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RESEARCH ARTICLE

CLASSIFICATION OF MAXILLOFACIAL DEFECTS: A REVIEW ARTICLE

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Abstract

Defects in the maxillary jaw can be congenital, developmental, acquired, traumatic or surgical involving the oral cavity and related anatomic structure.Absence or loss of some or all of the soft palate and / or hard palate results in insufficient structure or altered function of the remaining tissues. Defects can cause disruption of articulation and airflow during speech production and also nasal reflux during deglutition. Patients after surgical resection have altered anatomy due to scaring, tissue contracture, lack of bony support and tissue edema. These patients have problem of regurgitation of water and food through nose and difficulty in speech. These changes require the fabrication of prosthesis and also sometimes repeated prosthesis adjustments to confirm to the soft tissue changes. To prevent this and to help the patient in deglutition and speech defects must be restored with prosthesis. In such situation an obturator is designed to close the opening between the residual hard and / or soft palate and the pharynx. The prosthesis provided for these patients are called as obturators. An obturator is a prosthesis which is fabricated for the patients with the palatal defects in the form of cleft lip and palate, oroantral fistula or surgical resection after removable of pathology like tumor or cancer. This review article will highlight on the Prosthetic Rehabilitation of the maxillary defects and the types of obturators.

Introduction:-

"It is God-given right of every human being to appear human."[1]

"We restore, rebuild, and make whole those parts which nature has given, but which fortune has taken away. Not so much that it may delight the eye, but that it might buoy up the spirit, and help the mind of the afflicted."- Gaspare

Body abnormalities or defects that compromise appearance and function.[2] Most common intraoral defects in the maxilla are in the form of an opening into the antrum and nasopharynx.[3] Such defects compromise appearance, function and render an individual, incapable of leading a relatively normal life and affect his\her psyche.[4]

Following World War II, an era of specialization among health care professionals ensued. As a sub-specialty area of the recognized dental specialty prosthodontics, maxillofacial prosthetics has become an essential patient-care link between dentistry and surgery.[5]

The Glossary of Prosthodontic Terms (2005) defines Maxillofacial prosthetics as, "the branch of prosthodontics concerned with the restoration and/or replacement of the stomatognathic and craniofacial with prostheses that may

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not be removed on a regular or elective basis."[6] Maxillary defects can be congenital, developmental, acquired, traumatic, or surgical involving the oral cavity. Acquired and congenital defects of the face create an unfortunate condition for an individual to lead a comfortable life and these individuals require rehabilitation using maxillofacial prosthesis.[7] Absence or loss of some or all of the soft palate and/or hard palate results in insufficient structure or altered function of the remaining structure.[8] Such defects vary as far as etiology, location, and size are concerned. The size of the defect may vary from small to large, which may include parts of the hard and soft palate, alveolar bone, floor of the nasal cavity, maxillary sinus and may extend up to floor of the orbit and zygomatic complex.[9] It is seen that not only physiological functions are hampered; the psychological state of the patient is also affected.[10] A successful rehabilitation would go a long way in improving the quality of life of the patient.[11] Rehabilitation of the maxillectomy defect has been well defined for prosthodontists and surgeons. Malignancies are common in oral region, which are treated through surgical intervention.[3] Surgical intervention creates anatomic defect which forms communication among the oral cavity, nasal cavity and maxillary sinus.[12]

Prosthodontic management of palatal defects has been employed for many years. In maxillary defects, role of a prosthodontist is to rehabilitate the intra- and extra-oral structures and to endow with the normal function of mastication, speech, deglutition, andesthetics.[13] The early objectives of treatment were artificial closure of the defect and adequate retention of the artificial closure[14] The most important objective of prosthodontic care, emphasized by Devan, is preservation of the remaining teeth and tissue.[15] A comfortable, cosmetically acceptable prosthesis that recreate an anatomic barrier between the cavities and to restores the impaired physiologic activities of speech, deglutition, and mastication is a basic objective of prosthodontic care.[14]

A prosthesis used to close a palatal defect in a dentate or edentulous mouth is referred to as an obturator. Reconstruction of the maxillectomy with an obturator has several advantages. Besides replacing the missing soft and hard tissues, it enables the patient to swallow, masticate, and speak approximately in the normal way, and forms a barrier between nasal and oral cavities.[16]

The aim was to close the defect, separate the oral cavity from nasal cavities and prevent hyper-nasal speech, nasal regurgitation of food and liquids, and support the facial profile.Based on location and size of defect, health conditions of remaining teeth and bones, available soft tissue undercuts and muscular control, various obturator prostheses with different retentive designs were used to improve oral functions.[17] An attempt has been made, to throw some light upon various treatment options and modalities available for treating patients with hard and soft palate defects. Different problems encountered and precautions required for successful management of these unfortunate patients have been considered. Obturator prosthesis are discussed in detail for better understanding of the treatment modalities practiced in maxillofacial prosthodontics.

