ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun126

Management of Early and Late Orthodontic Correction of Unilateral Crossbite- A Narrative Review

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Publication Date: 2025/06/11

Abstract: Crossbites are among the most frequently encountered malocclusions during the primary and mixed dentition stages, affecting approximately 5–8% of children between the ages of 3 and 12. In over 90% of these cases, a lateral mandibular shift occurs upon closure, resulting from a transverse discrepancy between the upper and lower dental arches. This mandibular rotation leads to the appearance of a unilateral posterior crossbite, typically involving multiple teeth in the buccal segments when the teeth are in centric occlusion. The underlying transverse discrepancy may stem from various contributing factors, such as narrowed maxillary inter canine width due to non-nutritive sucking habits, mouth breathing or airway obstruction, localized dental interferences, atypical tooth eruption patterns, or trauma.

Given these risks, early correction of posterior crossbites is essential. Treatment should aim to guide developing teeth into more optimal functional positions and correct condylar asymmetry. Typically, this is achieved through maxillary expansion, which restores proper mandibular closure patterns and eliminates functional deviations. Performing these corrections during active growth phases facilitates favourable dentoskeletal changes, reduces long-term esthetic and functional complications, and simplifies treatment. Early intervention in primary or mixed dentition is generally less invasive, faster, and more physiologically manageable compared to treatments required at older ages.

Keywords: *Unilateral Crossbite, Maxillary Transverse Deficiency, Mandibular Shift, Skeletal Discrepancy, Occlusal Imbalance.*

How to Cite: Dr. Sharath Kumar Shetty; Dr. Mahesh Kumar. Y.; Dr. Sharanya. P. (2025). Management of Early and Late Orthodontic Correction of Unilateral Crossbite- A Narrative Review. *International Journal of Innovative Science and Research Technology*, 10(6), 116-123. https://doi.org/10.38124/ijisrt/25jun126.

I. INTRODUCTION

Crossbite is among the most common malocclusions seen during the primary and early mixed dentition stages, with a reported prevalence ranging from 8% to 22%. It is characterized by an abnormal buccal-lingual relationship between opposing molars, premolars, or both when the teeth are in centric occlusion.[1] The most typical form is unilateral, often accompanied by a functional mandibular shift toward the affected side. This condition is believed to persist from the primary to the permanent dentition and may influence jaw development over time. A unilateral posterior crossbite is generally caused by underdevelopment of the maxilla on both sides, which leads to the mandible shifting to one side during closure.[2] According to Leighton (1966), such crossbites can begin as early as 19 months of age and up to 5 years. As a result, early intervention is typically recommended to correct the occlusion and support normal occlusal development.[3]

II. ETIOLOGY

Crossbite can result from skeletal, muscular, or dental influences. Research suggests that its causes may be linked to genetic predispositions, birth-related anomalies, environmental influences, functional issues, or habits such as thumb sucking. A narrow upper jaw relative to the lower jaw may be shaped by inherited traits or external factors.[4]

When the width of the upper dental arch is inadequate, it often leads to a one-sided posterior crossbite, accompanied by a sideways shift of the lower jaw—also referred to as mandibular deviation.[5] These cases typically show a misalignment of the lower dental midline. If the upper jaw is significantly narrow, a crossbite may appear on both sides.

It's well documented that children with one-sided posterior crossbite often display irregular chewing behaviour on the affected side.[6] This includes a higher occurrence of a phenomenon called reverse sequencing, as described by Lewin (1985).

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In normal chewing, the lower jaw moves laterally toward the food before returning to the centre to complete the bite.

In reverse sequencing, the movement starts toward the centre and shifts outward during closure, ensuring proper tooth contact.[7] This abnormal pattern, controlled by central neural mechanisms, is limited to the side with the crossbite. As a result, a unilateral posterior crossbite is marked by both dental and functional imbalance.

