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Review Article

Dentistry Section

Airway from an Orthodontic Perspective

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ABSTRACT

With the change in concepts of orthodontics over the years, the focus today has slowly shifted to airway-centered orthodontics. Several pathological conditions of the craniofacial region both genetic and epigenetic in origin can contribute to nasal and airway resistance and airway collapse, all of which could sooner or later predispose the patients to sleep-related breathing disorders. These have serious implications on the lifestyle, body homeostasis, and cardiovascular system. On the other hand increased resistance to airflow through the upper respiratory tract can lead to mouth breathing tendency or snoring at a young age which ultimately hinders the normal transverse, sagittal and vertical development of the craniofacial complex especially of the stomatognathic system. This review focuses on the two-way relationship between the airway and craniofacial region. It also attempts to point out the need to consider the various goals of airway-centered orthodontics as various orthodontic treatment modalities impact the airway in a significant manner both positively and negatively.

Keywords: Airway resistance, Nasopharynx, Obstructive sleep apnea, Oropharynx, Stomatognathic system

INTRODUCTION

The emergence of the modern man following the evolution of hominids has resulted in jaws playing a vital role in respiration and speech. Enhancement of Quality Of Life (QOL) has taken precedence over almost all other aspects of health with the emerging trends in medicine and dentistry. During growth and development airway, mode of breathing and craniofacial structures is so interrelated that form can follow function, and function can follow form. Airway obstruction impairs respiration leading to craniofacial malformation. On the other hand, the abnormal craniofacial formation can lead to airway obstruction, impaired respiration, impaired nasal breathing, chronic mouth breathing, sleep apnea, sleep disorders, and lifelong ill-health [1].

As the maxilla translates downward and forward, there is a resultant increase in the size of both the oral cavity and nasal cavity. Hard and soft tissues undergo different rates of growth throughout childhood development. For instance, adenoids and tonsils are the largest between the ages of four and six. The upper airway volume increases in adolescence due to both the concurrent increase in vertical skeletal growth and the involution of the lymphoid tissue, which decreases in size after 12 years of age. Throughout adolescent years, the upper airway also changes shape to become larger in the transverse dimension and more elliptical overall. On average, the length and volume of the airway increases until age 20, is stable through mid-adulthood, and then decreases slowly in size after the age of 50 [2].

The pharyngeal airway is located between the mandible and thyroid cartilage and is connected by muscles and ligaments to the surrounding structures. It supports the tongue and acts as a point of attachment for tongue muscles, primarily functioning as an anchor to aid in tongue movement and swallowing. The hyoid bone adapts to anteroposterior changes of the head and changes in mandibular position. The change in position of the hyoid bone is determined by the conjoint action of supra and infra-hyoid muscles and the resistance provided by the elastic membranes of the larynx and trachea. The ratio between the soft palate and pharyngeal space is mandatory for correct speech and prevent sleep apnea in later life [3]. The various orthodontic treatment modalities can affect the airway by changing one or more components of the stomatognathic system.

Therapeutic extractions undertaken for orthodontic or orthognathic treatment show contrasting results which may be influenced by the type of malocclusion, type of extraction and anchorage considerations [4]. Rapid maxillary expansion that aims at increasing the transverse dimension of the maxilla, also affects the adjoining areas especially the nasal cavity and nasopharynx in growing age [5]. Functional appliances position the mandible forwardly which draws its adjoining structure along with it in the same direction and help increase the pharyngeal airway volume and dimension [6]. In adults, orthognathic surgeries are carried out to treat severe skeletal discrepancies. Among these mandibular advancement surgeries or combined maxillomandibular advancement surgeries prove to be utmost beneficial for the airway. But care must be practiced while taking into consideration maxilla mandibular setback surgeries [7-9]. This article highlights how orthodontics and dentofacial orthopaedic treatment options affect the airway, which can assist as a valuable aid to emphasise consideration for the airway in strategic orthodontic treatment planning.

