

Rational and simplified nomenclature for buccinator myomucosal flaps

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Abstract

Background Reconstruction of moderate-sized mucosal defects of the oral cavity or oropharynx represents a surgical challenge. Buccinator myomucosal flaps seem to provide “ideal reconstruction” of oral/oropharyngeal defects because they carry a thin, mobile, well-vascularized, and sensitive tissue, like that excised or lost. Nevertheless, these flaps are not immediately popular because of confusion surrounding the complex terminology used to name them.

Methods After a retrospective study on our experience and a literature review, the authors propose a new rational and simplified nomenclature for the classification of buccinator myomucosal flaps, which clarifies the source vessel, the composition of the flap, and the type of transfer.

Results According to this nomenclature, six types of buccinator myomucosal flaps are described.

Conclusions This proposed nomenclature may bring a consensus on the classification of buccinator myomucosal flaps and can help their spread.

Keywords Buccinator flap · Myomucosal flap · Musculomucosal flap · Cheek flap · FAMM · FAMMIF

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Introduction

The intraoral side of the buccal region has recently aroused interest as an “ideal donor site” for oral cavity soft tissue reconstruction. Its rich vascularization, which allows to harvest several types of flaps and its intrinsic capability to recover sensitivity, leads to good esthetic and functional results both in the cheek and in the oral cavity [1–5].

In 1989, Bozola et al. [6] first proposed the axial “buccinator musculomucosal flap,” pedicled on the buccal artery, with a posterior mucosal pivot at the maxillary tuberosity and a horizontal axis on the oral commissure.

In 1991, Carstens et al. [7], in contrast with Bozola’s beliefs, had reported that the buccal artery was not the main blood supply of the buccinator but the facial artery seemed to be preeminent instead. On this basis, Carstens proposed the “anteriorly based buccinator myomucosal island flap” based on the facial artery and vein. In 1992, Pribaz et al. [8] proposed the “facial artery musculomucosal flap” (FAMM), an axial myomucosal flap centered on the course of the facial artery with an orthograde flow (inferiorly based) or a reverse flow (superiorly based).

In 1999, Zhao et al. [7] described two buccinator myomucosal island flaps, with two different vascular patterns: the “buccinator myomucosal neurovascular flap posteriorly based” supplied by the buccal artery and the “buccinator myomucosal reversed-flow arterial island flap superiorly based” supplied by the lateral nasal artery, a terminal branch of the facial artery, with a reverse flow supply. However, these were not real island flaps, because they had a submucosal pedicle of 0.5–1 cm, which contains a sheet of the overlying buccinator and orbicularis muscles. Anyway, this work provided important anatomic bases for the development of a safe harvesting technique of the buccinator myomucosal flaps based on the facial and buccal arteries. In 2003, Zhao et al.

Table 1 Exclusion criterion list

Non-English language (11 articles)
Use of the generic term “buccinator myomucosal flap” without explanation of the technique used (20 articles)
Non-human studies (7 articles)
Use of an already reported name (42 articles)

[8] described a “buccinator myomucosal island flap” inferiorly based on the facial vessels for partial tongue reconstruction, but no details were given regarding the surgical technique used. More recently, Massarelli et al. proposed three modifications of the facial artery island flap previously introduced by Zhao: the tunneled buccinator myomucosal island flap [2], the arterialized buccinator myomucosal island flap [3], and the buccinator myomucosal free flap [9].

Because of the introduction of many “new types” of buccinator myomucosal flaps in the literature and the absence of any standardization in terminology, misunderstandings can occur when surgeons try to communicate and compare surgical techniques.

Present nomenclature is redundant, vague, inaccurate, and sometimes even conflicting. Therefore, the exact harvesting

procedure can hardly be understood unless the entire article is read. The resulting confusion hinders the communication and prevents further surgical and scientific development of the buccinator myomucosal flaps. Through an extensive literature review and on the basis of our experience of over 150 myomucosal flaps, the aim of this study is to propose a new simplified and clarified nomenclature of these flaps.

Materials and methods

Objective

A systematic review of the literature was performed in order to record different terms used to define the various types of buccinator myomucosal flaps.

Study identification and selection

A preliminary electronic search was performed using MEDLINE by means of PubMed (until February 15, 2017). A broad search strategy was performed using the following keywords: “myomucosal flap” OR “musculomucosal flap.”