➢ *The Causes of Cross Bite can be Grouped into the Following Categories:*

- **Local factors:** The most frequent cause is dental crowding, where one or more teeth are pushed out of alignment within the dental arch.
- **Skeletal factors:** Crossbites in the back teeth (buccal segments) may stem from an actual width discrepancy between the upper and lower jaws, or from a mismatch in the front-to-back (anteroposterior) positioning. This can cause a wider section of one arch to contact a narrower area of the opposing arch.
- **Soft tissue factors:** Habits such as thumb or pacifier sucking are commonly linked to posterior crossbite. These behaviours can lower the tongue's resting position and create negative pressure within the mouth, contributing to the development of the condition (Lewis, 2019).

III. CLASSIFICATION OF CROSSBITE: (PHALARIS AND NAIK, 2017)

A. According to their Location in the Arch

➢ *Anterior Crossbite*

- Single tooth crossbite
- Segmental crossbite

➢ *Posterior Crossbite*

- Single tooth crossbite
- Segmental crossbite.

Fig 1: Bilateral Posterior Crossbite (Phulari and Naik, 2017)

Fig 2: Unilateral Posterior Crossbite (Phulari and Naik, 2017).

- *Classification of Posterior Crossbite Based on its Presence on One Side or Both Side of the Arch Can be Classified into Following Two Types:*

✓ Unilateral posterior crossbite
✓ Bilateral posterior crossbite.

B. According to the Extent of Crossbite

- Simple posterior crossbite.
- Buccal non occlusion (scissor bite).
- Lingual non occlusion.

C. Classification of Crossbite based on Structure Involved

➢ *Crossbite can be Classified into Following Three Types based on Structure Involved:*

- Dental crossbite
- Skeletal crossbite
- Functional crossbite

✓ **Anterior crossbite** refers to an atypical front-to-back (labiolingual) positioning of one or more upper and lower front teeth. It is often described as a reverse overjet when, in the patient's normal bite (centric occlusion), one or more upper incisors are situated behind the lower incisors (Olsen, 1996).
✓ **Posterior crossbite** is characterized by a sideways shift of the lower jaw during closure, typically due to a mismatch in the transverse width between the upper and lower dental arches. This condition can affect one side (unilateral) or both sides (bilateral) and may appear as either a buccal or lingual crossbite.
✓ A complete unilateral posterior crossbite involving the buccal segments often indicates a mismatch in the transverse width between the upper and lower dental arches. This imbalance typically leads to muscular adaptations, causing the lower jaw to shift during closure in order to avoid bite interferences.[8] As a result, the lower dental midline often deviates toward the side with the crossbite, and several posterior teeth on that side are

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun126

involved when the teeth are in full contact (maximum intercuspation)

✓ Although the crossbite appears one-sided when the teeth are fully closed (centric occlusion), functional posterior crossbites usually involve bilateral cusp-to-cusp contact in the transverse dimension. These cases often feature a narrow upper arch that cannot properly overlap the lower teeth when the jaw is at rest or in centric relation (initial contact).[9] When the patient closes into full occlusion, the jaw shifts toward the crossbite side, confirming the functional nature of the condition.