EFFECTS OF ORTHODONTIC TREATMENT MODALITIES

Extraction Therapy

Airway volume in a non extraction case decreases insignificantly and appears to have more stable outcomes as the soft tissue adaptations are minimal [10]. There is a direct correlation of the tongue with the oropharynx and hypopharynx which is directly influenced by the hyoid and can be attributed to anatomical dependence of hyoid with the hyoglossal muscle [11]. Two main factors influence the airway concerning an extraction protocol: 1) large retraction of the anterior teeth; and 2) mesial movement of molars [12].

Large retraction of the incisors led to a dorsal movement of the anterior boundary of the oral cavity, which may cause backward movement of the tongue, which compresses the soft palate and results in narrowing the upper airway. In addition, a reduction in the middle and inferior airway spaces in the maximum anchorage group after orthodontic extraction has been observed [4]. Another possible explanation for reduction could be the dorsal movement of the hyoid bone [13].

On the other hand, intentional mesial movement of molars and anchorage loss increases the space behind the tongue, which may improve the upper airway dimensions. A mean increase in upper airway space was observed with minimum anchorage cases of approximately 1.5 mm after treatment may be due to the 3 mm mesial movement of the molars after resolution of anterior crowding in the minimum anchorage group [13]. Extraction of the second premolar seemed to cause a significant increase in the vertical airway length [14].

A greater rate of changes in the posterior pharyngeal wall occurs between six and nine years [12]. The upper airway shows a significant correlation with different sagittal and vertical skeletal patterns. In subjects with normal vertical facial patterns, the upper airway is largest with mandibular prognathism, followed by the normal mandible and mandibular retrognathism. In subjects with a normal sagittal facial pattern, the hyperdivergent group has a narrower anteroposterior pharyngeal dimension than the normodivergent group, and the dimension decreases, whereas the mandibular plane angle increases. Postextraction in adolescent subjects, no net change has been observed, where the rapid growth of the airway may have been partially masked by the effect of extractions on the upper airway [15]. Thus, age and growth patterns should be considered when interpreting the effect of orthodontic extractions on the upper airway in adolescents. On the contrary, the upper airway ceases to grow in adults, and the growth pattern and degree of growth have little effect on the outcome [11,12].

Malocclusion is another factor that should be taken into account [12]. Airway volume decreases with extraction in mandibular prognathism, as seen in class III cases. Decision making for extraction is critical in class III camouflage or surgery cases with mandibular prognathism as the tongue might displace upwards and backwards, occupying the posterior space of upper molars and affect the anterior wall of the pharyngeal airway [16].

Class I bimaxillary protrusion, with extraction after large retraction of the anterior teeth, showed a decrease in upper airway volume with the posterior-inferior movement of the hyoid bone [11,12]. Class I malocclusion crowding cases that underwent all four premolar extractions, but with the mesial movement of molars after relieving crowding, imposed little or no influence on the anterior oral boundary. Despite extraction in both cases, it is due to difference in biomechanics that the resultant effects were opposite [4,13,17].

It remains unknown whether decreased airway size can affect sleep quality and increase susceptibility to Obstructive sleep apnea. Therefore, a case-by-case evaluation is necessary before arriving at the treatment plan, preferably with additional diagnostic methods like Polysomnograms (PSG) before extraction/retraction and post-treatment to confirm that no damage has been done [1,12,18].

Rapid Maxillary Expansion (RME)

During the prepubertal and pubertal growth periods, the opening of the mid palatal suture results in the displacement of lateral walls of the nasal cavity. RME lowers the palatal vault and straightens the nasal septum. This remodelling increases nasal volume, decreases nasal resistance, and increases nasal airflow, which reduces head elevation, suggesting improvement in nasal breathing and reducing mouth breathing. These findings have also been confirmed in other studies with the help of acoustic rhinomanometric evaluation [19-21]. The postural and morphologic changes remained stable even with a 12 months follow-up [20,22].

The effect of RME on the nasal airway will largely depend on the cause, location, and severity of the nasal obstruction. The effects of RME on the nasal cavity are not uniform, and the changes in the nasal dimensions are progressively less toward the posterior nasal cavity. Although the actual increase in basal width is small, it should be remembered that airflow varies inversely as the fourth power of the radius of the tube through which it passes [23]. Opening the mid-palatal suture to increase nasal permeability cannot be justified unless the obstruction is shown to be in the lower anterior portion of the nasal cavity and accompanied by a relative maxillary arch width deficiency [19].

