

A Study of Classification Systems for Maxillectomy Defects

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ABSTRACT:

Maxillectomy is one of the most common procedures performed by oral and maxillofacial / head and neck surgeon. It is usually performed for ablation of maxillary tumors. Various classification systems exist in literature to describe the surgical defect, left behind after maxillectomy. There remains however confusion, in literature, regarding use of correct terminology and description of surgical defect. We performed a comprehensive literature search to identify all classification systems which have been described in the literature. We present a comprehensive review of these classification systems and also describe, based upon our own clinical experience, a simpler way of classifying and describing the Maxillary defects.

Key Words: Maxillectomy, Alveolectomy, Obturators.

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INTRODUCTION

Historically, there is evidence that the procedure of maxillectomy may have been performed as early as 1820. The first recorded Maxillectomy was however, performed in 1841 by Liston on a 21 years old patient with nasopharyngeal angiofibroma.¹

Numerous classifications and nomenclatures exist in literature to describe the post ablative defects. These classifications are not only useful for descriptive purpose but also provide guidance to the surgeon in reconstruction and rehabilitation phase. There remains, however confusion in use of terminology and nomenclature, as there is no single classification which is accepted universally.

In this article, a review these classification systems, in an attempt to clarify this confusion.

METHODOLOGY

Pubmed search was performed for papers published on maxillectomy classifications in the past 20 years. A total of 52 papers were found, out of which 6 classification systems were selected for further review.

LITERATURE REVIEW

Armany's Classification for Maxillectomy Defects:

Armany presented a classification system for maxillectomy defects in 1987[2]. He divided these defects into 6 categories, based upon the relationship of the defect with the abutment teeth (Table: 1)

Class I: The resection is performed in the anterior midline of the maxilla, with abutment teeth present on one side of the arch.

Class II: The defect in this group is unilateral, retaining the anterior teeth on the contralateral side.

Class III: The palatal defect occurs in the central portion of the hard palate and may involve part of the soft palate.

Class IV: The defect crosses the midline and involves both sides of the maxilla, with abutment teeth present on one side.

Class V: The surgical defect is bilateral and lies posterior to the abutment teeth. Labial stabilization may be needed.

Class VI: Anterior maxillary defect anterior with abutment teeth with abutment teeth present bilaterally in the posterior segment.

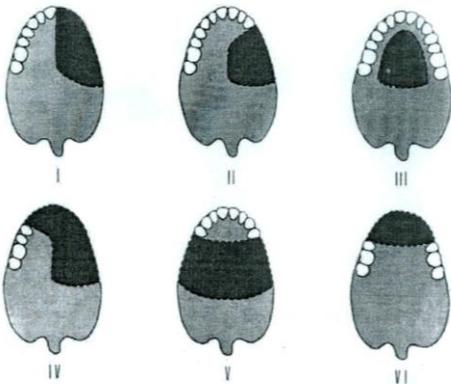


Figure 1: Aramany classification system for Maxillectomy defects. (Source: J Prosthet Dent. 1978; 40: 554-557).

This is an excellent classification and is devised in order to guide the Prosthodontists in obturator design. It is however deficient in description of surgical defect. It does not provide information about the resection of orbital contents, facial skin or soft palate. It also does not guide the surgeon in surgical reconstruction of the defect.

Spiro Classification of Maxillary Defects:

Spiro et al reviewed 403 maxillectomies performed between 1984 and 1993 for maxillary carcinoma.³ They suggested the following classification system:

Limited Maxillectomy: The term "Limited" was applied to any maxillectomy in which one wall of the maxillary antrum was removed.

Subtotal Maxillectomy: Maxillectomy in which at least two walls (including the palatal wall) were removed.

Total Maxillectomy: Complete resection of the Maxilla.

While this classification is simple and easy to use, it is incomplete in its description of Maxillary defects. It does not describe whether dento-alveolar part of the Maxilla, orbital contents, soft palate or facial skin was resected or retained. It does not guide the surgeon in reconstruction of the defect.

Liverpool Classification of Maxillectomy Defects:

Brown et al in 2000, presented data of 45 patients, who had undergone Maxillectomy from 1989 to 1997.⁴ They classified surgical defects separately according to the vertical and horizontal dimensions of the defect.

