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Tetyana Shcherbyna, Kostiantyn Lykhota

Shupyk National Healthcare University of Ukraine, Kyiv, Ukraine

Development of Dentofacial Anomalies Associated with Airway Obstruction and Low Tongue Posture

▷ **Aim:** To assess the impact of low tongue posture on the development of Angle Class III dentoskeletal anomalies and to evaluate the clinical effectiveness of a combined approach involving myofunctional therapy and orthodontic appliance treatment in pediatric patients.

Materials and Methods: This prospective observational study enrolled 100 children (55 girls and 45 boys), aged 5–14 years. Diagnostic cephalometric analysis was performed to categorize participants into two groups: (1) functional anterior mandibular displacement (dentoalveolar Class III) and (2) skeletal Class III associated with maxillary retrognathia. Group 1 received EF Line functional appliances combined with targeted myogymnastics and breathing exercises. Group 2 underwent rapid maxillary expansion and facemask therapy, followed by myofunctional exercises. Clinical endpoints included the restoration of nasal breathing, normalization of craniofacial parameters according to cephalometric indices, and relapse prevention. Outcomes were assessed upon treatment completion and at a six-month follow-up.

Results: Significant improvements were observed across all clinical and cephalometric measures. The restoration of nasal breathing occurred in over 85% of subjects. The mean maxillary width increased by 2.3 mm (±0.8) in Group 2, with a corresponding improvement in the maxillary position and a reduction in mandibular prognathism. Group 1 achieved the normalization of dental occlusion in 80% of cases. The addition of myofunctional therapy was associated with a relapse rate of less than 10% at the six-month follow-up period.

Conclusions: A multimodal intervention combining orthodontic appliance therapy and myofunctional exercises is effective in the early correction of Class III dentofacial anomalies associated with low tongue posture and airway obstruction. This approach results in both functional and skeletal improvements with a low relapse incidence. Such interdisciplinary interventions should be considered in pediatric orthodontic practice to prevent the progression of Class III malocclusion.

Keywords: *dentofacial anomalies, myofunctional therapy, low tongue posture, airway obstruction, Angle Class III malocclusion, pediatric orthodontics.*

Introduction

The increasing prevalence of maxillofacial anomalies is well-documented globally, particularly among children and adolescents aged 3–16 years, with an estimated 75% of this population exhibiting some form of dentofacial irregularity. These anomalies rank third in prevalence among all dental conditions in this age group [1]. The continuous rise in incidence highlights the necessity for targeted prevention strategies and timely interventions aimed at mitigating the development of malocclusion [2].

Mouth breathing is frequently observed in pediatric patients with malocclusions and is known to contribute to atypical tongue posture, ultimately disrupting the development of the craniofacial complex [3]. Causes of nasal obstruction include congenital craniofacial anomalies, mucosal inflammation, nasal septum deviation, and adenotonsillar hypertrophy, all of which can lead to adverse craniofacial skeletal remodeling [4].

A low resting position of the tongue not only impairs upper airway patency but may also lead to compensatory postural adaptations, such as forward head posture and altered body alignment, in an attempt to facilitate respiration [5]. Children with chronic mouth breathing often present with the so-called “adenoid facies," characterized by narrow dental arches, crowding of the permanent dentition, and a high-arched (Gothic) palate [6].

Altered breathing mechanics disrupt the neuromuscular equilibrium between the agonist and antagonist muscles of the orofacial region [1]. Hyperactivity of the buccinator muscles exerts increased lateral pressure on the dental arches, while the tongue, displaced from its physiological resting position against the palatal rugae, assumes a middle or low posture within the oral cavity [7]. When the mouth remains open, the tongue cannot counteract the constrictive forces from the cheeks, further exacerbating the development of malocclusion.

Physiological tongue posture is critical for the proper development of the maxillary arch and dental occlusion [8]. During nasal breathing with lip seal, the posterior third of the tongue exerts intermittent upward pressure on the palatal vault during swallowing, promoting transverse maxillary development and supporting palatal vascularization [9]. Conversely, low tongue posture often results in the tongue tip thrusting against the anterior teeth during swallowing, reducing the tonicity of the orofacial muscles, including the orbicularis oris.