Maxillary constriction is associated with low tongue posture plays a role in the pathophysiology of Obstructive Sleep Apnea (OSA). Obstructive sleep apnea subjects demonstrate smaller cross-sectional areas of the airway than in healthy adults (90-360 mm^2) [24]. In a follow-up study of OSA children treated with RME, there was a decrease in the apnea-hypopnea index with a mean maxillary width expansion of 4.5 mm [25]. Another study found no significant difference for the minimum cross-sectional area at the level of the nasal valve and turbinate with acoustic rhinometry but with computed rhinomanometry detected a progressive decrease in the inspiration and expiration resistance indicating RME may be a modest functional improvement based on bony expansion rather than mucosal change [26]. Along with the bony expansion, a significant increase in the cross-sectional area immediately posterior to the hard palate diminished further down, possibly due to soft tissue adaptation. They concluded that the further away the airway portion from the maxillary suture, the lesser the effect on the upper airway [26,27].

A reduction of nasal airway resistance by 0.21 Pa s/cm^3 was found with Tooth-Bone-Borne RME appliance (TBB), equivalent to the decongestant effect of a nasal spray (0.15-0.5 Pa s/cm^3). This can be of clinical significance, especially in children suffering from nasal airway obstruction [28]. Both bone-borne and tooth-borne expanders are viable options that can aid in increasing the nasal cavity volume and nasopharynx [29,30].

The nasopharyngeal volume increased after Micro Implant-Assisted Rapid Palatal Expander (MARPE) treatment [31,32]. Among pre-peak patients, greater total airway increases were seen with Hybrid Hyrax than conventional Hyrax expanders [33]. In addition, the volume and the anterior and middle cross-sectional area of the nasal cavity increased significantly after expansion, and the effect was stable at 1-year follow-up visit in young adults [34]. Thus, RME may increase the airway volume and minimum cross-sectional area; however, the corresponding reduction in the compensatory head posture can result in no significant net gain in airway volume and minimum cross-sectional area [29].

For Nasomaxillary Complex (NMC) expansion targeting nasal floor and nasal cavity, the fan-type expansion would be preferred using Surgically Assisted Rapid Palatal Expansion (SARPE) or Distraction Osteogenesis Maxillary Expansion (DOME) procedure. The maxillary surgical expansion also allows favourable tongue upward position, which results in a greater posterior pharyngeal airway. This modality would be preferred for OSA patients with nasal obstruction [35].

Orthognathic Surgeries

While planning a surgery, it is necessary to evaluate the skeletal movements and changes in the hyoid bone and tongue position that may directly or indirectly impact the oropharyngeal airway.

Mandibular Setback Surgery

Mandibular setback surgery causes posterior-inferior repositioning of hyoid bone carrying the root of the tongue downwards. Long term follow-up revealed cervical hyperflexion, suggesting that the positional changes in hyoid bone could also be due to alterations in head posture. Soft palate thickness decreased and its contact length with tongue increased. The tongue base moved downwards in the short term follow-up, whereas it moved upwards again to its initial position with time [36,37]. An increase in length of the tongue and soft palate resulted in increased soft tissue area, occupying more oropharyngeal space and decreasing airway patency. The soft palate has been confirmed as an obstructive site of central importance in OSA [36].

There was a decrease in anterior-posterior upper pharyngeal airway space, especially in the oropharyngeal region and residual oropharyngeal airway space, which was significant in long-term follow-up. However, reduction in hypopharyngeal and minimum pharyngeal airway space was not statistically significant. These changes could be due to the tongue and hyoid bone moving back relative to other craniofacial structures resulting in a reduction of the oropharyngeal lumen [36]. Since, the site for airway obstruction in OSA is usually located in the oropharynx region, involving soft palate, dorsum of the tongue and posterior pharyngeal wall, it is mandatory to consider all these before decision making about mandibular setback surgery [7,38,39].

Genioplasty

With genioplasty, the increased tension on the genioglossus and geniohyoid muscles pulls tongue forward, thereby suspending the hyoid. In patients with OSA, the surgical design of genioplasty can be modified to cut more superiorly at the central area below the lower central incisors and to include the genioglossus tubercle within the advancing segment (reverse T mandibular osteotomy) [7].

