Maxillectomy defects: a suggested classification scheme.

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Abstract

Introduction: The term "maxillectomy" has been used to describe a variety of surgical procedures for a spectrum of diseases involving a diverse anatomical site. Hence, classifications of maxillectomy defects have often made communication difficult. This article highlights this problem, emphasises the need for a uniform system of classification and suggests a classification system which is simple and comprehensive.

Methods: Articles related to this subject, especially those with specified classifications of maxillary surgical defects were sourced from the internet through Google, Scopus and PubMed using the search terms maxillectomy defects classification. A manual search through available literature was also done. The review of the materials revealed many classifications and modifications of classifications from the descriptive, reconstructive and prosthodontic perspectives.

Results: No globally acceptable classification exists among practitioners involved in the management of diseases in the mid-facial region. There were over 14 classifications of maxillary defects found in the English literature.

Conclusion: Attempts made to address the inadequacies of previous classifications have tended to result in cumbersome and relatively complex classifications. A single classification that is based on both surgical and prosthetic considerations is most desirable and is hereby proposed.

Keywords: *Maxillectomy, classification.*

Résumé

Introduction: Le terme «maxillectomie" est utilisé pour décrire une variété de procédures chirurgicales pour un spectre de maladies impliquant un site anatomique diversifié. Par conséquent, la classification des défauts de maxillectomie ont souvent rendu la communication difficile. Cet article met en lumière ce problème, souligne la nécessité d'un système uniforme de classification et propose un système de classification simple et claire.

Méthodes: Les articles liés à ce sujet, en particulier ceux avec les classifications précises de défauts de chirurgie maxillaire provenaient de l'Internet à travers Google, Scopus et Pub-Med en utilisant les termes maxillectomie de classification des défauts. Une recherche manuelle à travers la littérature disponible a également été faite. L'examen des documents a révélé de nombreuses classifications et de modifications des classifications des perspectives descriptives, reconstructives et prothétiques.

Résultats: Il n'existe pas de classification universellement acceptable entre les praticiens impliqués dans la gestion des maladies dans la région médio-faciale. Il y avait plus de 14 classifications de défauts maxillaires trouvés dans la littérature anglaise.

Conclusion: Les tentatives faites pour répondre les insuffisances des classifications précédentes ont eu tendance à entraîner des classifications encombrantes et relativement complexes. Une classification unique qui est fondée sur des considérations à la fois chirurgicale et prothétique est plus souhaitable et est donc proposé.

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Introduction

The term 'maxillectomy' is used to describe a variety of surgical procedures for a spectrum of conditions involving the maxilla – a diverse anatomic site. It has been defined as the surgical removal of a part of or all of the maxilla [1] and may be indicated in the surgical management of benign and malignant tumours of the nose, palate and paranasal sinuses [2] and rarely in the treatment of fulminant fungal infection of the sinuses [3].

There have been several attempts at classifying and reclassifying maxillectomy defects [4-17], but these efforts have been cumbersome and often resulted in further confusion and have not been universally accepted [18]. The literature is also replete with the use of terminologies such as limited, partial, subtotal, total, radical, hemi-, bi- and extended maxillectomy, all of which add to the confusion. The absence of an established, all-encompassing classification hampers communication. Prior to 2012, there were no sets of criteria established for classifying these defects until Bidra *et al* [18] suggested six criteria for universal assessment of classifications.

Although a criterion-based description of maxillectomy defects has been proposed, a simple,

clear and easy to visualize classification will be preferred for interspecialty communication and facilitate universal review of studies involving maxillectomy defects.

Material and methods

Articles related to this subject, especially those with specified classifications of maxillary surgical defects were sourced from the internet and manually using the search terms maxillectomy defects classification.

Results

There were fourteen recognised classifications in the English language literature and a review of the materials revealed original and modifications of classifications from the descriptive, reconstructive and prosthodontic perspectives.