This dysfunction may lead to maxillary retrognathia, characterized by sagittal deficiency and restricted transverse growth. Compensatory recruitment of accessory musculature—including the facial, cervical, and even abdominal muscles—during swallowing is frequently observed in such cases. Moreover, altered neuromuscular tone in muscles such as the geniohyoid, orbicularis oris, and mylohyoid contributes to the development of distal malocclusion, often accompanied by a deep bite [1].

Recent research highlights that certain craniofacial deformities may arise as a consequence of impaired airway patency [11]. Deviations of the nasal septum and chronic rhinitis have been implicated in the development of malocclusions such as mandibular prognathism and crossbite. Moreover, chronic rhinitis associated with palatine tonsil hypertrophy may contribute to the formation of a Class III (progenics) malocclusion [12].

Considering the significant variability in craniofacial structures due to individual anatomical and genetic differences, a standardized classification of malocclusion is essential for diagnostic and therapeutic purposes [13]. One of the most widely accepted systems is Angle's classification, which categorizes malocclusions based on the sagittal relationships of the dental arches, particularly the first permanent molars [14]. According to Angle, the first permanent molars—considered the "key to occlusion"—typically erupt in a stable, consistent position. The displacement of the mandibular first molars from this normative position is often a primary indicator of malocclusion [15].

In a normal (Class I) occlusion, the mesiobuccal cusp of the maxillary first permanent molar articulates with the mesiobuccal groove of the mandibular first permanent molar. Angle's classification system includes three main classes:

- ***Class I (Neutrocclusion):*** A normal molar relationship is present, potentially with dental irregularities such as crowding or rotation.
- ***Class II (Distocclusion):*** The mandibular first molar is positioned distally relative to the maxillary first molar. This class is subdivided into:
  - *Division 1:* The maxillary incisors are proclined, typically resulting in an increased overjet.
  - *Division 2:* The maxillary central incisors are retroclined and may exhibit a deep overbite, sometimes covering the mandibular incisors completely [14].
- ***Class III (Mesiocclusion)***: The mandibular first molar is mesially positioned relative to the maxillary first molar, often leading to an anterior crossbite and a characteristic underbite appearance [8].

Transverse discrepancies, such as maxillary constriction in the posterior segments, may result in a posterior crossbite. Clinically, this may present as crowding of the anterior teeth due to a reduced basal arch width and a mismatch between tooth size and arch dimensions. When a single tooth is involved, dentoalveolar factors are often responsible, whereas skeletal discrepancies are implicated when multiple teeth are affected [10].

Myofunctional disorders, particularly those involving aberrant tongue posture and orofacial muscle dysfunction, are recognized as major contributors to dentofacial anomalies. Consequently, early myofunctional intervention is considered crucial in preventive orthodontics [11]. The early application of functional appliances—such as myofunctional trainers—can aid in proper jaw development, correct the tongue position, and guide the eruption of teeth into a more physiologically appropriate alignment, potentially preventing the emergence of sagittal discrepancies [15].

The introduction of EF Line myofunctional appliances in the 1990s marked a significant advancement in interceptive orthodontics. These appliances are fabricated from soft, hypoallergenic materials and are often flavored with mint to minimize the gag reflex. They function by promoting nasal breathing, repositioning the tongue to the palatal vault, and enhancing the tone of the orbicularis oris muscle [16].

Fixed orthodontic expanders, including Rapid Palatal Expanders (RPE), are commonly used to address transverse deficiencies and to correct mandibular malpositions. These devices are most effective during periods of active growth, particularly prior to the completion of skeletal maturation. Extraoral orthopedic appliances, such as the facemask (protraction headgear), have also gained popularity in correcting Class III malocclusions [17]. These devices typically consist of a metal frame with forehead and chin supports connected to intraoral components via elastics or orthodontic traction. The applied forces promote maxillary protraction and inhibition of mandibular growth [18]. Optimal results are generally achieved when treatment is initiated during the early-to-late mixed dentition phase, particularly before 9–10 years of age [2].

For cases involving transverse maxillary deficiency—often secondary to sagittal anomalies—orthodontic appliances designed to expand the midpalatal suture can be employed. These include the Hyrax, Haas, Derichsweiler, and McNamara expanders, as well as fan-type appliances (e.g., Leone) [19].