Class I: Maxillectomy with no oro-antral-fistula:

Removal of alveolar bone that does not result in an oro-nasal or oro-antral fistula. Resection of ethmoidal sinus, frontal sinus and /or lateral wall of nose may also be included in this classification.

Class II: Low Maxillectomy:

This resection involves the alveolus and the antral wall, which would inevitably cause oro-nasal or oro-antral fistulae. Orbital floor or rim remains intact.

Class III: High Maxillectomy:

In this category floor of the orbit with or without peri-orbital tissue is resected along with the rest of the Maxilla. It may also include skull-base resection.

Class IV: Radical Maxillectomy:

Maxillectomy with orbital exenteration with or without anterior skull-base resection.

Horizontal component

- a. Resection involves unilateral maxillary alveolus and hard palate, sparing the contra-lateral side and nasal septum.
- b. Contralateral Maxilla is partially resected with the ipsilateral Maxilla.
- c. Alveolar maxilla and hard palate is completely resected bilaterally.

Maxillectomy Classification

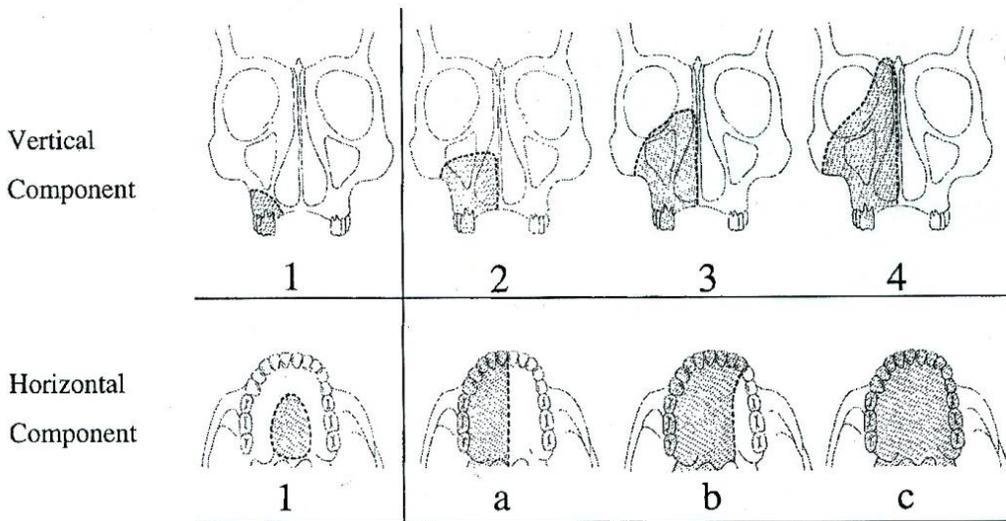


Figure 2: Liverpool classification of Maxillary defects (Source: Head Neck. 2000 Jan; 22(1):17-26)

They concluded that while obturator can be designed for any defect, they become unreliable (poor retention) in larger defects, such as in Class III and IV, with b and c sub types. In class I and 2a local and pedicled flaps can also be used successfully. In even larger defects, while soft tissue flap could be used to obturate the defect, Osseo-cutaneous free flaps is a better option. Vascularized bone can be used for insertion of osseointegrated implants and further dental rehabilitation.⁴

While this is an excellent classification, which not only addresses the vertical and the horizontal component of the surgical defect, it also guides the surgeon in selection of particular type of reconstruction. This classification is however too complicated to use and has failed to acquire wide spread usage.

Cordeiro’s Classification of maxillary defects:

Cordeiro et al reviewed 58 patients who had undergone maxillectomies of varying degrees. These defects were reconstructed using wide variety of flaps. Their aim was to classify maxillectomy in a rational fashion and also to provide an algorithm for reconstruction of these defects.⁵ Their classification was as follows:

Type I (Limited maxillectomy): One or two walls of Maxilla are resected with the preservation of palate.

Type II (Sub-total maxillectomy): 5 out of the 6 walls of Maxilla are removed, preserving orbital floor.

Type III (Total maxillectomy): Resection of all six walls of Maxilla.

III a: Total Maxillectomy with orbital contents preserved.

III b: Total Maxillectomy with orbital exenteration.

Type IV (Orbito-maxillectomy): Orbital exenteration with resection of upper 5 walls of Maxilla, preserving the palate.

