and feasible reconstructive option for extensive postablative soft palate defects. (Plast Reconstr Surg Glob Open 2022;10:e4531; doi: 10.1097/GOX.0000000000004531; Published online 17 October 2022.)

INTRODUCTION

Total soft palate reconstruction is a challenge for the head and neck surgeon. Velopharyngeal incompetence caused by soft palate resection impairs both speech and swallowing. Hypernasality and air escape may result in unintelligible speech, and nasal regurgitation of liquids during swallowing increases the risk of aspiration. The goal of soft palate reconstruction is the closure of the oronasal communication creating a new functional myomucosal velum; ideally, an adequate tissue mass that is sensitive, pliable, and mobile, with potential for dynamic function, is required. Among the different reconstructive techniques proposed, the most used worldwide is currently the radial forearm free flap (RFFF).

However, microsurgical skills, two surgical teams, and long operating and hospitalization times are required, with high donor-site morbidity. Furthermore, the RFFF shrinks during healing and even more after radiotherapy, reducing soft palate mobility and worsening functional results. For total and extensive soft palate reconstruction, we describe a novel technique using a single “kite-shaped” tunnelized-facial artery myomucosal island flap (t-FAMMIF) and report very favorable functional outcomes.

MATERIALS AND METHODS

We included three patients diagnosed with soft palate squamous cell carcinoma. Clinical examination, CT scan, and MRI showed no neck node metastases, and all neoplasms were classified as c, r T3N0M0. A total soft palate resection was performed in all patients by means of a transoral approach, and in two cases, a bilateral tonsillectomy

Disclosure: Dr. Massarelli is a Delegate for Sardinia, Italy, of the Italian Society of Microsurgery (S.I.M.). The other author has no financial interest to declare.

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was associated, due to cancer spreading to the tonsillar fossae (Fig. 1). Bilateral selective neck dissection (levels I–IV) with facial vessels and external jugular vein preservation for reconstructive purposes was associated, and a t-FAMMIF, specific surgical technique, refined over the years by the senior author (O.M.), was used for reconstruction in all cases.

Surgical Technique

A large t-FAMMIF is raised over the axes of the facial vessels as an island flap, including all the rich vascular networks of the cheek formed by the facial artery angiosome, anteriorly and the buccal artery angiosome, posteriorly. Once it is fully sculpted onto the cheek surface, respecting the parotid duct and the reference points (retromolar trigone, nasal alar base, and labial commissure), the flap is pedicled only onto the facial vessels. Due to its flying lines, the flap seems to have a “kite-shape” (Fig. 2). The full surgical dissection technique has previously been explained in detail in another report. Once harvested, the kite-shaped t-FAMMIF flap is rerouted through the parapharyngeal space by means of another tunnel created medial to the mandible and then “parachuted” over the soft-palate defect as a kite. The flap is inset with the mucosa toward the oral cavity and the buccinator muscle toward the rhinopharynx. Therefore, the mucosal and muscular sides of a single t-FAMMIF flap can restore the oral and nasal lining of the palate, respectively. Using a 2.0 Vicryl, the flap is then sutured as a “tent,” in slight tension to the posterior edge of the hard palate and bilaterally to the residual tonsillar fossae, properly fitting the defect (Fig. 3). The edges of the flap perfectly match with the dissected edges of the recipient site, providing a good contact surface and thereby preventing velopharyngeal dehiscence and postoperative insufficiency. The cheek donor site defect is repaired by advancing a pedicled buccal fat pad flap, which is spontaneously covered with mucosa again within a few days. (See Video 1 [online], which displays the flap harvesting technique. Transoral resection of soft palate squamous cell carcinoma extended to bilateral tonsillar fossa. Flap design, flap harvesting on facial vessels.

Takeaways

Question: What is the ideal method for functional extensive soft palate reconstruction?

Findings: The authors propose a novel technique using a tailored myomucosal flap, which they named the “kite-t-FAMMIF” describing its surgical details and functional outcomes in three consecutive patients. All patients were able to tolerate an oral soft diet 10 days after surgery. A high degree of sensory recovery was registered in all fields of sensitivity. The swallowing functions were not altered after complete wound healing, and the speech intelligibility was very good.

