

A Case Study

Modified Oral Screen - An Effective Myofunctional Appliance For Unilateral Crossbite Correction: A Case Study

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Abstract:

The development of the dentition is influenced by the balance and function of the orofacial musculature. The opposing forces from the buccal soft tissues and tongue are necessary to maintain the dentition in good form and function. When this balance is disrupted, it can cause malocclusion of varying degrees. Screening therapy aims to eliminate abnormal muscle forces and prevent the development of malocclusion, or intercept it if it has already begun. The oral screen is a myofunctional appliance used in early interceptive treatment, with various modifications made by different researchers. The following case report describes the correction of developing malocclusion and the orthopedic effects achieved with the use of a modified oral screen.

Keywords: Modified unilateral oral screen, crossbite correction, cleft lip and palate, interceptive orthodontics

Introduction

Functional appliances are a type of appliance designed to modify the arrangement of various muscle groups that affect the function and position of the mandible.⁹ This is done in order to transfer forces to the dentition and basal bone. These appliances differ from other appliances as how they apply force. They do not act on the teeth using mechanical elements such as springs, elastics or ligatures. Instead, they work to either transmit, eliminate or guide natural forces. The oral screen is a myofunctional appliance that is simple and adaptable, and it is used to intercept dental arch deformities in their early stages of development.² The appliance was initially introduced by Newell in 1912. Various researchers have developed different variations of the oral screen to meet different treatment requirements. The appliance is primarily used in the treatment of malocclusions that are worsened by incorrect muscle function.¹¹ By preventing the pressure from the cheeks from affecting the dentition, the oral screen allows the tongue to exert free force on a constricted dental arch.

This results in the passive expansion of the arches. Unilateral cross bite is a common malocclusion that can lead to functional and aesthetic issues if left untreated.¹² The aim of this case report is to demonstrate the efficacy of a modified oral screen as a myofunctional appliance for correcting unilateral cross bite.

Case Report

The oral screen, customized to suit the patient's needs, was prescribed and implemented according to a defined protocol. The treatment approach also encompassed a comprehensive exercise regimen aimed at improving muscular balance and coordination.

A 12-year-old girl visited the Pediatric & Preventive Dentistry department at BBDCODS in Lucknow with a chief complaint of irregular upper front teeth. On eliciting parents revealed no history of mouth breathing habit.

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Extra-oral examination

The patient had a leptoproscopic facial structure with a straight profile, flaccid upper lip and maxillary insufficiency on the left side of the face. The patient had previously undergone surgery for unilateral cleft lip and palate at the age of 2 years.

Intra-oral examination

A supernumerary palatally placed tooth irt 22, crowding irt 11,12,13, grade II mobility wrt 53 and dental posterior crossbite on the left side was present. Assessment of occlusion revealed end-on molar relation on left side and Angle's Class I molar relationship on right side. Intra-oral periapical radiograph irt 22 was done to verify the supernumerary tooth.

Management:

The management of cleft lip and palate in individuals should commence shortly after birth and extend throughout their developmental stages into adulthood.

In our present study, 63 and 64 was extracted, followed by separator placement in between 55 and 16 and also in between 65 and 26, in order to facilitate the placement of molar bands. Orthodontic brackets were bonded with 11, 13, and 21 to correct the anterior crossbite. The bite was adjusted to create a 1-1.5mm clearance. After a two-month evaluation, the anterior crossbite had been successfully corrected, and the brackets were removed. Subsequently, arch expansion was performed using a removable appliance with a Jack's screw, in combination with a modified oral screen, to mitigate abnormal muscle forces affecting the teeth.

A custom made acrylic oral screen with incorporated wire meshwork was created with an aim to correct the posterior unilateral crossbite. Parents were explained and educated about the treatment plan and consent was taken. The child was given instructions on lip exercises. The child was instructed to extend the upper lip as far as possible to cover the vermilion border under and behind the maxillary incisors.