Maxillary Impaction

Conventional Le Fort I osteotomy for maxillary impaction is disadvantageous for respiratory function. Maxillary horseshoe osteotomy, modification of Le Fort I osteotomy for superior maxillary impaction, can be applied to avoid compromising the nasal airway. In Horseshoe osteotomy, the hard palate remains pedicled on the nasal septum and the vomer bone. As a result, the Posterior Nasal Spine (PNS) does not move upward in horseshoe osteotomy. Therefore, the nasal cavity is not compromised despite a decrease in facial height [8].

Maxillomandibular Advancement (MMA)

Advancement of the maxilla, including PNS, increases the oral cavity space that accommodates the tongue, thereby causing a forward movement of the soft palate [9]. Advancement of chin pulls the tongue and hyoid forward by increasing the tension of tongue–hyoid complex, leading to uprighting of soft palate through the palatoglossus muscles. In addition, MMA showed improvement of lateral pharyngeal wall collapsibility, increasing the total volume of the upper airway at all levels, especially at the minimum cross-sectional area, and decreasing the critical closing pressure of the pharyngeal airway [9,40]. In OSA patients with hyperdivergent skeletal Class II pattern, the sagittal dimension of the pharyngeal airway increased by 47% and 76% at the oropharynx and hypopharynx, respectively [41]. Also, significant AHI reduction has been found with both conventional and rotational MMA surgeries [42].

Segmental MMA (modified MMA) has been developed to simultaneously improve sleep function and facial esthetics in Asian OSA patients who tend to have lip protrusion, acute nasolabial angle, and low nasal bridge [43]. As the posterior segment of maxilla is advanced for closing the maxillary premolar extraction space the soft palate is stretched causing velopharyngeal aponeurosis protraction. In addition, with total advancement of mandible tongue base protracts along with pterygomandibular aponeurotic attachments. Segmental-Rotational MMA advances the posterior nasal spine and palatine bone to open the velopharynx without protrusion of the anterior maxilla [44].

A cephalometric and portable PSG study conducted at Tufts University examined the effects of a mandibular setback with or without maxillary advancement on the development of OSA with skeletal Class III malocclusion. They concluded that combined two-jaw surgery might be more favourable for respiratory function as one-jaw surgery with more than 5 mm movement exhibited a higher incidence of mild-to-moderate OSA [45]. In addition, it has been found that the amount of maxillary surgical advancement rather than mandibular advancement is the significant correlation factor with the surgical success of MMA in skeletal Class II OSA patients [36].

Distraction Osteogenesis (DO)

Advancement of 10-45 mm of the maxillomandibular skeleton is possible with DO, resulting in 80-90% improvement in retrognathic mandibular cases. Can be effective for severe OSA with severe mandibular retrognathism and or a large amount of maxillary advancement is required [1].

Functional/Orthopaedic Appliances

Monobloc appliance brought the lower jaw forward in newborns with mandibular deficiency preventing glossoptosis during sleep and oropharyngeal collapse [46]. The remaining catch up growth and anterior displacement of the mandible following functional appliances influence the position of hyoid bone and tongue that improves soft palate adaptation, resulting in improved upper airway morphology [46].

Harold type of activator in combination with occipital headgear significantly increased mandibular length with anterior relocation of tongue and soft palate, improving oropharyngeal and nasopharyngeal airway dimension compared to control [47]. This increase was found to be stable in long term follow-up (22 years). Indicating its role in preventing the development of long-term impairment of respiratory function [48]. Bionator therapy showed a significant increase in the nasopharynx and hypopharynx and an insignificant increase in the oropharynx [47]. Frankel II significantly increased only the hypopharynx. Treatment with FR-I moved the hyoid downward-forward [49]. Farmund appliance decreased the airway space with long term usage [6].