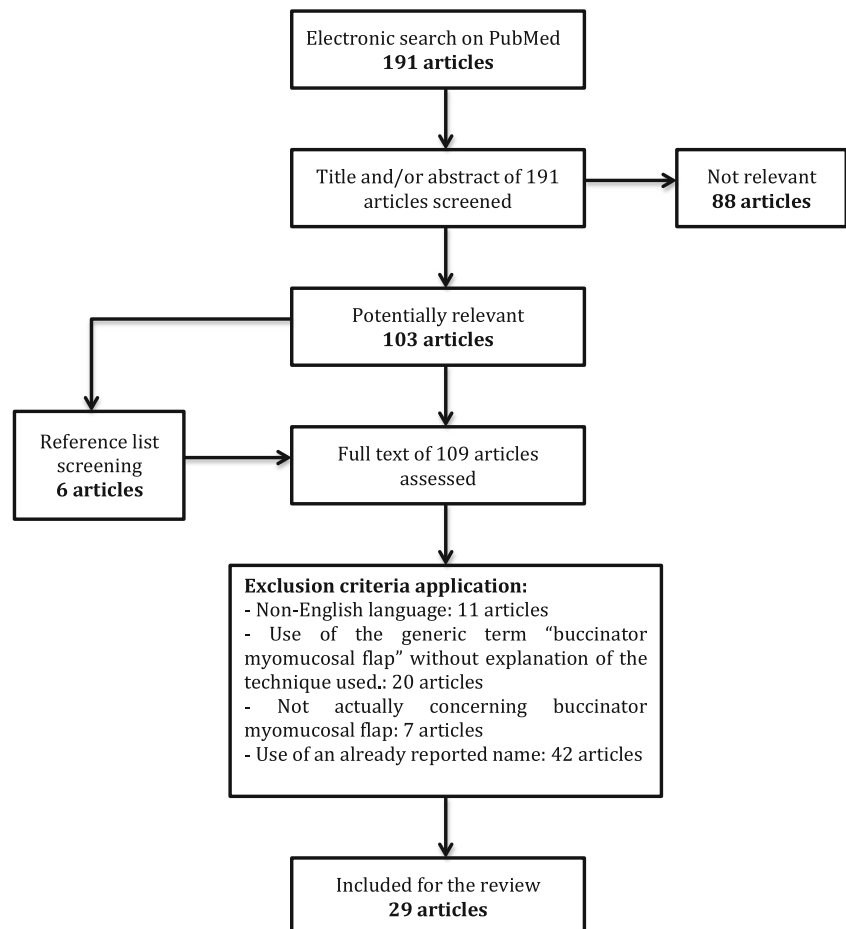
Fig. 1 Review process flowchart

Table 2 Results of the literature review on buccinator myomucosal flap nomenclature

Source vessel	Pedicle type	Nomenclature	Acronym
Nasal artery	Axial	Facial artery musculomucosal flap superiorly based [6] Superiorly based pedicled buccinator flap [12] Superiorly based reversed-flow facial artery myomucosal flap [13]	FAMM superiorly based [6]
Facial artery	Axial	Facial artery musculomucosal flap inferiorly based [6] Inferiorly based pedicled buccinator flap [12] Facial artery myomucosal flap [14] Pribaz flap [15]	FAMM inferiorly based [6]
Buccal artery	Axial	Buccinator musculomucosal flap [10] Buccal flap [23] Superiorly based facial artery myomucosal flap [24] Dorsally pedicled buccal musculomucosal flap [25] Bozola flap [14] Buccal myomucosal flap [26] Posterior-based buccinator myomucosal flap [27] Buccal artery-based buccinator myomucosal flap [28] Posteriorly based pedicled buccinator flap [12] Buccinator myomucosal flap [29] Buccinator artery-based buccal flap [30] Transverse facial artery musculomucosal flap [31]	FAMM superiorly based [24] DBMMF [25] t-FAMM [31] BMF [29]
Nasal artery	Island	Superiorly based buccal flap [7] Pedicled facial buccinator flap [16] Superiorly based islanded buccinator flap [12]	FAB [16]
Facial artery	Island	Buccinator myomucosal island pedicled flap [11] Anteriorly based buccinator myomucosal island flap [17] Buccinator musculomucosal island flap [8] Facial artery buccinator myomucosal island flap [2] Buccinator myomucosal island flap [18] Inferiorly based buccinator myomucosal island flap [12] Buccinator island flap [13] Inferior buccinator-based myomucosal flap [15] Facial artery myomucosal perforator flap [19] Zaho flap [14] Facial artery myomucosal island flap [20] Islanded facial artery musculomucosal flap [21]	BUMMIF (facial artery) [2] BUMIF [18] Inferiorly based BUMIF [22] Inferior BUMIF [15] FAMM island flap [21]
Buccal artery	Island	Posteriorly based buccal flap [7] Buccal artery buccinator myomucosal island flap [2] Facial artery musculomucosal flap [32] Buccal musculomucosal flap [33] Spacer facial artery musculomucosal flap [34] Posteriorly based islanded buccinator flap [12] Posterior buccinator-based myomucosal island flap [15]	BUMMIF (buccal artery) [2] FAMM [32] BMMF [33] s-FAMM [34] Posterior BUMIF [15]