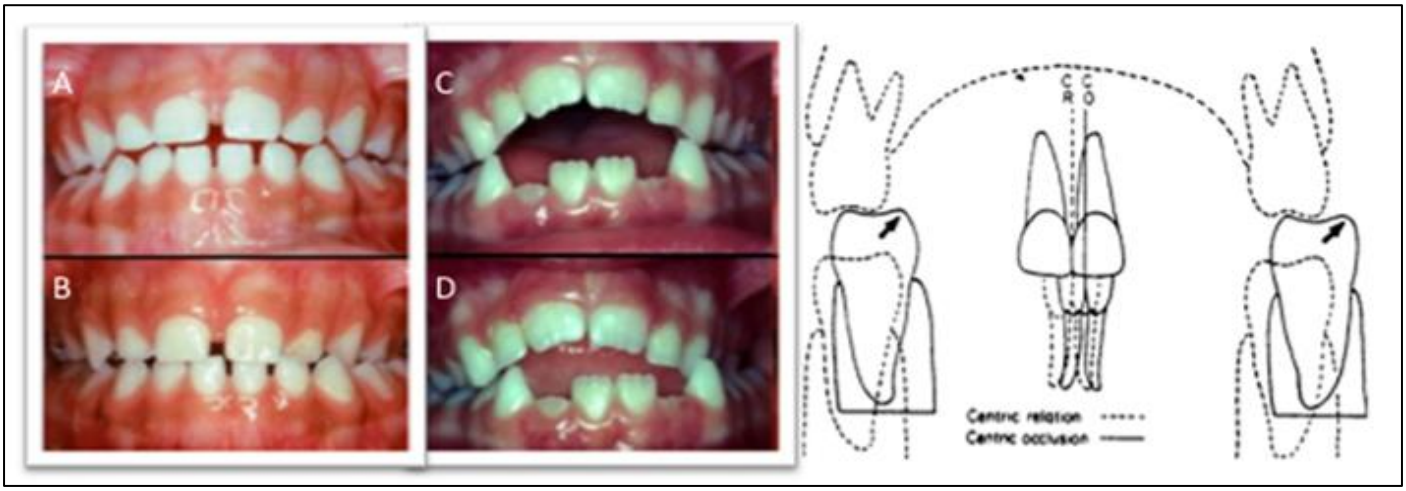

Fig 3: Lateral shift of the mandible from centric relation (first contact—top images) to centric occlusion (maximum intercuspation—bottom images) associated with functional posterior crossbite in two children at ages 4 years 9 months (A and B) and 7 years 1 month (C and D). The mandibular shift results in a lower midline asymmetry on the order of 2–3 mandible unilateral lingual crossbite of the entire buccal segment toward the side of the shift. Functional shifts of the mandible are noted in greater than 90% of unilateral posterior crossbite

IV. TREATMENT OF UNILATERAL CROSSBITES

A. *Primary Dentition (Ages 3–6)*

➢ *In the primary dentition stage, unilateral posterior crossbites with mandibular shifts are often treated with:*

- **Rapid Maxillary Expansion (RME):** Utilizing a palatal expander anchored on deciduous teeth to induce self-correction of anterior crossbites. This approach has shown to be effective and efficient without involvement of permanent teeth and with no compliance required.
- **Removable Appliances:** Simple removable appliances with expansion jackscrews can correct both anterior and posterior crossbites. These appliances are advantageous due to their ease of maintenance and oral hygiene care for young patients.

B. *Mixed Dentition (Ages 6–12)*

➢ *During the mixed dentition phase, treatment options include:*

- **Quad-Helix Appliance:** A fixed appliance that has shown superior success rates and shorter treatment times compared to expansion plates. It effectively corrects unilateral posterior crossbites in the mixed dentition.
- **Expansion Plate:** A removable appliance that can be used for crossbite correction. However, its success rate is lower compared to the quad-helix appliance, with one-third of cases being unsuccessful.
- **Composite Onlay:** This method has been found ineffective for crossbite correction in the mixed dentition.

C. *Late Mixed to Early Permanent Dentition (Ages 12–16)*

➢ *In this age group, treatment options become more limited:-*

- **Fixed Appliances:** Traditional fixed orthodontic appliances can be used to correct crossbites. However, the success of treatment may be compromised due to the fusion of the mid-palatal suture, requiring greater forces for expansion.
- **Functional Appliances:** Devices like the Function Generating Bite (FGB) appliance can be used to address masticatory dysfunction and improve the transverse dimension of dental arches.

D. *Treatment of Maxillary Deficiencies*

The treatment of maxillary deficiencies can be classified into.

➢ *Nonsurgical Treatment:*

- Rapid maxillary expander.
- Slow maxillary expander.