Functional mandibular advancer and Herbst appliance were found non effective to avoid respiratory problems in children. Maxillary expansion with Herbst therapy caused a forward displacement of the mandible and hyoid bone with resultant anterior traction of the tongue, resulting in increased posterior airway space [50]. Increased forward mandibular advancement with twin block was observed when compared with MPA-IV. This more anterior displacement of the mandible with anterior tongue traction away from the soft palate and changes in soft palate dimensions and inclination with twin-block appliance was comparable with the measurements of healthy controls, while the same was not the case with MPA-IV. Oropharyngeal and hypopharyngeal depth improved more with twin block therapy than MPA-IV [50].

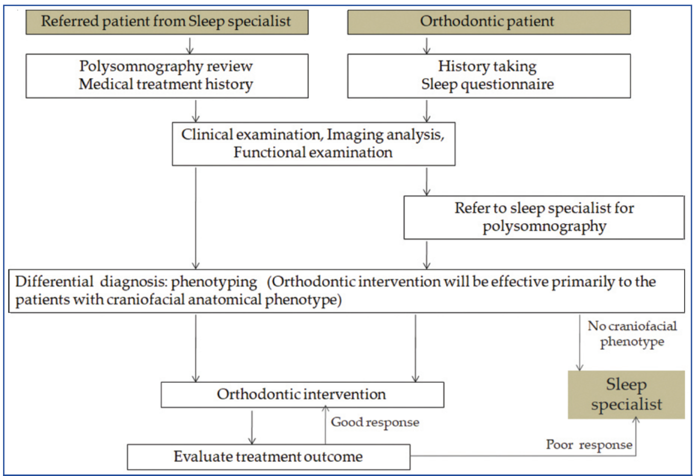
A three-dimensional study comparing twin block appliance with Forces Fatigue Resistance Device (FFRD) reported that there was a more significant increase in the volume of the oropharynx, which was observed with twin block as twin block is given in peak pubertal age and allows for more skeletal repositioning of the mandible [51].

Maxillary growth assisted by maxillary protraction appliance or face mask therapy significantly affected the superior upper airway dimension. It facilitates maxillary growth, increases the upper airway dimensions, and improves respiratory function, especially in maxillary hypoplasia [52].

Cervical headgear facilitates mandibular growth, which may lead to improved airway size. During sleep, the involvement of tonic muscles is reduced based on the sleep stage. Usage of cervical headgear while sleeping has been found to decrease the upper airway size and may contribute to sleep apnea in patients with a history of OSA [53].

ROLE OF ORTHODONTIST IN AIRWAY RELATED DISORDERS

The orthodontist should perform an OSA screening assessment and refer at risk patients for diagnostic evaluation to a Sleep Specialist (SS). Evaluation of the respiratory function for every regular orthodontic case that is evaluated and treated should be done. Orthodontist should be qualified for the differential diagnosis and selective application of orthodontic modalities toward active cooperation with a SS for SDB patients [Table/Fig-1]. Once the diagnosis of OSA is confirmed, the SS or physician may prescribe orthodontic appliances or procedures in appropriately selected patients as part of OSA management [21].



[Table/Fig-1]: Orthodontic work flow.

History

Sleep history and related medical history needs to be checked. OSA symptoms, including severe snoring, witnessed apnea, sleep fragmentation, Excessive Daytime Sleepiness (EDS), distraction, and morning headaches, need to be examined. Co-morbidities such as cardiovascular and cerebrovascular and diseases with medication history needs to be asked. Social or behavioural history including alcohol, smoking, exercise, and travel frequency [21].

The representative questionnaires for the suspected OSA patients, such as the Berlin questionnaire, Epworth Sleep Scale (ESS), and STOP-Bang, can be introduced in orthodontic clinics. Five questions can be assessed in every case not only to diagnose OSA but to prevent OSA after any orthodontic treatment:

1) Is the patient obese?;
2) Is the patient retrognathic?;
3) Does the patient complain of daytime sleepiness?;
4) Does the patient snore?;
(5) Does the patient have hypertension? [54].

Assessing Clinical Risk Factors

Physical factors like height, weight, age, Body Mass Index (BMI) should be noted along with the habitual head, neck posture, lip posture in rest position, breathing pattern, and the presence of daytime sleepiness [55].