The title and the abstract of the articles retrieved using the described strategies were then screened by two reviewers. For those studies appearing to be relevant and for those with insufficient information provided in the title, the full text article was checked to decide if their inclusion in the study was appropriate. The reference list from each selected article was also screened, and the full text of any relevant citation was also evaluated to take part in the study.

The full text of all articles retrieved from the first “keyword” searching phase and the articles retrieved from the reference list search were evaluated independently by two reviewers. Articles reporting a new denomination for a buccinator myomucosal flap type were also accepted. Four exclusion criteria have been considered: (1) non-English language, (2) non-clear

explanation of the surgical technique used, (3) article that did not regard cheek flaps, and (4) the use of a name previously reported.

Results

The electronic database search, updated on February 15, 2017, yielded 191 hits from PubMed. A total of 103 articles were considered relevant to the topic after title and/or abstract screening. Manual reference list search of the 103 selected articles added 6 more articles to the list. Full texts of the 109 articles were evaluated for the reporting of the nomenclature used. A total of 29 articles [2, 6–8, 10–34] were accepted

Table 3 Buccinator myomucosal flap new nomenclature

Source vessel	Vascularization pattern	New nomenclature	Acronym
Nasal artery	Axial	Nasal artery myomucosal flap	NAMM
Facial artery	Axial	Facial artery myomucosal flap	FAMM
Buccal artery	Axial	Buccal artery myomucosal flap	BAMM
Nasal artery	Island	Nasal artery myomucosal island flap	NAMMIF
Facial artery	Island	Facial artery myomucosal island flap	FAMMIF
Buccal artery	Island	Buccal artery myomucosal island flap	BAMMIF

using the exclusion criteria listed in Table 1. A flowchart of the systematic article selection and evaluation is illustrated in Fig. 1. A framework summary of the research findings is reported in Table 2.

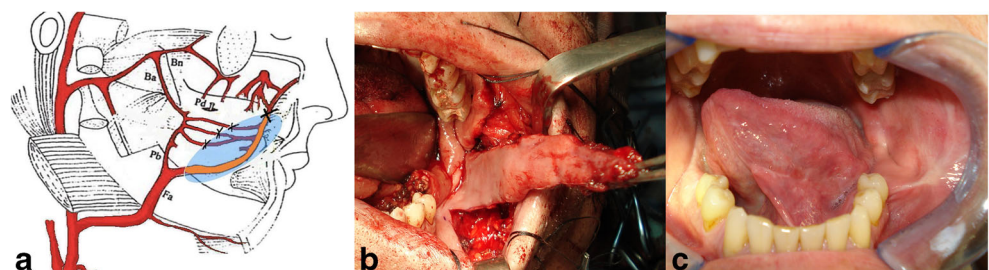
Discussion

Buccinator myomucosal flaps are becoming popular among reconstructive surgeons. They are versatile flaps and meet most of the criteria for an ideal like with like soft tissue reconstruction of the oral cavity and oropharynx [1–34].

In recent years, flap variety and flap nomenclature have had a concomitant exponential growth. Consequently, flap name can often be redundant, confusing, and sometimes even conflicting. It often occurred that in two different works, the two authors used different names to describe the same flap. The lack of standardized terms caused lot of confusion. Standardization of terminology is essential for communication between surgeons while discussing anatomy, preoperative planning, intraoperative surgical techniques, and postoperative care.

