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A review comparing unilateral versus bilateral posterior crossbite

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Abstract
This review is undertaken to observe the characteristics of unilateral and bilateral posterior crossbite. Unilateral posterior crossbite is usually presented with mandibular shift and mandibular deviation due to the reduced width of maxillary dental arch. The management of unilateral posterior crossbite may be more complex than it may seem. The treatment success is higher if the treatment is started early. The development of a treatment plan for posterior crossbite is determined by the presence or absence of a functional shift during mandibular closure. In the young age, posterior crossbite can be treated with rapid maxillary expansion appliances and in older age it can be treated with surgical assisted rapid maxillary expansion or mini-screw assisted rapid maxillary expansion appliance. The treatment of unilateral posterior crossbite requires asymmetric expansion of maxillary arch with AMEX appliance or U-MARPE appliance. Early diagnosis of posterior crossbite may be helpful in successful treatment of posterior crossbite**.**

Keywords: cross bite, early treatment, malocclusion, appliances

Introduction

Posterior crossbite is one of the most common malocclusions in the mixed dentition period. The occurrence of posterior crossbite is understood to be from 8 to 22% [1]. Posterior crossbite is defined as the abnormal bucco-lingual relationship between the maxillary and mandibular molars or premolars in occlusion. A frequent presentation of posterior crossbite is unilateral posterior crossbite with a functional shift of the mandible on one side [2]. Posterior crossbite if observed in mixed dentition, most likely will be observed in permanent dentition as well. It can have negative effects on the long term growth of maxillary and mandibular jaw. Unilateral posterior crossbite can occur due to a bilateral narrowing of maxilla and shifting of mandibular on one side while biting. Leighton *et al*. showed that unilateral posterior crossbite present during the age from 19-months to 5-years in children [3]. It has been observed in studies on patients with posterior crossbite that they have a higher risk of developing craniomandibular disorders in adolescents and adults age [4]. For these reasons, early treatment of posterior crossbite is recommended to create anormal occlusion and offer appropriate conditions for develop of normal occlusal-scheme.

Etiology of posterior crossbite

The cause of posterior crossbite can be due to skeletal issues, dental issues, or muscular issues. There is evidence to suggest that the causative factors for crossbite are related to genetic conditions, environmental conditions, functional issues, or negative oral habits [4]. The reason for occurrence of posterior crossbite is the discrepancy in the relative width of maxilla and mandible. When the ratio of maxillary width to mandibular width is small, then it can lead to posterior crossbite [5]. Some risk factors such as obstructive episodes of upper airway due to increase in adenoid size or tonsil size or chronic allergic-rhinitis can lead to develop of posterior crossbite [2]. It has also been reported that patients who are intubated during the infant life-period have higher incidence of posterior crossbite. Sometimes the decreased maxillary width results in the development of unilateral posterior crossbite with displacement of mandible towards one side resulting in unilateral posterior crossbite [6]. Other times it leads to the development of bilateral crossbite.

Presentation of unilateral and bilateral posterior crossbite

Unilateral posterior crossbite usually show a midline discrepancy between maxilla and mandibular midline due to mandibular midline shifted towards the crossbite side. When maxilla is constructed more significantly, the presentation is usually bilateral posterior crossbite [4]. In bilateral posterior crossbite, the midlines can be coincident or non-coincident. Posterior crossbite could present with prolonged retention of deciduous teeth, premature loss of deciduous teeth, crowding of teeth, palatal cleft, arch deficiencies, tooth size abnormality, tooth eruption abnormality, habits such as digit sucking habit, oral respiration, etc [7]. It has been contemplated that posterior crossbite can affect the Temporomandibular Joint (TMJ) if not corrected [8]. The presentation of poster crossbite can differ based on the age of the patient and the growth status. The skeletal maturation and growth tatus of the patients can be assessed on lateral cephalograms and cone-beam computed tomography [9]. It has been reported in a previous study that when lateral cephalogram is used for assessment of CVMI, the CVMI staging may be higher than using CBCT [9]. Children with unilateral posterior crossbite can present with atypical chewing patterns when chewing on the crossbite side. During a normal chewing cycle, the mandible moves laterally towards the food bolus and then moves medially while closing through the transcuspal and intercuspal phases of mastication. In patients with posterior crossbite, the mandible may deviate medially first and then laterally during closure. Therefore, the chewing pattern is reversed in patients with posterior crossbite [8]. That is why a posterior crossbite is both a developmental abnormality and

functional abnormality.