Fig 1: Pre-operative Extra-oral Photograph Fig 2: Intra-oral Photograph Of Maxillary Arch Fig 3: Intra-oral Photograph Of Mandibular Arch

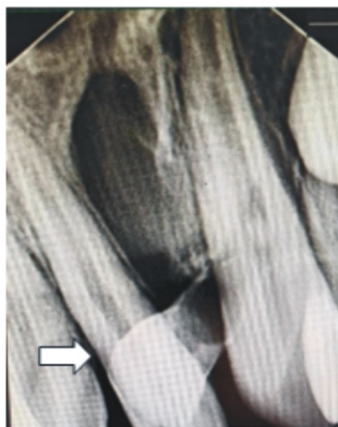


Fig 4: Pre-operative Iopawrt 22 (supernumerary)



Fig 5: Unilateral Crossbite on the Left Side of Patient's Face

Appliance Fabrication

Precise impressions of the upper and lower teeth were taken using alginate impression material and careful attention was given to accurately capture the vestibular sulcus and labial fold depths. Models were created using dental stone and a construction bite was taken using modeling wax. The appliance was made of pink-colored acrylic and wire components. Three loops were fabricated unilaterally using 21-gauge stainless steel wire and joined together on the distal side with the same wire. The loops were designed to extend from the distal of permanent central incisor to the mesial of the last

erupting tooth, with a clearance of 2-3 mm between the loops and buccal surfaces of the dental arches. The loops were designed in such way that the innermost loop was till the primary 2nd molar, the middle loop was till the distal end of the 1st permanent molar and outer loop was extended up to mesial of the last erupting tooth. An additional loop was added to the anterior portion of the appliance, and the wire components were incorporated into the appliance during the acrylization process. The appliance was processed with cold-cure acrylic, trimmed and polished before delivering it to the patient. Frenum relief were made as well.

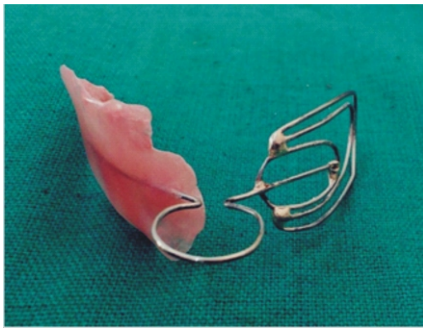


Fig 6: Modified Unilateral Oral Screen (frontal View)



Fig 7: modified Unilateral Oral Screen (top View)



Fig 9: Modified Unilateral Oral Screen (left Lateral View)



Fig 10: Modified Oral Screen In Patient's Mouth (frontal View)



Fig 11: Modified Oral Screen In Patient's Mouth (left Lateral View)



Fig 12: Modified Oral Screen In Patient's Mouth (right Lateral View)

Post insertion instruction and adjustment of the appliance

The patient was advised to wear the oral appliance every night and maximum time during the day. Lip seal exercises were demonstrated to the patient and suggested practicing them for 30-45 minutes per day.¹⁴ The patient was asked to wear the appliance for maximum hours of the day and also while sleeping. It should be removed while eating and stored in a moist container. It was also recommended to schedule regular check-ups every 1 month to check the progress.

Results Achieved

On examining the patient at every 1 month interval, at the end of 5 months of treatment with the screen, mild improvement in the posterior crossbite. Functional and aesthetic outcomes were achieved, leading to enhanced oral health and patient satisfaction. The patient was advised to maintain consistent usage of the appliance and adhere to a daily exercise routine of thirty minutes for the next few months.²