E. *Rapid Maxillary Expander (RME)*

Rapid maxillary expansion (RME) appliances are considered the most effective tools for orthopaedic widening of the upper jaw because they primarily bring about changes in the skeletal framework rather than merely shifting teeth through the surrounding bone. This technique works by

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun126

separating the mid-palatal suture and also influences the circum-zygomatic and circum-maxillary sutural systems. RME is also referred to as palatal expansion or split palate.

As a skeletal expansion method, RME achieves its effect by widening the mid-palatal suture.[10] While the primary aim of RME is to address a narrow upper dental arch, its influence extends beyond the maxilla—it impacts up to 10 bones in the craniofacial region.

Patients who have lateral discrepancies that result in either unilateral or bilateral posterior crossbites involving several teeth are candidates for RME. The constriction may be skeletal (narrow maxillary base or wide mandible), dental, or a combination of both skeletal and dental constriction.

V. TYPES OF THE RME APPLIANCES

A. Removable Appliances
B. Fixed Appliances

- Tooth borne
- Tooth and tissue borne

Removable Rapid Maxillary Expansion Appliances Removable appliances produce skeletal expansion by the splitting of mid palatal suture, when they are used in the deciduous or early mixed dentition the reliability of these appliances in producing skeletal expansion is highly questionable when used in older adults.

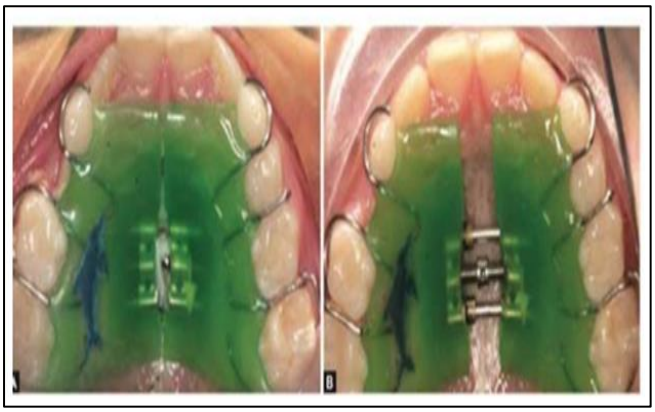

Fig 4: Removable Appliances

B. Haas-Type Expander:

Removable rapid maxillary expansion appliances, consisting of an expansion screw in the midline with split acrylic plate, Adam's clasp one the first molar and labial bow on the anterior teeth.

VI. FIXED RAPID MAXILLARY EXPANSION APPLIANCES

Most used Fixed Expander of **Tooth and Tissue Borne Appliances** are:

A. Derichsweiler-Type Expander

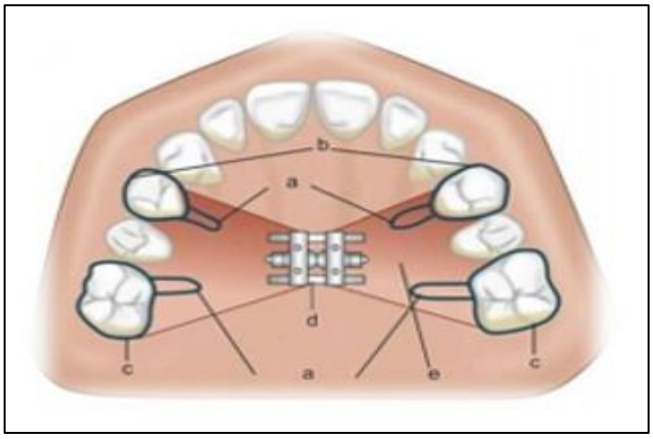

Fig 5: Derichsweiler-Type Expander

This expansion appliance consists of molar bands on right and left permanent first molars and first premolars with wire tags soldered into the palatal surface. Jack screw is connected to the bands by means of tags that are welded and embedded in acrylic.