Treatment Timing of posterior crossbite

When the posterior crossbite is treated in mixed dentition period, then lessamount of forces are required to open the maxillary suture and expand the maxillary arch. The tooth anchored maxillary expansion appliances such as rapid maxillary expansion (RME) can be used for such situations [10, 11]. Early treatment of posterior crossbite can reduce the changes of signs and symptoms of Temporomandibular joint disorder with posterior crossbite [12]. If the treatment of posterior crossbite is carried out in adolescents or older adults, then tooth anchored maxillary expansion appliances do not provide the desired results. In such situations, the mini-screw assisted rapid maxillary expansion (MARME) appliances can be used. With these appliances, the maxillary suture can be opened predictably and successfully. The expansion results with these appliances have been reported in a study to be stable over time [13]. In earlier times before MARME appliance, the surgical assisted rapid maxillary expansion was used but now it is not used as commonly due to less invasiveness and higher stability with MARME appliances [14].

Treatment Methods for posterior crossbite

Bilateral Posterior Crossbite

Treatment of posterior crossbite involves the expansion of maxillary arch, removal of the occlusal interreferences and removal of the functional shift. There are some differences in the methods highlighted above that are used to achieve the expansion. The appliances such as quad-helix appliances, rapid maxillary expansion screw, nickel-titanium alloy appliances can be used in mixed dentition [15]. for adolescents and adults, mini-screws are used for expansion procedures and the MARME appliance is turned two times a day until the expansion is achieved [16]. The MARME appliances can be connected to only the mini-screws or to both mini-screws and Teeth, That is the hybrid expanders [17]. Mini-screws as usually placed in the palate for such appliances. Palatal mini-screws have been found to have higher success rates than buccal mini-screws [18]. Posterior crossbite usually occur sin combination with other types of malocclusions. MARPE appliance is kept for retention after the expansion is completed for atleast 6 months [19]. When posterior crossbite accompanies anterior crossbite, then the MARPE appliance can be used in combination with other mini-screws for class III intermaxillary elastics [20]. Sometimes in adult patients when performing the MARME appliance, osteoperforations are performed in the midpalatal suture to achieve higher suture opening and maxillary expansion [21]. Osteoperforations have been shown to accelerate tooth movement as they lead to increased inflammatory response [22]. All these options lead to bilateral expansion of maxilla and are useful in patients with bilateral posterior crossbite.

Unilateral posterior crossbite

For treatment of unilateral posterior crossbite, bilateral expansion of maxilla can be done with the methods highlighted above. However, usually it leads to overexpansion of the normal side [23]. This results in unnecessary increased duration of treatment as clinicians need to correct the overexpanded side after the expansion is performed. Therefore, a few techniques can be used to expand the maxillary arch unilaterally. Asymmetric Maxillary Expansion (AMEX) appliance can be used to move selected teeth on the side of maxillary arch which is in crossbite [24]. With this appliance, the maxillary and mandibular teeth on the crossbite side are anchored together on the normal side so they act as an anchor unit. However, side effects with these appliances have been observed on the normal side specially on the mandible. Unilateral MARPE appliance (U-MARPE) can be used to correct the posterior crossbite unilaterally. With these appliances, the palatal mini-implants are inserted on one side of the arch and they push the maxilla transversely on the crossbite side [25]. The normal side does not receive any abnormal forces and therefore, is very useful in clinician situation in reducing the treatment duration [25]. Other appliances that can be used asymmetrically are W-Arches, quad-helix appliances. These appliances can be modified by changing the length of the arms to include more teeth in the anchorage unit. But these appliances lead to side effects on the normal side unlike the U-MARPE appliance.

Posterior crossbite and asymmetry may be a difficult problem to correct in orthodontics [26]. Different appliance designs can be used for the correction of dental crossbite, constricted maxilla, bilateral or unilateral crossbite. With the increase in popularity for esthetic options, aligners are now more commonly used for orthodontic treatment [27]. Aligner therapy can also be used for the correction transverse maxillary issues and can be useful in achieving maxillary expansion. It has been reported that if the staging of aligner therapy is performed properly, then complex tooth movements can be achieved with aligners effectively [28]. A combination of aligners and mini-screws may be used for correction of complicated malocclusions [29].