In children aged 6–12 years, Angle Class III malocclusion is commonly managed through maxillary protraction using a combination of intraoral and extraoral orthopedic appliances. Extraoral devices, such as the facemask or chin cup, aim to redirect growth in the temporomandibular joint (TMJ) area and promote posterior positioning of the mandible. This approach is particularly beneficial in addressing sagittal maxillary deficiency, especially when combined with chronic mouth breathing, as early intervention can significantly reduce the risk of relapse.

Preventive treatment is gaining increasing attention, with emphasis placed on restoring nasal breathing through respiratory re-education and on enhancing the tone of orofacial muscles—including the orbicularis oris and masticatory muscles—via myofunctional therapy (myogymnastics) [16].

Clinical studies have demonstrated that the concomitant use of myofunctional appliances and myofunctional exercises significantly improves treatment outcomes and contributes to long-term stability [12]. The primary muscles targeted during myogymnastics include the masseter, temporalis, lateral and medial pterygoid, and orbicularis oris muscles. For optimal effect, training should follow Rogers' principles, which emphasize the need for regular, low-amplitude muscle contractions with moderate intensity, interspersed with adequate rest intervals—typically a brief pause after each contraction [14].

In addition to muscle training, breathing exercises play a critical role in correcting dentofacial anomalies by addressing the etiological causes of mouth breathing. Therefore, restoring nasal patency and breathing should be a priority in orthodontic therapeutic planning. However, diagnosing nasal obstruction remains challenging due to the subjective nature and variability of clinical findings. Some studies suggest a lack of a consistent relationship between mouth breathing and the presence of malocclusion, which may lead to incomplete or inadequate treatment approaches [18]. These conflicting data underscore the clinical relevance of our investigation [19].

The aim of this clinical study was to evaluate the influence of low tongue posture associated with impaired nasal breathing on craniofacial development. Specifically, the study sought to assess changes in transverse maxillary dimensions and skeletal cephalometric parameters, as well as to develop a comprehensive orthodontic treatment protocol for dentofacial anomalies resulting from such functional disturbances.

Materials and Methods

A clinical case involving a 7-year-old male patient was analyzed. The patient underwent a comprehensive otorhinolaryngological (ENT) examination, which included oropharyngoscopy, anterior and posterior rhinoscopy, otoscopy, and lateral cephalometric radiography [7].

Nasal airway patency was evaluated using a functional inhalation–exhalation test, in which a paper indicator was applied as a passive flow indicator over the external nasal aperture. During normal nasal breathing, inhalation through the middle nasal meatus typically draws the indicator inward, while exhalation through the inferior meatus pushes it outward. Atypical movement patterns of the indicator suggest nasal airflow obstruction [5, 7]. Each nasal passage was evaluated independently.

An orthodontic assessment was conducted concurrently. Based on the results of the otolaryngological and functional breathing tests, the patient was confirmed to exhibit physiologically normal nasal breathing. No history of trauma or active inflammatory diseases of the upper respiratory tract was noted, and no exclusion criteria were identified [14].

To assess craniofacial morphology, the sagittal and transverse dimensions of the maxillary arch were measured using Moyers analysis. This method utilizes anatomical landmarks to evaluate the arch width at the level of the first permanent maxillary molars, allowing for the identification and prediction of potential dentofacial anomalies [5]. Measurements were recorded at baseline and after the completion of orthodontic treatment combined with a myofunctional exercise program.

Cephalometric Evaluation and Treatment Protocol: The patient underwent lateral cephalometric radiography (LCR) for a detailed analysis of skeletal and dental craniofacial relationships. During the procedure, standard radiation protection was ensured using a lead-lined apron to minimize scatter radiation exposure.

Cephalometric landmarks were identified and marked on the lateral cephalogram as follows:

- *Nasion (N):* The junction of the frontal and nasal bones in the midsagittal plane; a critical reference point for assessing the anterior cranial base and facial height.
- *Sella (S):* The geometric center of the sella turcica (hypophyseal fossa); used as a primary reference point in cranial base analysis.
- *Point A (A)*: The most posterior concave point on the anterior maxillary profile between the anterior nasal spine and the prosthion.
- *Point B (B):* The most posterior concave point on the anterior contour of the mandibular alveolar process, between infradentale and the bony chin.
- *Pogonion (Pog):* The most anterior point on the symphysis of the mandible.
- *Gnathion (Gn):* The most anteroinferior point on the mandibular symphysis; typically determined as the midpoint between Pogonion and Menton.
- *Menton (Me):* The lowest (most inferior) point on the mandibular symphysial shadow.
- *Gonion (Go):* The most posterior-inferior point at the angle of the mandible, located at the junction of the mandibular ramus and the body.
- *Anterior Nasal Spine (ANS):* The anterior tip of the bony process of the maxilla at the inferior margin of the aperture of the nasal cavity.
- *Posterior Nasal Spine (PNS):* The posterior limit of the bony hard palate.