Meaning: The results demonstrate that the “kite-t-FAMMIF” is emerging as an efficacious surgical technique for reconstruction of larger soft palate defects.
its externalization into the neck, the final tunnelization under the mandible, and its insetting to repair the oropharyngeal defect are shown step by step in this video.

**RESULTS**

The median length of hospital stay was 12 days. The nasal feeding tube was removed 10 days after surgery, and all patients were able to tolerate an oral soft diet. No complications were detected. No shrinking of the flap was seen during the follow-up, and speech and swallowing functions were not impaired after complete wound healing and speech therapy. Approximately 3 weeks after surgery, complete mucosalization on the nasal lining was observed by video-endoscopy, which demonstrates the high recovery of word intelligibility. (See Video 2 [online], which displays functional assessment by nasofarangoscopy. Visual examination of the velopharyngeal port via flexible nasopharyngoscopy, performed in the follow-up, showed the complete mucosalization of the buccinator muscle in the soft palate nasal side and the velopharyngeal closure during phonation. Furthermore, it can be appreciated how the patient's speech intelligibility appears very good. In fact he does not vocalize nasalized vowels, doesn't have air leaks through the nose or hypernasality while the patient is invited to repeat phonemes and sentences in the Italian language that contain occlusive, semiocclusive and constricting consonants that stimulate the function of the velopharyngeal valve.) As previously demonstrated, a high degree of sensory recovery has been reported in all fields of sensitivity. All patients are alive and disease-free after surgery (Table 1).

**DISCUSSION**

Among a variety of reliable flaps, the RFFF, for its thinness and pliability, is particularly suitable for large soft palate defect reconstruction and remains the most widely used. Nevertheless, the RFFF shrinks during healing, especially after adjuvant radiotherapy, reducing soft palate mobility and worsening functional results.

Several modifications on the flap design, such as the folded RFFF, have been proposed to overcome these problems. Nevertheless, RFFF requires microanastomoses,
long operating time, carries a high risk of donor site morbidity, and does not adhere to the principle of “replacing like with like.”

The cheek’s myomucosal pedicled flaps offer several advantages. They allow for the replacing of the soft palate with similar featured tissues (thin, mobile, well-vascularized, and sensitive tissue with a secretory glandular function), do not require two surgical teams, may be quickly harvested with low donor-site morbidity, are hairless, and more pliable than a skin flap with no shrinking observed during healing or radiotherapy.1–8 Furthermore, good functional outcomes and a high degree of sensorial recovery have been previously demonstrated with these flaps.9

In 2013, Massarelli et al10 believed that they offered the best functional results and described the double-layer reconstruction of a total soft-palate defect using a single “folded” t-FAMMIF because at that time, surgical soft-palate reconstruction techniques were focused on the morphological restoration of two layers (oral and nasal). Even though this technique overcomes the need to harvest a double buccinator myomucosal island flap, it may not be sufficient to reconstruct a whole soft palate defect extended to the tonsillar fossae.

In this series, we were able to reconstruct extensive soft palate defects using a single pedicled “unfolded” kite-shaped t-FAMMIF. Nearly all the cheek mucosa may be harvested and safely transferred with this technique without needing to be folded, since mucosalization of the muscular surface occurs within approximately 3 weeks after surgery.

The flap’s inset slightly narrows the velopharyngeal space, which is responsible for better functional outcomes such as good speech intelligibility and effective swallowing function, both of which showed in our series.

Hence, the authors believe that the “kite-t-FAMMIF” represents an excellent reconstructive option for extensive postablative soft palate defects.

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ETHICAL APPROVAL

Due to its retrospective nature, this study did not require ethical committee approval but was conducted in accordance with the Declaration of Helsinki of 1973 as revised in 2002.

PATIENT CONSENT

Written informed consent for publication of clinical details and/or clinical images was obtained from the patients.

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