Conclusions

Posterior crossbite can be corrected at an early age in mixed dentition with appliances such as rapid maxillary expansion can open the midpalate suture easily. In growing patients, the suture expands easily whereas in adults such appliances only lead to dentoalveolar expansion. For this reason, in adults mini-screw assisted rapid maxillary expansion is performed to achieve the sutural opening for bilateral posterior crossbite. The unilateral MARPE appliance can be used for patients with unilateral crossbite. In patients with esthetic concerns, aligner therapy can be performed for correction of the transverse issues. The treatment timing and appliance design are an important part of the decision-making process for posterior crossbite.

References

1. Sofia Petren DDS, Lars Bondemark DDS, Odont DR. Bjorn Soderfeldt, PhD, Dr Med Sc. A Systematic Review Concerning Early Orthodontic Treatment of Unilateral Posterior Crossbite. Angle Orthod,2003:73:588-596.
2. David B, Kennedy, Matthew Osepchook. Unilateral Posterior Crossbite with Mandibular Shift: A Review. J Can Dent Assoc,2005:71(8):569-73.
3. Chris van Keulen, Guy Martens and Luc Dermaut. Unilateral posterior crossbite and chin deviation: is there a correlation? European Journal of Orthodontics, 2004:26:283-288.
4. Stasa Melink, Mojca Velikonja Vagner, Irena Hocevar-