Many classification systems have been suggested for classification of maxillofacial defects, out of these, some salient classifications are given by, Chalian, Armany, Veaus, Kernahan & Stark etc

According to the onset (Chalian's Classification)[18]

There are three types of maxillofacial defects, according to onset

a) Congenital
- Cleft lip
- Cleft palate
- Facial cleft
- Missing ear

b) Acquired
- Accident
- Surgery
- Pathological

c) Developmental
- Prognathism or Retrognathism
- Various syndromes affecting maxillofacial regions

A. According to the region involved

a) Intraoral defects
- Tongue
- Floor of the mouth

- Alveolar ridge
- Tonsillar and adjacent region
- Hard and soft Palate
- Maxilla and mandible

b) Extraoral defects

- Ear
- Nose
- Lip
- Ocular defect
- Midfacial defect
- Genial defect

c) Combined defect

- Any possible combination of intraoral and extraoral defects.

Davis and Ritchie (1922)[19]

classified the congenital clefts were divided into 3 groups according to the position of the cleft in relation to the alveolar process:

Group I: - prealveolar clefts, unilateral, median, or bilateral.
Group II: - postalveolar clefts involving the soft palate only, the soft and hard palate or submucous cleft.
Group III: - alveolar clefts, unilateral, bilateral, or median.

Spina (1974)[19] gave the classification as follows: -

Group I: -. Preincisive foramen clefts (clefts lying anterior to the incisive foramen). Clefts of the lip with or without an alveolar cleft- (Harkins)
a. Unilateral
b. Bilateral
c. Median
Group II: - Transincisive foramen clefts (clefts of the lip, alveolus, and palate)
a. Unilateral.
b. Bilateral.
Group III: - Postincisive foramen clefts.
Group IV: - Rare facial clefts.

Veaus classification of cleft (1931)

Group I	Defects of the soft palate only
Group II	Defects involving the hard palate and soft palate
Group III	Defects involving the soft palate to the alveolus, usually involving the lip
Group IV	Complete bilateral clefts

Kernahan and stark's classification of clefts (1958)[20]

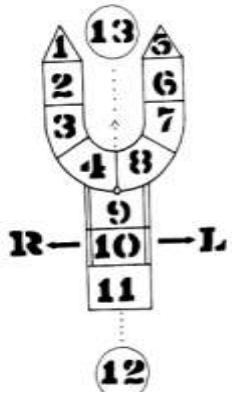
a) Cleft of primary palate only ▪ Unilateral (right or left) • Complete • Incomplete ▪ Median • Complete (Premaxilla absent) • Incomplete (premaxilla rudimentary)	**b) Cleft of secondary palate only** ▪ Complete ▪ Incomplete ▪ Submucous **c) Clefts of primary and secondary palates** ▪ Unilateral (rights or left) • Complete • Incomplete

▪ Bilateral • Complete • Incomplete	▪ Median • Complete • Incomplete ▪ Bilateral • Complete • Incomplete

Modified Kernahan and Stark Classification (1971)[20]: -

Kernahan and Stark had given a classification for cleft palate. The classification was a symbolic/diagrammatic classification and came to be known as „The Striped-Y Classification".

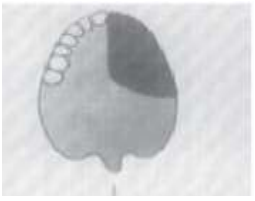
This classification was modified by Elsahy in 1971. The modified classification had several advantages over the original classification, i.e; one could estimate the degree of the cleft, status of the hard and soft palate and the alveolar ridge, described the position of the hard and soft palate, and presence and absence of velopharyngeal closure. Following is the diagrammatic representation of the classification and its classification



1. The triangles 1 & 5 represent the lip, stippling represents the cleft, if the cleft is complete then nasal floor is included (squares1 & 2 and 5 & 6), if the cleft is incomplete then only squares 2 & 6 will be included.
2. If the collapse of the alveolus, then the squares 3 & 4; 7 & 8 will be blackened otherwise they are stippled.
3. The square 9 & 10 with extra lines on either side indicate the hard palate whereas the square number 11 represents the soft palate.
4. The two arrows adjacent on either sides of the hard palate represent displacement of the palate. If there is displacement on either of the sides, then an „X" can be drawn on that side representing the displacement of the palate.
5. The circle 12 represents the velopharyngeal closure. If there is complete closure then a line is drawn along the dots towards square 11, if closure is not present then a line is drawn along the dots towards square 11. The amount of closure can be depicted by varying the length of the line to be drawn.
6. The circle 13 represents the premaxilla, if there is protrusion of the premaxilla then a line can be drawn in the direction of the arrow. The amount of protrusion can be depicted by varying the length of the line.

Aramany's classification of acquired hard palate defects (1979)[21]

Class I: -Resection in this group is performed along the midline of the maxilla; the teeth are maintained on one side of the arch. This is the most frequent maxillary defect.