Reconstruction Algorithm:

Type I defect: Palate is preserved, by definition, in these defects. Reconstruction with free non vascularized bone may be required to replace bone in critical area, such as orbital rim or anterior floor of orbit. Defect can be further obliterated using RFFF.

Type II defect: RFFF can be used to reconstruct missing palate. An Osseo-facio-cutaneous RFFF can be used to reconstruct the anterior Maxilla, which would provide good support to the lip.

Type III a defects: In these defects free non-vascularised bone can be used to reconstruct the orbital floor, while the remaining defect may be obliterated using either Temporalis or Rectus Abdominus flap. Cordeiro et al recommended that bone graft must be sandwiched with in the flap (Figure: 3).

Type III b defect: This is a large defect in which Cordeiro recommended use of Rectus Abdominus flap

Class I b: Defects that involve any part of the maxillary alveolus and dentition posterior to the canines or involving the pre-maxilla.

with skin paddles which may be used to reconstruct Palate, nasal wall or facial skin (Figure: 4).

Type IV defect: This is a large defect which has an advantage of having palate intact. In these cases, large bulk flap such as Rectus Abdominus with or without skin paddle to reconstruct the defect.

While this classification is simply to use and contains easy terminology, it fails to addresses, in its simplicity, those defects which are composite in their content. For example, if base of skull, facial skin or adjacent muscle are removed, they are not mentioned in this classification.

This classification however, provides a guideline for flap reconstruction in these defects. It does not mention rehabilitation through obturators.

Okay's Classification of Maxillary defects:

In 2001, Okay et al classified palato-maxillary defects into 3 major classes and 2 sub-classes.⁶ The aim of this defect oriented classification was to organize and define the complex nature of the restorative decision making process. The classification is as follows:

Class I a: Defects that involve hard palate but not the tooth-bearing alveolus.

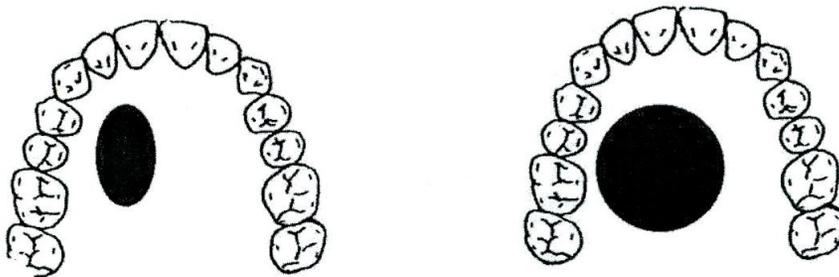


Figure 5: Okay classification type Ia. (Source: J Prosthet Dent.2001 Oct; 86:352-63)

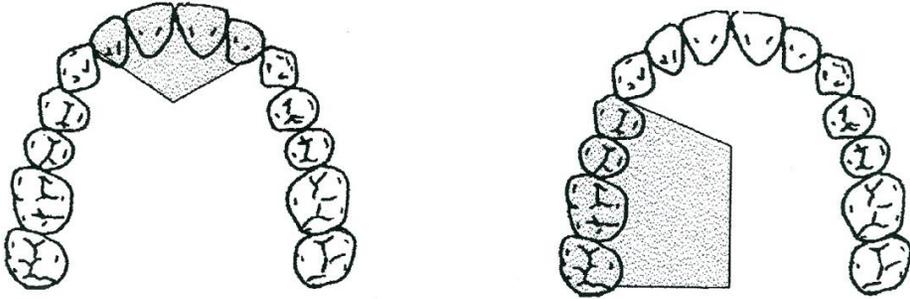


Figure 6: Okay classification type Ib. (Source: J Prosthet Dent.2001 Oct; 86:352-63)

Class II:

Defects that involve any portion of the tooth-bearing maxillary alveolus but include only 1 canine.

The anterior margin of these defects within the pre-maxilla. Also involved in this group were anterior transverse palatotomy defects that involved less than one half of the palatal surface.