Obstruction of the nasal airways caused immediate head extension with changes in cervical posture observed by craniofacial Electromyogram (EMG) activity. An increased craniocervical extension was observed in children with enlarged tonsils, adenoids and chronic respiratory problems. A larger hypopharyngeal and smaller nasopharyngeal airway cross-sectional area, lower hyoid bone position in relation to the mandibular plane, increased tongue size and obesity are associated with an extended, forward Natural Head Position (NHP) in OSA patients. A larger hypopharynx exposed the palate to direct inspiratory suction, promoting its collapse [56].

Mouth breathers due to nasal obstruction tend to position the head forward to facilitate airways. Smaller the nasal patency, the greater the head extension [57]. Head projection and increased neck lordosis are due to changes in their stomatognathic system that increase the tension on the head and shoulder muscle, in an anteroposterior or lateral direction, with a forward shifting of the centre of gravity [58].

A longer-thinner tongue or a larger- longer tongue was related to increased Craniocervical Extension (CCE) and Forward Head Posture (FHP). A CCE with FHP form a compensatory mechanism that accommodates the enlarged tongue by pulling the hyoid bone away from the posterior pharyngeal wall. In OSA patients, the absence of this mechanism during sleep and gravity caused the heavier tongue to drop back and obstruct the airway [56].

An increased lower anterior facial height, posterior rotation pattern of the mandible and a sagittal skeletal Class II relationship have been observed in these cases [56]. In addition, due to the enlarged tongue, the soft palate reduces the velopharyngeal airway size, causing a change in craniocervical posture. A low hyoid with a low tongue posture puts the geniohyoid at a mechanical disadvantage by creating a need for tongue elevation, which results in more downward and backward postural forces on the mandible, leading to increased mandibular load and thereby an interruption of the postural balances of the craniomandibular region, resulting in craniocervical extension [59].

Facial and chin profile, facial height ratio and midfacial width are assessed along with the facial triad (throat length, cervical-mental angle, and neck circumference). Typical characteristics associated with OSA patients include short throat length and obtuse cervicomental angle of the mandibular body, a wide neck circumference over 17 inches and submental fat deposition [21].

Intraoral triads to be assessed include:

1) Narrow and deep palatal arch;
2) Tongue position-related structures like large tongue, tongue tie, and tori; and
3) Enlarged palatine tonsils with flabby uvula in the mouth.

The degree of tonsillar hypertrophy and posterior oropharyngeal tissue collapse can be evaluated using Friedman classification and modified Mallampati test, respectively. These scoring will help identify the oropharyngeal soft tissue problems and further predict the presence and the severity of OSA [21].

Imaging analysis: Lateral cephalometry is an adjunctive airway assessment tool. The main site of pharyngeal narrowing or obstruction can be assessed. In addition, the pharyngeal dimension can be evaluated in relation to the craniofacial and para-pharyngeal soft tissue abnormalities as a whole. It can also aid in diagnosing adenoid hypertrophy and posterior upper airway obstruction, airway changes in relation to skeletal change. CBCT aids in assessing three-dimensional airway shape, total volume and minimal cross-sectional area (cm^2), which is more pathophysiologically relevant than volume. Origin of nasal cavity obstruction can be assessed in relation to transverse maxillary constriction. Changes in airway length can be noted with the displacement of the hyoid bone. Computational Fluid Dynamics (CFD) can be utilised to assess theoretical airway flow and resistance. [60].

Functional Evaluation of Respiration and Sleep

Assess for Breathing

Mouth breathers come with symptoms like dry mouth, gingival or periodontal inflammation, halitosis, snoring, chronic fatigue, and excessive sleepiness. Also, parents observe signs like slow growth rate, irritability, crying episodes at night, and behavioural and cognitive problems [61].

In mouth breathing, the inspiratory air current strikes upon the anterior portion there is a resultant high position of the palate seen in this region, while the tongue is quite closely applied to the posterior part of the palate; this prevents the action of the air current on that portion [61]. Tissue or muscles of the cheek apply abnormal pressure against the buccal surface resulting in narrowing of the alveolar process and lingual tilt of the associated teeth in this region. While the lips remain apart and their normal pressure is lacking, there is a labioversion of the anterior [61].