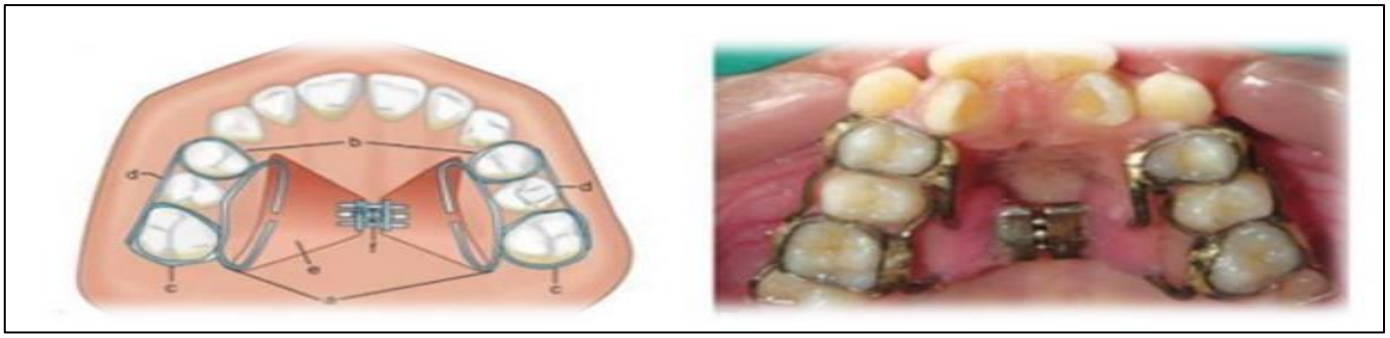

Fig 6: Haas-Type Expander

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun126

This appliance is a rigid appliance which not only transmits forces on to the teeth but also on to the palatal shelves directly. Heavy stainless-steel wire (0.045inch/1.15mm) is welded and soldered along the palatal aspects of the band. The free ends are turned back to be embedded in acrylic plate which contains an expansion screw in the midline.

C. Tooth Borne Appliances Are:

- *Hyrax-Type Expander*

Fig 7: Hyrax-Type Expander

This tooth-borne appliance uses HYRAX screw, named after ability to keep clean. Screw has heavy wire extensions, which can be adapted to follow contour of the palate and are soldered to either metal bands or cast cap splints or a wire framework that has acrylic splints or is embedded in acrylic splints.

- *Isaacson Expansion Appliance*

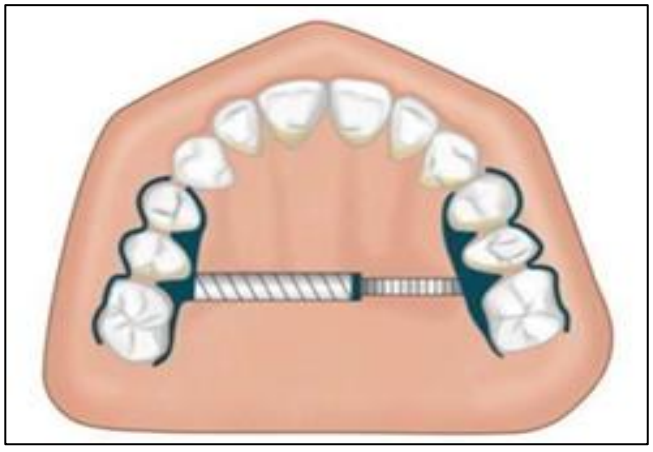

Fig 8: Isaacson Expansion Appliance

This type uses Minne-Expander which is a special spring-loaded screw. It is adapted and soldered directly to the molar and premolar bands with a closing nut which tends to compress the spring and activates the expander. Acrylic plates are not used in this.

VII. BONDED RAPID MAXILLARY EXPANDER

This type of expander features an acrylic splint that covers several teeth on each side of the upper arch, with a central jack screw attached to it. The splint may be fabricated from either a silver-copper alloy cast cap or acrylic made from polymethyl methacrylate. Additionally, a wire framework can be placed around the teeth to provide extra support to the acrylic.