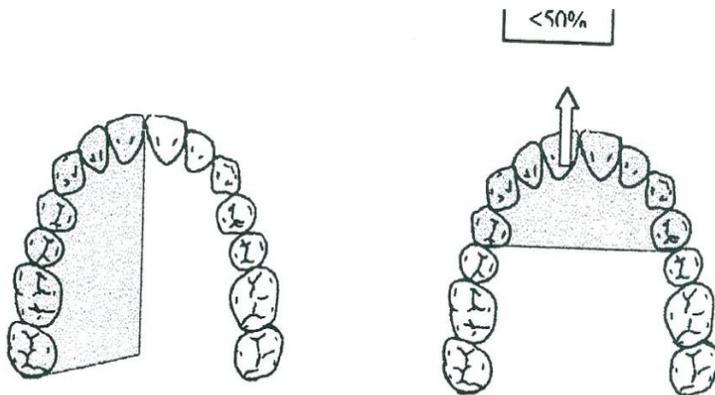


Figure 7: Okay classification type II. (Source: J Prosthet Dent.2001 Oct; 86:352-63)

Class III:

Defects that involved any portion of tooth-bearing maxillary alveolus and includes both canines, total

palatotomy defects and anterior transverse palatotomy that involved more than half of the palatal surface.

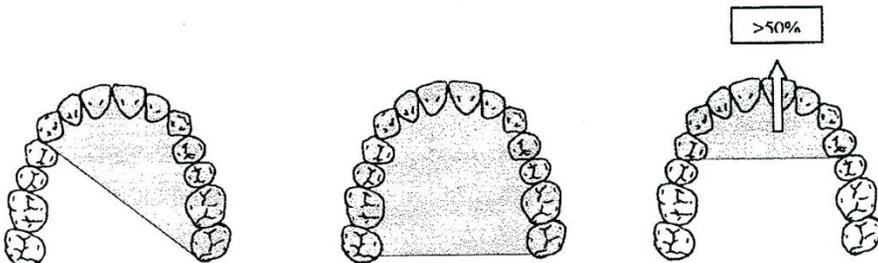


Figure 8: Okay classification type III. (Source: J Prosthet Dent.2001 Oct; 86:352-63)

Subclasses f and z: Subclass f includes defects that involve the inferior orbital rim whereas Subclass z have defects that involved the body of the zygomatic bone.

Reconstructive options:

Okay et al recommended that in Class I a defects, since the dentition is not lost, the best reconstructive option is to either obturator plate or use a local or free facio-cutaneous flap for reconstruction. In Class I b defects, since the defect involve dentition posterior to the canine, the option for reconstruction is either obturator with prosthetic teeth or local soft tissue flap or free facio-cutaneous flaps on which a denture could be made later on. The gold standard however remains Osseo-cutaneous free flap in which implant could be inserted for dental rehabilitation.

The surgical defect in Class II cases is larger than class I b, however options remain the same as in Class Ib.

In class III defects left there is little or no residual palate left hence to get secure retention for an obturator is difficult leading to poor prosthetic prognosis. In these cases defect should be closed using free osseo-cutaneous flap. In very large resections where bilateral maxilla is resected along with orbital exenteration and /or base of skull resection, the option for reconstruction include very large flap, e.g. Rectus free flap.

This classification is extremely complicated to use and fails to address those defects which involve orbital contents, facial skin, soft palate or base of skull.

Discussion

Bidra et al ⁷ conducted a systematic review of literature published on maxillectomy defects from 1974 to 2011. They identified 6 criteria on which to judge the clinical relevance of a classification. These criteria were:

1. dental status.
2. oroantral / nasal communication status.
3. soft palate and other contiguous structure involvement.
4. superior-inferior extent.
5. antero-posterior extent.
6. medial-lateral extent of the defect.

They concluded that no single classification system described accurately the maxillectomy defect that could satisfy both surgical and prosthodontics needs.

We believe that any classification for maxillary defects should be simple, comprehensive and easy to use. It should also guide the clinician regarding reconstructive and rehabilitation options.

Based upon the above assertion and experience through surgical practice, we propose the following classification system and terminology for the maxillary defects.

I. Alveolectomy:



Figure 9 (Graphic design at RMI)

These are surgical defect that involve alveolar bone alone, with no oro- nasal or oro-antral fistula. In these cases, no flap or obturator may be required. A denture however may be extended to cover the defect.