Cephalometric planes were constructed to facilitate standardized angular and linear measurements:

- *NSL (Nasion–Sella Line):* Represents the anterior cranial base and serves as a primary reference plane.
- *FH (Frankfort Horizontal Plane):* A line connecting the orbitale (Or) and porion (Po), representing the stable horizontal cranial reference.
- *NL (Spinal Plane / Nasopalatal Plane):* A line connecting ANS and PNS, representing the orientation and inclination of the maxillary base.
- *ML (Mandibular Line):* A line representing the base of the mandible (typically connecting Gonion and Menton).

Key angular and linear measurements were assessed using cephalometric analysis software:

- *SNA Angle:* Formed at the intersection of SN and NA lines; reflects the anteroposterior (sagittal) position of the maxilla relative to the cranial base.
- *SNB Angle:* Formed by the intersection of SN and NB lines; indicates the sagittal position of the mandible relative to the cranial base.
- *ANB Angle:* The difference between SNA and SNB; indicates the intermaxillary skeletal relationship.
- *FMA (Frankfort-Mandibular Plane Angle):* The angle between the mandibular plane (ML) and the Frankfort plane (FH); used to identify the vertical growth pattern (divergence).
- *U1-PP (ILs/NL) Angle:* Measures the proclination/retroclination of the maxillary central incisors relative to the palatal plane.
- *L1-MP (ILi/ML) Angle:* Evaluates the inclination of the mandibular incisors relative to the mandibular base.
- *Wits Appraisal:* The linear distance between the perpendicular projections of Points A and B onto the functional occlusal plane. A positive value suggests a Class II relationship, while a negative Wits value reflects mandibular prominence (Class III) [5, 7].

Cephalometric analysis revealed significant deviations from normative values, confirming a skeletal Class III malocclusion. The profile was characterized by distinct sagittal and vertical discrepancies, including mandibular protrusion (prognathism), a retrognathic maxilla, and compensatory incisor angulations. The initial digital cephalometric indicators reflected the severity of the dentofacial malocclusion and its morphological impact on the facial profile.

Treatment protocol

The patient was managed using a comprehensive combination of EF Line functional appliances, targeted myofunctional therapy, and nasal respiratory exercises. This multidisciplinary approach was aimed at correcting orofacial muscle imbalance and establishing stable nasal breathing. Such a multimodal strategy is designed to facilitate proper jaw development and ensure long-term skeletal stability.

Data analysis was performed using descriptive statistics, including the calculation of the mean (*M*), standard deviation (*SD*), and standard error of the mean (*SEM*). The paired Student's t-test was applied to assess the statistical significance of differences between pre- and post-treatment measurements. A p-value of < 0.05 was considered statistically significant.

Results

The findings of the clinical and instrumental examinations conducted by the multidisciplinary team of otolaryngologists and orthodontists—specifically regarding mouth breathing patterns and sagittal malocclusion—are summarized in Tables 1–4 and Figures 1–5.

Table 1.

Analysis of Clinical Examination Data

Age	Number of patients	The presence of sagittal anomalies of the bite	Presence of mouth breathing	The presence of sagittal abnormalities of the bite in combination with mouth breathing
7	100	38 (38%)	7 (7%)	31 (31%)

Table 2.

Anomalies of bite taking into account age and gender

Age	Boys (Total)	With a mesialbite	With retroposition of the upper jaw
7	1 (100%)	1 (100%)	0 (0%)

Table 3.

Distribution of Nasal Breathing Disorders by Malocclusion Type and Age

Age	Type of nasal breathing disorder	With a mesial bite (*n* = 1)	With retroposition of the upper jaw
7	Not broken	1 (100%)	n/a

Table 4.