Boltezar, Maja Ovsenik. Posterior crossbite in the deciduous dentition period, its relation with sucking habits, irregular orofacial functions, and otolaryngological findings. Am J Orthod Dentofacial Orthop,2010:138:32-40.
5. Brunelle JA, Bhat M, Lipton JA. Prevalence and distribution of selected occlusal characteristics in the US population, 1988-1991. Journal of Dental Research,1996:75:706–713.
6. McNamara JA. Maxillary transverse deficiency. American Journal of Orthodontics and Dentofacial Orthopedics,2000:117:567–570.
7. da Silva Filho, OG, Montes LA, Torelly LF. Rapid maxillary expansion in the deciduous and mixed dentition evaluated through posteroanterior cephalometric analysis. American Journal of Orthodontics and Dentofacial Orthopedics,1995:107:268–275.
8. Maria Grazia Piancino, Francesca Talpone, Paola Dalmasso, Cesare Debernardi, Arthur Lewin and Pietro Bracco. Reverse-sequencing chewing patterns before and after treatment of children with a unilateral posterior crossbite. European Journal of Orthodontics,2006:28:480-484.
9. Mehta S, Dresner R, Gandhi V, Chen PJ, Allareddy V, Kuo CL *et al*. Effect of positional errors on the accuracy of cervical vertebrae maturation assessment using CBCT and lateral cephalograms. J World Fed Orthod,2020:9(4):146-154. doi:10.1016/j.ejwf.2020.09.006
10. Haas AJ. Palatal expansion: just the beginning of dentofacial orthopedics. American Journal of Orthodontics,1970:57:219-255. [PubMed] [Google Scholar]
11. Bishara SE, Staley RN. Maxillary expansion: clinical implications. American Journal of Orthodontics and Dentofacial Orthopedics,1987:91:3-14. [PubMed] [Google Scholar]
12. Rungcharassaeng K, Caruso JM, Kan JY, Kim J, Taylor G. Factors affecting buccal bone changes of maxillary posterior teeth after rapid maxillary expansion. American Journal of Orthodontics and Dentofacial Orthopedics,2007:132:428.e1-428.e8.
13. Mehta S, Wang D, Kuo CL, Mu J, Vich ML, Allareddy V *et al*. Long-term effects of mini-screw-assisted rapid palatal expansion on airway. Angle Orthod,2021:91(2):195-205. doi:10.2319/062520-586.1
14. Koudstaal MJ, Poort LJ, van der Wal KG, Wolvius EB, Prahl-Andersen B, Schulten AJ. Surgically assisted rapid maxillary expansion (SARME): a review of the literature. Int J Oral Maxillofac Surg,2005:34(7):709-714. doi:10.1016/j.ijom.2005.04.025
15. Hesse KL, Artun J, Jondeph DR, Kennedy DB. Changes in condylar position and occlusion associated with maxillary expansion for correction of functional unilateral posterior crossbite. Am J Orthod Dentofacial Orthop,1997:111(4):410-8.
16. Mehta S, Chen PJ, Vich ML, Upadhyay M, Tadinada A, Yadav S. Bone-anchored versus tooth-anchored expansion appliances: Long-term effects on the condyle-fossa relationship [published online ahead of print, 2021 Jul 28]. J World Fed Orthod, 2021, S2212-4438(21)00031-X. doi:10.1016/j.ejwf.2021.07.001
17. Akin M, Akgul YE, Ileri Z, Basciftci FA. Three-dimensional evaluation of hybrid expander appliances: A pilot study. Angle Orthod,2016:86(1):81-86. doi:10.2319/121214-902.1
18. Arqub SA, Gandhi V, Mehta S, Palo L, Upadhyay M, Yadav S. Survival estimates and risk factors for failure of palatal and buccal mini-implants. Angle Orthod,2021:91(6):756-763. doi:10.2319/090720-777.1
19. Kapetanović A, Theodorou CI, Bergé SJ, Schols JGJH, Xi T. Efficacy of Miniscrew-Assisted Rapid Palatal Expansion (MARPE) in late adolescents and adults: a systematic review and meta-analysis. Eur J Orthod,2021:43(3):313-323. doi:10.1093/ejo/cjab005
20. Mehta S, Chen PJ, Upadhyay M, Yadav S. Intermaxillary elastics on skeletal anchorage and MARPE to treat a class III maxillary retrognathic open bite adolescent: A case report [published online ahead of print, 2021 Aug 24]. Int Orthod,2021:S1761-7227(21)00107-8. doi:10.1016/j.ortho.2021.08.001
21. Santana LG, Marques LS. Do adjunctive interventions in patients undergoing rapid maxillary expansion increase the treatment effectiveness?. Angle Orthod,2021:91(1):119-128. doi:10.2319/051320-431.1
22. Mehta S, Chen PJ, Kalajzic Z, Ahmida A, Yadav S. Acceleration of orthodontic tooth movement and root resorption with near and distant surgical insults: An in-vivo study on a rat model [published online ahead of print, 2021 Oct 26]. Int Orthod,2021:S1761-7227(21)00125-X. doi:10.1016/j.ortho.2021.10.002
23. Kennedy DB, Osepchook M. Unilateral posterior crossbite with mandibular shift: a review. J Can Dent Assoc,2005:71(8):569-573.
24. Serdar Toroglu M, DDS, PhD, Erhan Uzel, DDS, Mustafa Kayalioglu, DDS, Ilter Uzel, DDS, PhD. Asymmetric maxillary expansion(AMEX) appliance for treatment of true unilateral posterior crossbite. Am J Orthod Dentofacial Orthop,2002:122:164-73.
25. Dzingle J, Mehta S, Chen PJ, Yadav S. Correction of Unilateral Posterior Crossbite with U-MARPE. Turk J Orthod,2020:33(3):192-196. Published 2020 Jul 20. doi:10.5152/TurkJOrthod.2020.20034.
26. Sollenius O, Golež A, Primožič J, Ovsenik M, Bondemark L, Petrén S. Three-dimensional evaluation of forced unilateral posterior crossbite correction in the mixed dentition: a randomized controlled trial. Eur J Orthod,2020:42(4):415-425. doi:10.1093/ejo/cjz054
27. Zhou N, Guo J. Efficiency of upper arch expansion with the Invisalign system. Angle Orthod,2020:90(1):23-30. doi:10.2319/022719-151.1
28. Mehta S, Patel D, Yadav S. Staging orthodontic aligners for complex orthodontic tooth movement. Turk J Orthod, 2021:34(3):202-206. DOI: 10.5152/TurkJOrthod.2021.20116
29. Wilmes B, Schwarze J, Vasudavan S, Drescher D. Maxillary Space Closure Using Aligners and Palatal Mini-Implants in Patients with Congenitally Missing Lateral Incisors. J Clin Orthod,2021:55(1):20-33.