II. Sub-total Maxillectomy:

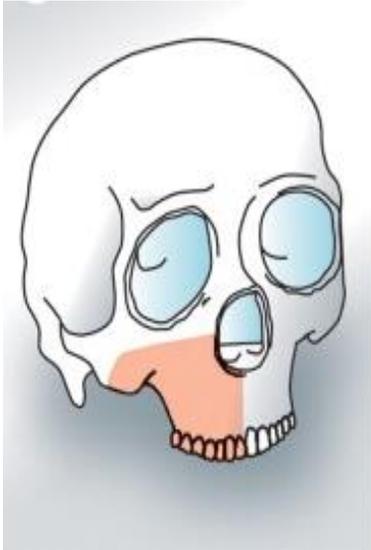


Figure 10 (Graphic design at RMI)

Surgical defect that cause oro-nasal or oro-antral fistula, but do not disturb the orbital wall of the Maxilla. These defects can be repaired using either an obturator or local flap such as naso-labial flap, buccal fat pad flap or temporlis flap. The advantage of using obturator is the ability of the patient to clean it from time to time and better surveillance for tumor recurrence.

III. Total Maxillectomy:



Figure 11 (Graphic design at RMI)

In these cases complete Maxilla is removed including the orbital floor, while the orbital contents remain intact. These defects can be rehabilitated using an obturator, which is extended upwards to make orbital floor. For Surgical reconstruction, options range from regional flaps such as temporalis flap to free flaps. The additional advantage of a vascularized bony flap is its accommodation of dental implants, which can be further used for dental rehabilitation.

IV. Radical Maxillectomy:

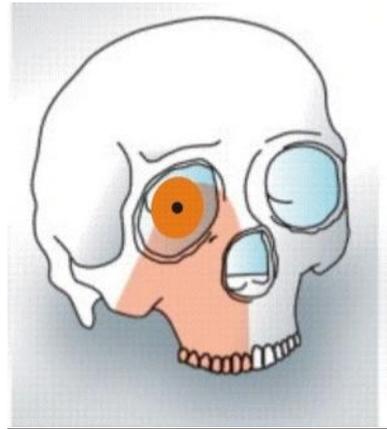


Figure 12 (Graphic design at RMI)

These are the defects in which orbital contents are removed along with maxilla. These defects can be oburated using prosthetic appliance for maxillary defect, whereas orbital defect can be initially covered using skin graft and later prosthetic eyeball may be constructed. Flap reconstruction in these cases need a bulky flap such as free rectus abdominus flap or osseo-cutaneous flap such as free fibula flap.

V. Composite Maxillectomy:



Figure 13 (Graphic design at RMI)

The term composite Maxillectomy can be used where facial skin, soft palate and/or any other part of oral cavity are resected in addition to Maxilla.

All these defects can be further subdivided into:

1. Unilateral: defects that remain on one side of the midline
2. Bilateral: defects that cross the midline

After describing an ipsilateral defect, the contralateral defect may be further designated as alveolectomy, subtotal maxillectomy, total maxillectomy and radical maxillectomy defects. So for example a patient may have undergone an Ipsilateral radical maxillectomy with contralateral subtotal maxillectomy or an ipsilateral total maxillectomy with a contralateral alveolectomy.

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REFERENCES:

1. Myhre M, Michaels L. Nasopharyngeal angiofibroma treated in 1841 by Maxillectomy. *Otolaryngol.* 1987 16:390-2.
2. Aramany MA. Basic principles of obturator design for partially edentulous patients. Part I: Classification. *J Prosthet Dent* 1978; 40:554-557.
3. Spiro RH, Strong EW, Shah JP. Maxillectomy and its classification. *Head Neck* 1997;19:309-14.
4. Brown JS, Rogers SN, McNally DN, Boyle M. A modified classification for the maxillectomy defects. *Head Neck* 2000; 22:17-26.
5. Cordeiro PG, Santamaria E. A classification system and algorithm for reconstruction of maxillectomy and midfacial defects. *Plastic Reconstr Surg* 2000; 105:2331-2346, discussion: 2347-8.
6. Okay DJ, Genden E, Buchbinder D, Urken M. Prosthetic Guidelines for surgical reconstruction of the maxilla: a classification system of defects. *J Prosthet Dent* 2001; 86:352-63.
7. Bidra AS, Jacob RF, Taylor TD. Classification of maxillectomy defects: a systemic review and criteria necessary for a universal description. *J Prosthet Dent* 2012; 107:261-70.