Results of cephalometric analysis

Parameters	With mesial bite (Mean ± SD)	Parameters	With mesial bite (Mean ± SD)
SNS angle	82.7° ± 1.8°	N-MP angle	59.7° ± 3.9°
Pn-SpP angle	82.9° ± 2.1°	SpP-MP angle (x)	24.8° ± 5.3°
Kut N	88.4° ± 3.9°	GoGn-SN angle	34.4° ± 1.03°
SNB angle	88.8° ± 3.4°	ILs/NL angle	0.64° ± 0.01°
Angle ANB	– 3.1° ± 3.1°	Angle ILi/ML	0.59° ± 0.03°
Pn-OcP angle	77.3° ± 3.6°	Savvy	0.8 ± 0.04

Table 5.

Sagittal Dimensions of the Upper Jaw Before and After Orthodontic Treatment in Combination with Myogymnastic Exercises

Parameter	With a mesial bite Earlier	With a mesial bite After
Norm	-	1 (100%)
Lengthening	-	-
Abbreviation	1 (100%)	-

Table 6.

Transverse Dimensions of the Upper Jaw Before and After Orthodontic Treatment in Combination with Myogymnastic Exercises

Parameter	With a mesial bite Earlier	With a mesial bite After
Norm	-	1 (100%)
Lengthening	-	-
Abbreviation	1 (100%)	-

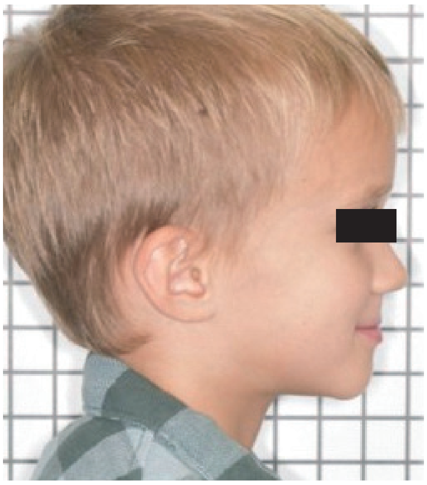

Figure 1. Child's bite before intervention

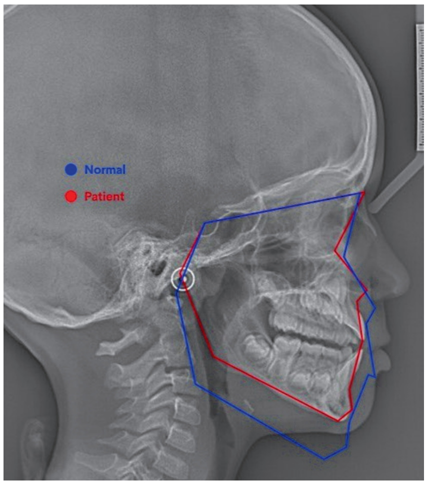

Figure 2. Cephalogram before treatment

Figure 3. Child's bite before the intervention

Figure 4. The patient's bite before the intervention

Figure 5. Carrying out the first manipulations.

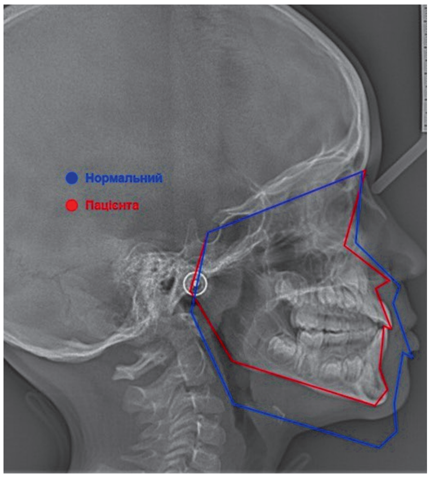

Figure 6. Cephalogram after expansion.

Figure 7. Bite after expansion.

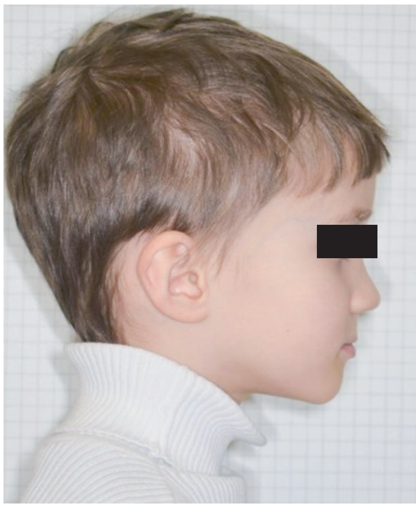

Figure 8. After 6 months after expansion.

