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TITLE: OPEN BITE: ETIOLOGY, DIAGNOSIS AND MANAGEMENT

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ABSTRACT:
Anterior open bite is one of the most difficult malocclusions to treat with its varied characterizations. Appropriate etiology should be identified for effective management of open bite. Anterior Open Bite can irrespectively occur in all kinds of malocclusion. Aesthetics, speech, mastication and tooth wear are some of the common concerns for the patients. Thorough apprehension of the anomaly is important in determining the appropriate corrective measures. This review will throw more light on the etiology of open bite, diagnosis and treatment enabling the clinicians for better understanding of the malocclusion.

KEYWORDS: Open bite(OB) ; skeletal ; dentoalveolar ; orthodontics ; surgery

1. INTRODUCTION:

The term open bite is coined by Caravelli in the year 1842. Open bite can be defined as the absence of vertical overlap of lower incisors by the upper incisors when the posterior teeth are in full occlusion. Subtenly and sakuda described open bite as deviation in vertical relationship of maxillary and mandibular dental arches.[1] The prevalence of open bite is less common than deep bites and the demand for treatment is around 17%(Proffit). Prevalence of open bite around the globe is 4.93% and it greatly varies with ethnicity and age.[2]

2. CLASSIFICATION:

Open bites can be skeletal or dental[3]**.** Skeletally the lower third of the face may increase or remain normal associated with or without an open bite. Worms, Meskin and Isaacson[2] classified open bite as simple, compound and infantile.

Simple OB: Open bite extends from canine to canine Compound OB: Open bite extends from premolar to premolar Infantile OB: Open bite extends from molar to molar.

Cooks in 1981, classified open bite as Skeletal, Habit associated or Dental, Iatrogenic, Pathological and open bite due to abnormal tongue function. Yamaguchi [4] in 2010, classified open bite as (a)Dentoalveolar with alteration in normal eruption of anterior teeth(due to non-nutritive sucking habits) b)Skeletal with long face caused by clockwise(backward) rotation of the mandible c)Skeletal OB caused by skeletal deformations such as tipping of the maxilla and diversion of the gonial angle of the mandible .

3. ETIOLOGY

Open bite constitutes a multifactorial etiology.Development of lower anterior facial height is under strong genetic influence. Open bite along with other skeletal growth anomalies is one of the common etiological factor.Other anatomic factors include inadequate nasal airway due to nasal septal defects,blockage from turbinates, enlarged tonsils and adenoids, and Amelogenesis imperfecta.Several other factors i.e., Macroglossia, Tongue thrusting, Abnormal tongue posture, Muscular dystrophy causes mandible to drop down from the facial skeleton with progressive distortion of facial proportions and excessive eruption of posteriors, narrowing of maxillary arch segment, invariably resulting in anterior open bite.If the postural change of the tongue lasts long, there is mandibular clockwise rotation with increased anterior height and infraocclusion of anteriors. Tongue thrusting is the forward placement of tongue between the anteriors against the lower lip during swallowing.(Schneider,1982). Brauer[6] classified tongue thrust as a)nondeforming tongue thrust, b)deforming anterior tongue thrust with anterior open bite, posterior cross bite and associated procumbency of anteriors. c)Deforming lateral tongue thrusts with associated posterior open bite, posterior crossbite and deep overbite. d)Deforming anterior and lateral tongue thrust with anterior and posterior open bite, associated procumbency of anterior teeth, and posterior crossbite. Skeletal open bite may arise due to unfavourable growth potential with steep mandibular plane, Increased gonial angle, short ramal length, Increased lower anterior facial height, clockwise rotation of mandible, anticlockwise rotation of the maxilla or divergent jaw bases. Local and systemic causes such as traumatic injuries, avascular necrosis, rheumatoid arthritis may result in condylar resorption. There is also a possibility of idiopathic bilateral resorption of condyle with no obvious etiology leading to sudden open bite. Environmental factors include abnormal functions and altered soft tissue postures i.e., use of pacifiers, lip sucking, thumb sucking, tongue thrusting, mouth breathing, traumatic ankylosis of the anterior teeth, airway obstruction due to tonsils, adenoids and nasal polyps contributing to open bite[5].Iatrogenic open bite is the result of poor orthodontic mechanics causing palatal cusp hanging and failing to prevent overeruption of second molars when biteplates or functional appliances are used.