Recently, Rahpeyma et al. [12] proposed a new classification of buccinator myomucosal flaps. This classification has the merit of trying to answer the necessity of standardization in terminology but it presents four main drawbacks: (1) it does not allow the immediate identification of the source vessels, (2) it does not contemplate acronyms, (3) it eliminates the acronym FAMM flap which is the only term commonly used, and (4) it does not include important technical modifications such as tunneled or arterialized flaps. Moreover, Rahpeyma et al. have not used their classification in subsequent works on buccinator myomucosal flaps [15, 22, 35].

Fig. 2 a FAMM vascular pattern and shape. b FAMM flap harvested to reconstruct left lateral mouth floor. c 24-month follow-up



In our opinion, a complete and clear nomenclature should consider first the most crucial factor during flap dissection that ensures its survival: the pedicle [36–39].

However, focusing only on the blood supply of the flap often provides an incomplete description. The identification of secondary characteristics is essential to create a more accurate depiction, which is often necessary to improve the efficacy of flap dissection and a more effective communication of results [37]. As proposed by Tolhurst et al. [40], flap composition could answer this necessity.

Finally, a comprehensive nomenclature should include the type of pedicle (axial or island flap) and eventual technical peculiarity. Moreover, the possibility of using simple and catchy acronyms may facilitate the terminology diffusion.

The proposed classification reported in Table 3 allows ready identification of which vascular pedicle should be dissected (facial artery (FA), buccal artery (BA), lateral nasal artery (NA)) and the composition of the flap (myomucosal (MM)). Thus, along with FAMM, we propose the acronym BAMM and NAMM for the flaps with an axial pattern on the buccal and lateral nasal artery, respectively, and the acronyms FAMMIF, NAMMIF, and BAMMIF for the flaps harvested in an “island version.”

1) Facial artery myomucosal flap (FAMM)

Firstly described by Pribaz [6], the FAMM flap is an axial flap based and centered on the facial artery with an oblique orientation, extending from the retromolar trigone to the ipsilateral gingival labial sulcus at the level of the alar margin (Fig. 2a). It can be used to close small mucosal defects of the posterior hard palate, soft palate, tonsillar fossa, alveolus, floor of the mouth, and lower lip (Fig. 2b). In dentate patients, this flap requires a bite bloc during healing and a second operation time for pedicle section and vestibuloplasty.

Fig. 3 **a** BAMB vascular pattern and shape. **b** BAMB flap harvested to reconstruct right hard palate. **c** 6-month follow-up



Thanks to its simple and catchy acronym, FAMM flap denomination gained popularity and it is nowadays universally used. In our opinion, it should be the starting point for a new nomenclature.

2) Nasal artery myomucosal flap (NAMM)

Firstly described by Pribaz et al. as the “superiorly based reverse flow FAMM” [6], it presents the same orientation and shape of the orthograde flow FAMM but it is based on the lateral nasal artery, a terminal branch of the facial artery. The pivot point is located on the alar margin area and the flap can be used to reconstruct defects of the anterior hard palate, alveolus, maxillary antrum, nasal floor and septum, upper lip, and orbit. The use of the term NAMM flap allows an immediate identification of the source pedicle so as to distinguish orthograde and reverse flow FAMM flaps.

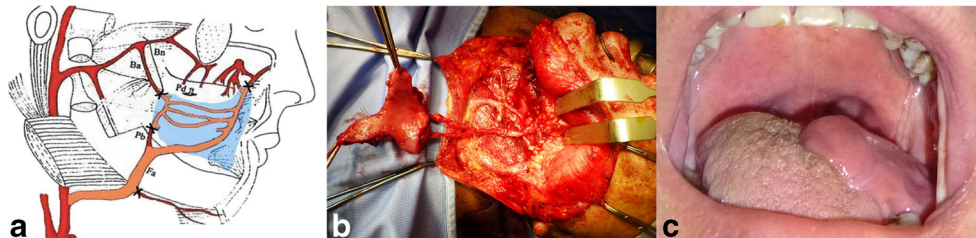
3) Buccal artery myomucosal flap (BAMM)

Firstly described by Bozola et al. [10], it is an axial flap based and centered on the buccal artery, an internal maxillary artery branch, extending from the maxillary tuberosity to the oral commissure (Fig. 3a). It can be used to close small mucosal defects of the posterior hard palate, soft palate, and maxillary alveolus (Fig. 3b). The nomenclature of this flap is confused and imprecise [10, 12, 14, 23–31]. Vague terms such as Bozola’s flap [14] or buccal flap [23] or the improper FAMM flap [24, 31] have been often used.