Figure 9. After myofunctional therapy

Figure 10. After myofunctional therapy.

Figure 11. After myofunctional therapy.

Figure 12. After myofunctional therapy.

The transverse dimension of the maxilla was assessed by measuring the distance from the incisive foramen (incisive canal) perpendicularly to the line connecting the mesiobuccal cusps of the first permanent maxillary molars. This measurement is essential for evaluating the maxillary arch width and identifying any skeletal constriction, which may predispose the patient to dentoalveolar and myofunctional anomalies.

Accurate determination of maxillary transverse dimensions is critical for developing a targeted orthodontic treatment plan, particularly in cases requiring rapid or slow maxillary expansion. The comparative data on maxillary arch width before and after treatment are presented in Table 5.

Measurements showed that the combination of functional orthodontic treatment and myofunctional therapy (myogymnastics) significantly altered the sagittal dimensions of the maxilla in the male patient with skeletal Class III malocclusion and mandibular protrusion. Following the active treatment phase, a marked normalization of sagittal dimensions was observed, indicating improved maxillary development and corrected intermaxillary relationship (Table 6, Figures 6–8).

The measurements showed that the male patient with mesial occlusion (Class III) initially presented with maxillary constriction and a significant decrease in transverse dimensions. Following comprehensive orthodontic treatment and myogymnastics, a clinically significant normalization of the transverse dimensions was recorded.

A consistent trend was also observed in patients with maxillary retrognathism, where transverse development accompanied sagittal correction. Targeted myofunctional therapy was performed to stabilize the dental arch and improve muscle tone; the clinical results are documented in Figures 9–12.

Developmental anomalies of the maxilla significantly influence the spatial positioning of the mandibular dentition and the overall morphogenesis of the lower dental arch. Transverse maxillary constriction often results in compensatory angulation and ectopic eruption of the mandibular molars, contributing to complex malalignment of the dental arches.

The restoration of a functional physiological occlusion requires the normalization of maxillary transverse dimensions, as maxillary deficiency is a major etiological factor in the development of compensatory sagittal malocclusions.

Cephalometric analysis revealed a significant reduction in the SNB angle in children with nasal airway obstruction and Class III malocclusion. The mean SNB value in the affected group was 80.6° ± 1.9°, compared to 82.5° ± 1.6° in the control group. This suggests functional underdevelopment of the maxilla, likely associated with low tongue posture and a concomitant reduction in upper airway volume. Furthermore, posterior and inferior displacement of the hyoid bone was noted, potentially altering cervical posture and reducing the efficiency of nasal respiration.

In patients with skeletal Class III malocclusion, the mandible was positioned anteriorly relative to the maxilla. Cephalometric evaluation showed a mean ANB angle of –3.8°, compared to the normative value of +2°, confirming a severe skeletal discrepancy. The SNB angle was increased to 85.2° ± 2.5° (relative to 83.6° ± 0.9 in controls), indicating significant anterior displacement of Point B and true skeletal mandibular prognathism.

Analysis of the GoGn–SN angle demonstrated a significant decrease to 30.2° ± 1.04° in cases of horizontal (hypodivergent) growth, and an increase to 34.4° ± 1.03° in patients with vertical (hyperdivergent) growth (reference value: 33.1° ± 1.02°). These findings emphasize the importance of analyzing anterior-to-posterior facial height ratios and determining the skeletal growth pattern of the craniofacial complex. Additional assessment of the SpP–MP (palatal-to-mandibular plane) angle facilitated the evaluation of the lower anterior facial height (LAFH), which is crucial for predicting the direction of mandibular rotation and facial growth.

In patients with anterior open bite (AOB), a distinct vertical gap between the maxillary and mandibular anterior teeth was observed, despite full occlusion of the posterior segments. Cephalometric analysis revealed an increased GoGn–SN angle of 34.4° ± 1.03°, indicating a hyperdivergent vertical mandibular growth pattern. This was associated with compensatory elongation of the lower anterior facial third (LAFT), which is a hallmark of vertical craniofacial dysplasia.

Clinical signs of transverse maxillary deficiency included pronounced nasolabial folds, a narrowing of the nasal base, and reduced inter-alar width, leading to increased nasal airway resistance and compromised nasal breathing.