Existing Classifications

The earliest and perhaps simplest classification of maxillary pathologies was by Ohngren in 1933 [19]. This classification was for establishing resectability criteria. He based his criteria on an arbitrary imaginary line passing from the medial canthus of the eye to the angle of the mandible and classified the tumour as having good prognosis if below the line and those above the line as having poor prognosis. This classification did not take into consideration the defect left after surgery.

Three of these classifications are based on prosthetic considerations. These are the classifications by Aramany [4], Unimo *et al* [7] and Okay *et al* [12]. Aramany [4] studied a cohort of 123 patients and classified the defects based on the frequency of occurrence of the defects in his study population. He identified six classes of defects in his partially dentate population and classified them according to their horizontal extension on the hard palate and the involvement of the teeth.

Unimo *et al* [7] however advocated a two part classification with five subclasses. Their classification was based on location of defect either in the hard palate (class I) or soft palate (class II). They sub classified these based on connection with the antral and nasal cavities.

Okay *et al* [12] divided the defects into four classes with class I having two sub classes as well as class IV. They used the canines as landmarks for involvement of the dentition and notably included extension into the orbital floor and zygoma in their class IV.

The classifications based on surgical end points are about nine in number.

Brown *et al* [9,17] attempted to harmonise prosthetic requirements with consideration for loss of palatal and alveolar tissue and surgical end points of vertical extension and involvement of adjoining structures.

Spiro *et al* [6] highlighted the problems of maxillary defect classification and proposed a scheme based on an analysis of 442 maxillectomies and orofacial resections. They came up with: I – limited maxillectomy with involvement of one wall, II – Subtotal maxillectomy with involvement of at least two walls including the palate, III – Total maxillectomy which is a complete resection of the maxilla (Table 1)

The perceived drawbacks of this classification scheme include the fact that the particular antral wall (or walls) has to be specified and a note has to be written on the surgical access need and the extent of involvement of adjacent structures. These make the classification cumbersome and difficult to relate to a colleague verbally.

Davison *et al* [8] in 1998 proposed a reconstruction algorithm based on a review of 108 patients undergoing prosthetic obturation, non – vascularised bone grafts, local flaps, regional flaps and microvascular free tissue transfer. They divided the patients into two broad classes, I – Complete maxillectomy and II partial maxillectomy and developed a treatment algorithm.

Triana *et al* [10] in 2000 gave a classification that divided defects into three classes based on vertical extension and affected area of the palate. Their class III was designated total maxillectomy with and without orbital exenteration. This classification was rather not comprehensive and failed to give a mental picture of the defects to facilitate easy communication.

A classification scheme that reflects both aesthetic and functional outcome was that developed by Cordeiro and Santamaria [11] in 2000. They designated their classification as limited (class I): Resection of one or two walls of the maxilla excluding the palate; subtotal (class II): Resection of the maxillary arch, palate , anterior and lateral walls lower five walls with preservation of the orbital floor; total maxillectomy with preservation of orbital contents, (class IIIa): Total maxillectomy (resection of all 6 walls) with preservation of orbital contents, (class IIIb): Total maxillectomy with orbital exenteration and (class IV):Orbitomaxillectomy (resection of the orbital contents and upper five walls of the maxilla, with preservation of the palate. Yamamoto *et al* [13]

in 2004 developed a buttress based classification scheme, while Carillo *et al* [14] in 2005 developed a classification based on preservation of the walls of the antrum. Both classifications did not receive much acceptance.

Futran *et al* [15] in 2006 tried to refine this classification and split the total maxillectomies into two classes based on the performance of orbital exenteration.

Larson [20] paid glowing tribute to this classification scheme by claiming that it was simple enough to facilitate surgical plans and aid in communication with ablative surgeons.

Brown *et al* [9] in 2000 were the first to combine both a surgical and prosthodontic approach towards classifying maxillopalatal defects. They emphasized the need for a classification that will take into account the aesthetic and functional outcome while indicating the most appropriate form of management in terms of obturation or reconstruction, so that the results of cases can be compared between units and across the world literature. The resultant classification following analysis of 487 patients was described according to the vertical and horizontal dimensions of the defect.