Class II: -The defect in this group is unilateral, retaining of anterior teeth on both sides and posterior teeth on the contralateral side. This type of surgical resection is favored more than the classical maxillectomy.

Class III: - The palatal defect occurs in the central portion of the hard palate and may involve part of the soft palate. The surgery does not involve the remaining teeth. The design for these patients is simple, and retention, stabilization, and reciprocation can be effectively planned.

Class IV: - The defect crosses the midline and involves both of the maxillae. A few teeth remain and lie in a straight line, and may create a unique design problem similar to the unilateral design of conventional removable partial dentures.

Class V: - The surgical defect in this situation is bilateral and lies posterior to the remaining teeth. Labial stabilization may be needed, and splinting of remaining teeth is advisable.

Class VI: -It is rare to have an acquired maxillary defect anterior to the remaining abutment teeth. This occurs mostly in trauma rather than as a planned surgical intervention. In this class, cross-arch stabilization is derived through a system of cross-arch bars which will provide wide distribution of support and retention from separated abutment teeth.

Spiro's Classification of Maxillary Defects (1983 and 1993)[22]: -

They suggested the following classification

1. Limited Maxillectomy- Any maxillectomy in which one wall of the maxillary antrum is removed.
2. Subtotal Maxillectomy- Maxillectomy in which atleast two walls of the antrum are removed including the palatal wall.
3. Total Maxillectomy- Complete resection of the maxilla.

Liverpool Classification of Maxillectomy Defects(2000)[23]: -

Brown et al in 2000, classified surgical defects separately according to the vertical and horizontal components of the defect.

The classification is as follows

Vertical Component

Class 1: - Maxillectomy not causing oro-nasal fistula.
Class 2: - Maxillectomy not involving the orbit.
Class 3: - Maxillectomy involving the orbital adnexae with orbital retention.
Class 4: - Maxillectomy with orbital enucleation or exenteration.
Class 5: - Orbitomaxillary defect.
Class 6: - Nasomaxillary defect.

Horizontal Component

Letter a: - Palatal defect only.
Letter b: - Less than or equal to half of the bilateral maxilla.
Letter c: - Less than or equal to half of unilateral maxilla.
Letter d: -Greater than half of the maxillectomy.

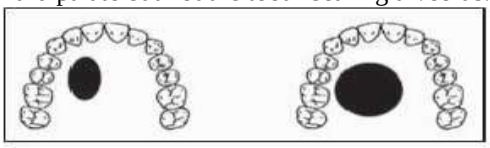
Okay's Classification of Maxillary Defects (2001)[24]: -

classified palato-maxillary defects into 3 major classes and 2 sub classes.

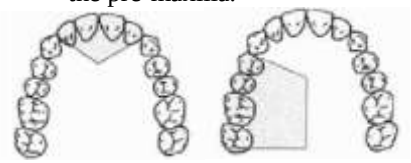
The aim was to organize and define the complex nature of the restorative decision making process.

The classification is as follows: -

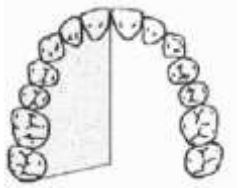
Class 1a: - Defects that involve the hard palate but not the tooth bearing alveolus.



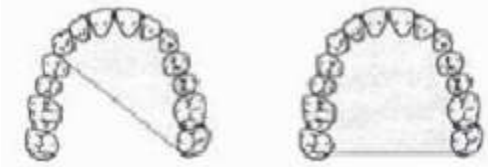
Class 1b: - Defects that involve any part of the maxillary alveolus and dentition posterior to the canines or involving the pre-maxilla.



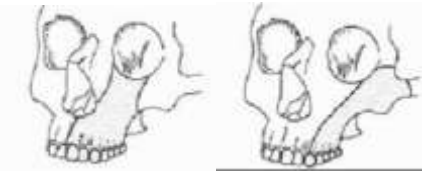
Class 2: - Defects that involve any portion of the tooth bearing maxillary alveolus but include only one canine. The anterior margin of these defects lies within the pre-maxilla.



Class 3: - Defects that involve any portion of the tooth bearing area and includes both canines, total palatectomy defects and anterior transverse palatectomy that involved more than half of the palatal surface.



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



Durrani et al, Classification of Maxillary Defects (2013)[25]: -
Based on their research and surgical experience.
Their classification is as follows
1. Alveolectomy: - These defects involve the alveolar bone alone.
2. Sub-total Maxillectomy: - These defects cause oro-nasal or oro-antral fistula but do not disturb the orbital wall of maxilla.
3. Total Maxillectomy: - These defects are characterized by absence of complete maxilla including orbital floor but the orbital contents remain intact.
4. Radical Maxillectomy: - These defects are characterized by absence of orbital contents along with the maxilla.
5. Composite Maxillectomy: - These defects involve resection of facial skin, soft palate, and any other part of the oral cavity. All these defects can be further classified into Unilateral and Bilateral defects.

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