Fig 13: Improvement In The Posterior Crossbite After 4 Months

Discussion

An oral screen is utilized to relieve pressure from the cheeks and apply pressure to the teeth, allowing the tongue to push against the limited dental arch and cause expansion through passive curvature.³ Oral screen relieves pressure from the labial and buccal aspect allowing maxilla and mandibular growth leading to significant occlusal relationship.⁴ It also produces lingual pressure on the maxillary teeth, leading to teeth inclination and significant changes in occlusal relationships, which can decrease overbite and overjet. Using an oral screen can affect muscle activity and cause changes in the incisors.¹³ Kraus labeled this approach as "inhibition therapy," which involves suppressing the root cause.⁵ It creates an artificial mold for the lips and cheeks, which corrects the function of the muscles surrounding the growing teeth and, in turn, rectifies the shape. To put it differently, the process of creating the appliance involves pushing the mandible forward to achieve an edge-to-edge incisor relationship, and myofunctional exercises are employed to achieve the desired esthetic outcomes.¹⁰ This is the fundamental approach underlying the appliance's effectiveness. Hötz introduced a loop made of stainless steel in the anterior of the oral screen, which patients can pull on to resist the appliance's displacement with their lips while using small holes in the anterior acrylic aspect of the oral screen to allow for some mouth breathing.⁶ As nasal breathing improves, the size of the holes can gradually be reduced. The double oral screen is another option, consisting of a separate screen with a 0.9mm wire bilaterally placed that passes through the bite in the lateral incisor or distal to the last molar area to prevent tongue thrusting. In open bite cases, an acrylic projection is added to the oral screen to keep the tongue away from the dentition. Rehak's modification includes attaching a pacifier to the screen, projecting out from the outer part of the oral screen, which patients have to hold in place with their lips, thus improving hypotonic lips.⁸ Goyal's modification involves reducing the acrylic portion and incorporating a wire component.¹ Lastly, Sudipta Kar made a modification to the oral screen, which involves reducing the amount of acrylic material used and incorporating an ovoid and criss-cross wire design.¹

Cleft lip and palate represent a prevalent type of congenital craniofacial anomalies. This condition arises from the incomplete fusion of the lip and palate along the midline during fetal development, giving rise to readily noticeable deformities in newborns and resulting in cosmetic irregularities. Alongside, crossbite refers to a misalignment of the upper and lower teeth, where some of the upper teeth sit behind the lower teeth when the jaw is closed. This can result in functional issues, discomfort,

and potential aesthetic concerns. Correcting crossbites is an important aspect of orthodontics and dental treatment. Oral screen which is a simple and versatile myofunctional appliance is used in early interceptive treatment in dental arch deformities. Oral screens cover a substantial portion of the patient's face, obscuring their smile and facial features. Moreover, patients may be self-conscious about their appearance while the screen is in place, impacting their perception of the dental aesthetics during the procedure. Therefore, dentists should be mindful of these potential drawbacks and work to address them through effective communication, patient education, and sensitivity to patient comfort and aesthetic concerns. Advancements in dental materials and technology allow for the creation of custom-fit oral screens. Dental professionals can fabricate oral screens that are tailored to the patient's mouth, ensuring a more precise fit and reducing any discomfort or aesthetic concerns related to ill-fitting screens. The current modification intends to decrease the amount of acrylic material used in the appliance and enhance safety measures, thereby making it easier and more comfortable for cleft lip and palate patients with unilateral crossbite to wear the appliance. This screen allows better visibility of the patient's face and smile, reducing the obstructive effect that traditional oral screen have on the patient's esthetics. This modified oral screen is lightweight, and criss-cross wires that minimize or eliminate distortion of extended loops. Additionally, it requires less chair-side time for adjustment, causes fewer soft tissue ulcers in vestibules, is easy to clean, and is more comfortable with low maintenance. This oral screen is designed to be more comfortable to wear and less likely to induce feelings of confinement. This enhances patient comfort and minimizes the psychological impact of wearing an oral screen. It enables patient to communicate more effectively as it is not bulky. Another benefit of this treatment approach is its low likelihood of causing iatrogenic harm or unintended damage. By providing effective education and consistent support to both children and parents, compliance was achieved. In the aforementioned case, the utilization of an oral screen for treatment not only resulted in positive clinical outcomes but also significantly influenced the patients' psychological well-being, fostering confidence and a positive mindset.² This modified oral screen is designed with aesthetics in mind. It featured sleek and modern design that appears less intimidating and clinical, helping to create a more pleasant and visually appealing esthetics for a cleft lip and palate patient with mild improvement in the posterior crossbite.

Conclusion

The findings of this case report underscore the efficacy of using a modified oral screen for unilateral posterior crossbite correction as a myofunctional appliance. The presented case supports the appliance's effectiveness in addressing the specific condition discussed. Further research and clinical investigations are warranted to further validate these findings and expand our understanding of the role of myofunctional appliances in achieving optimal outcomes in various orthodontic cases.

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