The term buccal artery myomucosal flap is precise and univocal. Moreover, the acronym BAMM is similar to the FAMM and it could be successfully accepted and avoid confusion which results from the use of improper or confused terms.

4) Facial artery myomucosal island flap (FAMMIF)

Fig. 4 **a** FAMMIF vascular pattern and shape. **b** t-FAMMIF harvested to reconstruct left tongue defect. **c** 11-month follow-up



Firstly described by Zhao et al. [8], this flap is pedicled on the facial vessels. Using this technique, it is possible to raise almost all the cheek mucosa as an island flap. The buccal artery angiosome is resected, but always included in the flap to augment peripheral vascularization [2].

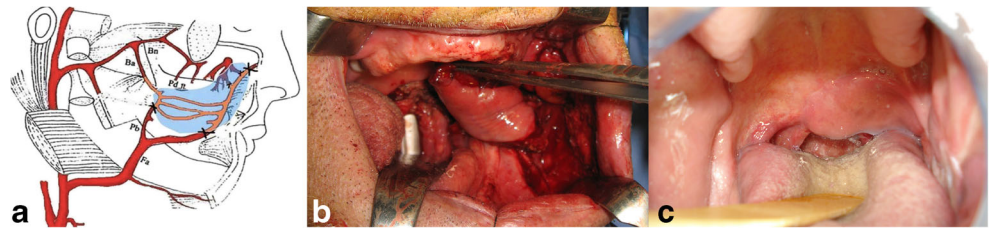
FAMMIF flap can be used successfully to reconstruct ipsilateral oral and oropharyngeal cavity soft tissue defects. No second surgery for pedicle section is required and defects up to 8 cm in diameter can be properly reconstructed. Commonly used names such as buccinator myomucosal island flap (BUMIF) [2, 15, 18] or buccinator myomucosal island flap inferiorly based [12, 15] do not give reference to the vessel on which the flap is based. On the contrary, the term “facial artery myomucosal island flap” allows to uniquely individuate the composition, the source vessel, and the pedicle type of the flap.

An important modification of the FAMMIF flap should be considered: the tunnelized facial artery myomucosal island flap (t-FAMMIF) [2–4]. With this technique, facial vessels are dissected up to their origin in the neck. The flap is carried out to the neck region, through a short paramandibular tunnel created on the inferior fornix following the course of the vessels (Fig. 4a). The flap is then re-routed through the anterior tonsillar pillar or the oral floor by means of another tunnel created medially to the mandible. The t-FAMMIF has a very long arc of rotation allowing to reconstruct virtually all areas of the oral cavity or the oropharynx, even on the contralateral side (Fig. 4b).

5) Buccal artery myomucosal island flap (BAMMIF)

Firstly described by Zhao et al. [7], it is the “buccinator myomucosal neurovascular flap posteriorly based,” based on the buccal artery as an island flap. The outline of this flap is the same of the FAMMIF but the facial artery was ligated and harvested with the flap to maintain the integrity of the cheek

Fig. 5 **a** BMMIF vascular pattern and shape. **b** BMMIF harvested to reconstruct left soft palate defect. **c** 11-month follow-up



vascular network. Arterial blood flow is assured by the buccal artery, which is meticulously dissected up to the pterygomandibular raphe to increase its arc of rotation (Fig. 5a). This flap is useful in posterior reconstructions, in patients classified as cN+ and in those cases in which the facial artery was ligated or accidentally cut (Fig. 5b). The use of the term BMMIF allows to overcome the inaccurate set of names proposed up to now for this type of flap [2, 7, 12, 15, 32–34].

Conclusions

The proposed nomenclature intends to provide a useful standardization in terminology about buccinator myomucosal flaps, removing misunderstanding and confusion in communication among the authors. This nomenclature describes tissue components, source vessels, and type of transfer of these flaps by simple acronyms. For this reason, it can aid the surgeon in understanding “where and how” to harvest buccinator myomucosal flaps and can help these techniques to gain wider acceptance and popularization.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval Not required.

Patient consent Written consent was obtained to publish clinical photographs.

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