If the nasal obstruction and the mouth-breathing occurred during and lasted only until the beginning of the permanent dentition, there will be a resultant high palate, the upper alveolar arch will be an ellipse, and but teeth will be normally placed. While if it persists during the shedding of the deciduous teeth and the eruption of the greater number of the permanent teeth, the deformity of the palate and alveolar enhances, the anterior teeth become angulated. At the same time, the entire maxilla lags so markedly in growth that the permanent teeth have insufficient space for their proper eruption and growth. Moreover, there may be a further increase in the deformity of the mouth and the occlusion of the teeth [61]. In the earlier stage of growth under the age 5-6, mouth breathing with extended head/neck postures and lowered jaw/tongue postures may disturb the mechanism of cranial base flexion, resulting in a dolichocephalic pattern with narrow facial width and innate mandibular retrusion, creating a vicious cycle between mouth breathing and craniofacial abnormalities. On the other hand, the skeletal Class III pattern with strong mandibular growth potential, having mouthing breathing tendancy may worsen as it passes through the pubertal growth peak period [1,21].

Depending upon the level of respiratory obstruction, the mandible may be retrognathic and posteriorly inclined, which accounts for vertical growth pattern in older children by increasing anterior facial height due to clockwise mandibular displacement [62].

Mouth breathing can be classified into three types: obstructive type, structural type, and habitual type. For the obstructive type of mouth breathers, nasal obstruction caused by allergic rhinitis, septal deviation, or nasal polyps should be treated firstly, and hypertrophic adenoids and tonsils need to be removed if indicated. We need to refer the obstructive type of mouth breather to the ENT doctors. For the structural type of mouth breathers who have severely retruded chin, excessive lower facial height, constricted maxillary arch and nasal cavity, skeletal modification should be considered to bring about a structural change that can allow natural lip sealing and nasal breathing. Active myofunctional therapy should be recommended for the habitual or residual mouth breathers, after checking the presence of tongue-tie or tori [63].

Assess for Tempromandibular Disorders (TMD) and Bruxism

Sleep bruxism is defined as "repetitive jaw muscle activity characterised by clenching or grinding of the teeth and/or bracing or thrusting of the mandible." Diagnostic criteria for sleep bruxism include regular or frequent tooth grinding sounds along with the presence of abnormal tooth wear or transient morning jaw muscle pain or fatigue, and/or jaw locking on awakening. Sleep bruxism peaks during childhood and decreases with age. It is regulated centrally (pathophysiological and psychosocial factors) [64].

Orthodontic Management

After the physician's diagnosis, a patient may be referred to (or back to) an orthodontist for one or more types of care. Proper orthodontic treatment modality is decided depending on the craniofacial target.

Informed consent: The patient should be informed about the treatment procedure in detail, its pros and cons, expectations and related realistic estimates [21].

Appliance titration: Initially, the oral appliances are delivered with the mandible advanced to a position approximating 70% of maximum protrusion. Further, based on subjective feedback from the patient regarding their symptoms and sleep quality, the amount of protrusion can be titrated or increased until optimum symptom relief is obtained. If the calibrated position is sub-therapeutic, possibility of further titration or alternative treatment should be discussed on [21].

Monitoring: During treatment for OSA, the patient should be monitored, which may involve subjective reports and objective observations. Usage of the oral appliance and compliance should be evaluated, and the appliance should be checked for fit and comfort, the need for titration, and the development of undesirable side-effects. The use of thermal sensors can be done for the objective measurement of oral appliance adherence. Monitoring should be conducted at least once every six months during the first year and then annually. Routine monitoring should result in regular communications between the physician and orthodontist. If the patient has to worsen OSA related symptoms and/or changes to overall health, a consultation with the physician is strongly recommended [21].

CONCLUSION(S)

All patients visiting the orthodontic setup should be asked and assessed for airway related concerns. Assessment of the impact of orthodontic treatment on upper airway dimensions should be considered a key aspect in the decision-making. Several treatment options like RME, functional jaw orthopaedics and especially maxillomandibular advancement surgeries have a strong literature to support their positive correlation and effects on the airway related problems. Also, a few procedures especially those that involve mandibular setback should be done with utmost caution after thorough evaluation and should be kept to the minimum.

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