Fig 9: Bonded Rapid Maxillary Expander

Thick gauge stainless steel wire is closely adapted around the posterior teeth from premolars to molars both buccally and palatally. The screw is soldered to the wire. Acrylic is covered over the occlusal, buccal and palatal occlusal third of all the posterior teeth

A. Expansion Screw

A typical expansion screw consists of an oblong body divided into two halves. Each half has a threaded inner side that receives one end of a double-ended screw. The screw has a central bossing with four holes. These holes receive a key called expansion screw key, which is used to turn the screw.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun126

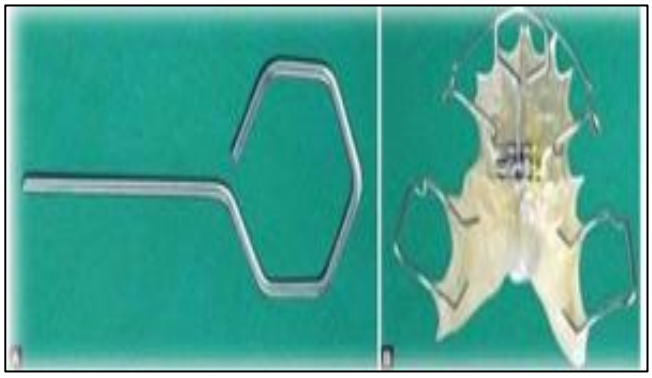

Fig 10: Expansion Screw

Removable orthodontic appliance with a special key used to activate the expansion screw to widen the device sideways. Used for treating growing children with narrow dental arches

B. Slow Palatal Expansion (SPE)

➢ *Indications for Slow Maxillary Expansion (SME):*

- Correction of crossbites—either on one side (unilateral) or both sides (bilateral)
- Minor space creation to alleviate mild crowding
- Treatment of dental crossbite in the permanent dentition
- Managing mild upper jaw deficiency in patients with cleft lip and palate by applying steady, gentle pressure (Naidu and Suresh, 2019)

B. Quad Helix

➢ *Contraindications:*

- Not recommended for adults who have completed their growth phase (Naidu and Suresh, 2019)

VIII. APPLIANCES USED TO PRODUCE SLOW MAXILLARY EXPANSION

A. Coffin Spring

Fig 11: Coffin Spring

A coffin spring provides useful alternative to a screw for expansion This heavy spring is constructed in 1.25mm wire and activated by pulling the two halves of the appliance apart manually or flattening the spring with pliers. Coffin spring deliver high forces that will tend to displace the appliance.

Fig 12: Quad Helix with Band on First Permanent Molars given in Unilateral Cleft Lip and Palate

C. Surgical Treatment

As individuals age, the influence of dental forces on the maxillary bone decreases, making surgical methods for expansion more appropriate in certain cases.

➢ ***Surgically Assisted Expansion*** *is Recommended under the Following Conditions:*

- When there is a need to increase the width of the maxillary arch
- For correcting posterior crossbites that require significant expansion (greater than 7 mm), in order to reduce the likelihood of needing more complex segmental osteotomies
- To expand the arch in patients with collapsed maxilla due to cleft palate, particularly when the gingival tissue is extremely thin or fragile, there is notable gum recession in the canine–premolar region, or when nasal airway narrowing (nasal stenosis) is present.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun126

IX. COMMON SURGICAL TECHNIQUES INCLUDE

A. Surgically Assisted Rapid Palatal Expansion (SARPE)
B. Distraction Osteogenesis

A. Surgically Assisted Rapid Palatal Expansion (SARPE)

In adult patients with a transverse maxillary deficiency, **SARPE** is a suitable method for expanding the upper jaw. This technique combines orthodontic expansion with a surgical modification of the Le Fort I osteotomy. The procedure involves making an incision along the lateral aspect of the maxilla, similar to the traditional Le Fort I approach. An additional vertical incision is made at the anterior nasal spine, just above the roots of the central incisors, to allow separation of the mid palatal suture. Once the expansion appliance is activated, the upper jaw gradually widens.[11] After achieving the desired expansion, the appliance is kept in place for approximately three months during the retention phase to stabilize the results.