For the vertical component, a Class I defect was described as maxillectomy with no oro-antral fistula, Class II: a low maxillectomy that does not involve the floor of the orbit with or without peri-orbital and with or without anterior skull base resection. Class IV was a maxillectomy involving orbital exenteration with or without anterior skull resection. The horizontal components were described as (a) being a unilateral, alveolar, maxilla and hard palate resection, (b) a bilateral, alveolar and hard palate resection and (c) removal of the entire alveolar maxilla and hard palate.

The authors of this classification stated that: "the classes of defect (1-IV) indicate the likely aesthetic effect of the surgery and the qualifying letter (a, b or c) the increasing difficulty of full oral and dental rehabilitation. These defects are poorly managed by prosthetic rehabilitation alone and often require hard tissue reconstruction.

Kotisko [21] in 2004 suggested a modification to this classification by the introduction of a Class V to designate maxillectomies involving other structures e.g temporal bone, base of skull etc. Brown and Shaw [17] in 2010 probably influenced by the suggestion added two new classifications; (V) orbitomaxillary defect and (VI) nasomaxillary defect. He modified the horizontal component by expunging the total maxillectomy class and expanding the horizontal component of the classification to four classes based on the extent of the defect on the palate and alveolus. We find Brown's classification to be quite comprehensive and borrowed extensively from him in our proposed classification.

We think, though, that his classification gives a limited pictorial representation of these defects with regard to rehabilitation of these patients which should be a major and final consideration in managing these patients to ensure they have an optimised quality of life after surgery [22]. We have also been influenced by the work of Aramany [4].

Proposed classification.

We propose that to have a succinct and pictorial classification of defects of a complex area such as the maxilla, certain ground rules should be observed. We agree with Bidra *et al* [18] in their submission that any classification must address six criteria to be comprehensive. These criteria are (1) Dental status (2) Oroantral/nasal communication (3) Contiguous structure involvement (4) Superior – inferior extension (5) Anterior- posterior extension and (6) Medial – lateral extension. We however disagree with their submission that a criteria based description appears more objective and amenable for universal use than a classification. We propose a scheme that fulfils all of these criteria and is simple and will enhance intra and inter – centre communication and review of the literature.

However we concede that classification may require descriptions to make them clearer and less cumbersome. We therefore propose the following rules for our classification:

1. The classification is a classification of maxillary defects. Extensions into the soft palate, zygoma, anterior base of skull, orbit and other associated structures are what they are "extensions". These should only be expressed in the classification with a prefix –"extended" and a suffix naming the structure(s) involved.
2. The vertical extension should not determine the classification, but should be used in a descriptive sense thus:

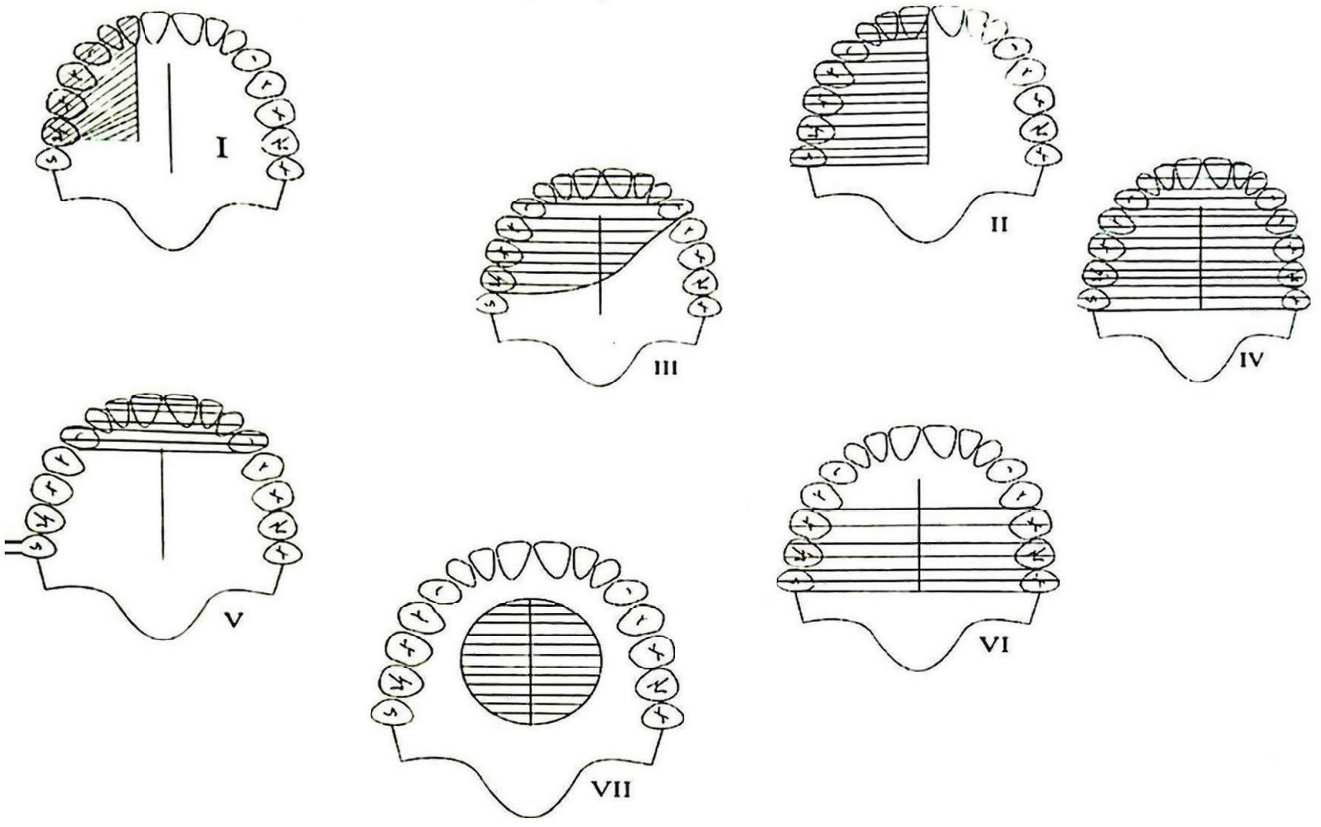
Low – level: involvement of dento-alveolar structures without formation of oro-antral fistula

Mid- level: Formation of oro-antral fistula without exposure of the base of skull or orbital floor.

High level: Formation of oro-antral fistula with exposure of base of skull and (or) orbital floor.

3. The main classification should be considered with the dento-alveolar structures in mind. Hence, the classification can be used for both dentate and edentulous patients (Fig 1).

Figure 1: Proposed classification of maxillectomy



We propose a classification of maxillectomy defects with seven classes represented by the first seven Roman numerals. The classification would be based on the horizontal extension of the defect on the palate.

Class I: Unilateral defect not extending to the mid-line and involving the dento-alveolar structures.

Class II: Mid-line resection involving the dento-alveolar structures.

Class III: Bilateral resection involving the dento-alveolar structures, but does not involve the entire tooth bearing area.

Class IV: Bilateral resection involving the entire tooth bearing area i.e. total maxillectomy.

Class V: Bilateral resection involving only an anterior tooth bearing area with abutment tooth posterior to defect bilaterally.

Class VI: Bilateral posterior resection with abutment teeth anterior to defect anteriorly.

Class VII: Palatal resection sparing the entire dento alveolar structures

A typical resection which extends to the soft palate and orbit that has a unilateral mid-line palatal resection would thus be named extended high level class II maxillectomy – soft palate and orbit.

Conclusion

A single classification that considers both surgical and prosthetic considerations for a complex anatomic site like the maxilla could be most challenging to fashion out. We believe our classification introduces brevity and clarity and into the classification of maxillectomy defects thereby enhance communication between practitioners and investigators and help to standardize research in maxillectomies

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