4. PRESENTING FEATURES:

Open bite is invariably associated with all anteroposterior dysplasias. OB is present with class II, class III , class I rotated to class II because of posterior vertical maxillary excess.Skeletal anterior open bite may present with increased lower anterior facial height or reduced ramal height.[7]Posterior Vertical maxillary excess causes increased lower facial height, mandibular rotation, downward and backward chin position with adaptive forward posture of the tongue. Open bite patients with reduced ramal height show average/reduced LAFH, pronounced antegonial convexity and average vertical maxillary position. Bjork [8] gave seven key features to identify signs of extreme growth rotation:- Inclination of the condylar head,curvature of the mandibular canal,shape of the lower border of the mandible,inclination of the symphysis, and increased lower anterior facial height .In severe skeletal abnormalities,the open bite extends to the posterior segments as well. Dental open bite has normal facial features without alteration in the skeletal pattern, and OB is restricted only to the anteriors. When the maxillary, occlusal, and mandibular planes converge symmetrically to meet near the occiput, Sassouni[9] identified the face as well proportionate face. In case of vertically disproportionate jaws the associated planes does not converge, this skeletal pattern is associated with different anterior and posterior facial heights correlating with skeletal open bite.[9] If lip incisor ratio is normal in an Open Bite, the problem can be directed towards posterior maxillary excess. When patient presents with reduced incisal show, its diagnosed as anterior dentoalveolar vertical maxillary deficiency ,anterior extrusion is favourable in such cases.

5. MANAGEMENT

Mizrahi[10] advocated four modalities of treatment for open bite, which includes myofunctional therapy, Orthodontic Mechanotherapy(using fixed or removable appliances),Or combination of the two. The Upper and lower anterior facial height ratio aids in determining the prognosis for orthodontic correction. It is important to discuss which form is treatment is most suitable for each case. In a growing child with presenting open bite, passive posterior bite blocks activated 3-4mm beyond the rest position is given. This inhibits the increase in height of buccal dentoalveolar processes and allows differential eruption. High pull

headgears when used along with the bite blocks increases their efficiency. Vertical pull chincup therapy can also be used to limit excessive vertical growth. When there is OB due to faulty postural activity of the orofacial musculature, Frankel's functional regulator can be recommended(FR4).Spurs on maxillary lingual arch can be used to stop the sucking habit and establish new neuromuscular pattern thus diminishing the probability of relapse[11].With fixed appliances, vertical intermaxillary elastics are used to extrude anteriors. This may be combined with TPA and high pull headgear to limit vertical development of the maxillary molars.If the etiology is primarily skeletal, incisor extrusion would be esthetically inappropriate and are highly prone to relapse. Molar extractions are performed to reduce the magnitude of open bite Nahoum[12] suggested that although this may close the anterior open bite, physiological rest position of the mandible would not change thus leaving total facial height unaltered. Kim[13] reported the use of multiloop edgewise archwire together with heavy anterior elastics to achieve molar intrusion and simultaneous incisor extrusion to close anterior open bites. A systematic review by Foosiri[14] indicated that there is no significant relapse in extraction cases. Skeletal open bites can be surgically corrected by principal methods like differential posterior impaction of the Lefort 1 osteotomized maxilla, segmental impaction of the posterior maxilla, or by isolated mandibular surgery.[15]Differential impaction of maxilla causes retroclining effect on the maxillary incisors. For an average maxillary length 1mm of posterior impaction leads approximately 1.5 degree of maxillary incisor retroclination[7].In segmental osteotomy osteotomized maxilla is vertically segmentalized either distal to the canines or distal to the lateral incisors. Between canine and first premolar before placing osteotomy cuts, canine roots has to be tipped mesially. Orthodontic mechanics to be avoided prior surgery include rapid maxillary expansion, uprighting of severely tipped teeth, levelling an excessive curve of spee , levelling the lower arch which has a reverse curve of spee. Avoid using class II or class III intermaxillary elastics as it has some vertical component of force.

6. RECENT ADVANCES:

Paik [16] suggests that molar intrusion itself is enough for correcting the vertical excess with anterior open bite. He estimated that 1mm of molar intrusion will close 2-3mm overbite in the anterior teeth**.** Usually maxillary molar intrusion is indicated because of its stability and convenience in mini-screw fixation. Mandibular molar intrusion is recommended when there is a steep occlusal plane angle and decreased overjet. Steepening the occlusal plane by intruding maxillary molars will interfere the balance among the incisal, cuspal and condylar guidance. In cases with minimal overjet, lower incisors can be simultaneously intruded and retracted subsequent to counter clockwise rotation of the mandible. Once the mandibular plane angle is closed direction of bite force becomes closer to the tooth axis which helps in preventing extrusion(relapse).

SURGERY FIRST ORTHODONTIC APPROACH is a novel technique which improves facial esthetics, dental function, swallowing and speech functions earlier during surgical phase and also it is claimed that the orthodontic tooth movement proceeds at a much faster pace following surgery. On restoring the bony skeleton and soft tissues to more normal functional and anatomic relationships the tooth movement achieved is much stable. Surgery first approach is contraindicated when there are gross occlusal interferences, when the projected post surgical orthodontic movement might compromise the results by opening the bite again and when the projected osteotomy cuts are impossible because of proximity of roots.[17]

7. CONCLUSION:

Anterior open bite has multiple aetiologies and accurate diagnosis is the key in determining the best management strategy. Open bites before the age of 12 may resolve spontaneously when the swallowing pattern matures or when digit sucking habits are stopped. Older patients should be motivated to accept the malocclusion as there is higher risk of relapse. Long term retention is recommended.

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