It is critical to note that spontaneous self-correction of such discrepancies does not occur. As the child matures, the persistent dentoalveolar anomaly exacerbates the progression of maxillofacial growth, contributing to irreversible changes in the sagittal and vertical facial dimensions.

If left untreated, these morphological deviations lead to established skeletal disharmony that may eventually require orthognathic surgical intervention rather than conservative orthopedic treatment.

Treatment Approach

The treatment followed a comprehensive protocol incorporating EF Line functional appliances, myofunctional therapy, respiratory exercises, a fixed Rapid Maxillary Expander (RME), and a protraction facemask. Post-treatment cephalometric analysis demonstrated significant expansion of the maxillary transverse dimensions and successful correction of skeletal discrepancies.

The synergy between orthodontic mechanotherapy and myogymnastics was pivotal in achieving and stabilizing the achieved occlusion. To enhance perioral muscle tone and prevent relapse, a targeted exercise regimen for the orbicularis oris muscle was implemented, including “Fish,” “Elephant,” and “Button” exercises. The patient was instructed to perform 10 repetitions of each exercise twice daily.

Clinical studies, corroborated by our observations, demonstrate that the management of mesial occlusion in children aged 6–12 years is highly effective when orthopedic appliances are combined with extraoral traction (e.g., a protraction facemask or chin cup). These modalities exert a targeted influence on the temporomandibular joint (TMJ) growth centers, facilitating mandibular repositioning and arresting the progression of skeletal malocclusion.

Furthermore, the management of malocclusions exacerbated by nasal breathing dysfunction necessitates a proactive, multidisciplinary strategy. The integration of myofunctional therapy to rectify masticatory muscle imbalances has proven essential in stabilizing treatment outcomes and significantly mitigating relapse rates.

Conclusions

1. The integrated application of EF Line functional appliances, fixed Rapid Maxillary Expanders (RME), and protraction facemask therapy facilitated the effective restoration of transverse maxillary dimensions and the correction of dentofacial anomalies within a concise treatment timeframe.

2. The synergistic effect of these orthopedic modalities allowed for significant skeletal repositioning, addressing both the underlying malocclusion and associated airway concerns.

3. The inclusion of a targeted myogymnastic exercise regimen was pivotal in stabilizing functional outcomes and served as a critical factor in long-term relapse prevention.

4. A multidisciplinary approach, combining mechanical correction with functional rehabilitation, is essential for achieving harmonious dental and skeletal development in patients with Class III malocclusions.

Conflict of interest

The authors declare no conflict of interest.

Consent to publication

The authors have given their consent to the publication of the manuscript.

Use of Artificial Intelligence

The authors state that no artificial intelligence was used in the writing of the article.

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Розвиток дентофаціальних аномалій, зумовлених обструкцією дихальних шляхів та низьким положенням язика

Тетяна Щербина, Костянтин Лихота

Національний університет охорони здоров'я України імені П.Л. Шупика, м. Київ, Україна

У роботі досліджено вплив низького положення язика на патогенез дентоскелетних аномалій III класу за Енглем у дітей та оцінено ефективність інтеграції міофункціональної терапії у протоколи ортодонтичного лікування. Об'єкт дослідження — 100 дітей віком від 5 до 14 років. Комплексна діагностика включала цефалометричний аналіз; лікувальний протокол передбачав застосування функціональних апаратів EF Line, апаратну експансію верхньої щелепи та курс міогімнастики.

Результати продемонстрували значне покращення цефалометричних показників, відновлення фізіологічного носового дихання у понад 85% випадків та зниження частоти рецидивів до 10%. Доведено, що комплексний підхід сприяє гармонізації щелепного росту, а також нормалізації функцій дихання та ковтання.

Ключові слова: *дентофаціальні аномалії, міофункціональна терапія, низьке положення язика, обструкція дихальних шляхів, клас III за Енглем, дитяча ортодонтія*.

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Shcherbyna, Tetiana

Postgraduate student of the Department of Stomatology, Shupyk National Healthcare University of Ukraine, Kyiv, Ukraine

https://orcid.org/0009-0009-0715-9245

Lykhota, Kostiantyn

Doctor of Medical Sciences, Professor, Professor of the Department of Therapeutic Dentistry, Shupyk National Healthcare University of Ukraine, Kyiv, Ukraine

https://orcid.org/0000-0003-0912-6470