Fig 13: Surgically Assisted Rapid Palatal Expansion (SARPE)

A central diastema developed and expansion was complete two weeks after surgery. The Hyrax screw was then blocked for retention. Four weeks after surgery the first maxillary arch wire 14 NiTi was placed to begin the alignment and levelling phase. The active closure of the central diastema started at about ten weeks post-surgery once enough bone had started to form for the incisors to move into. Because of the typical mushroom shape of the customized lingual appliances, the arch wire has to be swivelled using tandem mechanics in front of the canines until the spaces are closed

B. Distraction Osteogenesis

➢ *Advantages:*

- Allows for greater skeletal expansion without overstretching the soft tissues
- Avoids the need for bone grafts and eliminates the complications of additional surgical sites
- Reduces the risk of trauma to the temporomandibular joint (TMJ)
- Lowers the likelihood of nerve damage and sensory loss

➢ *Disadvantages:*

- The procedure requires high technical precision
- Involves two separate surgeries—one to place the device and another for removal
- Suitable only for correcting skeletal deficiencies, not for managing excessive jaw growth
- Cannot be applied in cases involving overdevelopment of the jawbones.

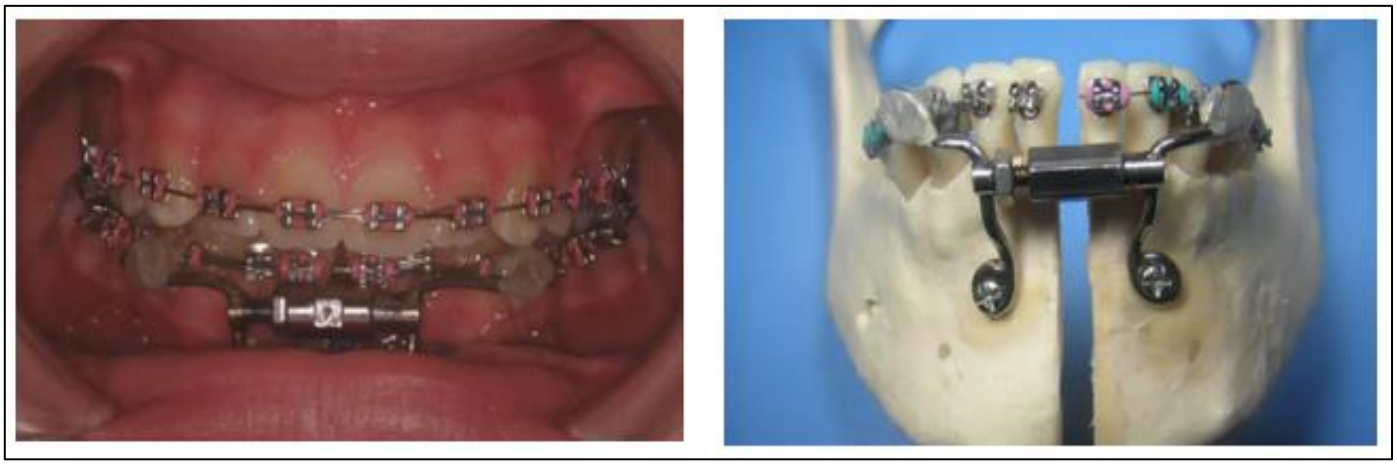

Fig 14: Mandibular Widening by Distraction Osteogenesis A Stable Non-Extraction Technique

X. SUMMARY

Unilateral posterior crossbite is a common malocclusion seen in children, particularly during the primary and mixed dentition stages, with a prevalence between 5% and 22%. It is often characterized by a transverse discrepancy between the maxillary and mandibular arches, leading to a lateral mandibular shift upon closure. This results in asymmetric occlusion and muscular adaptation that can persist into permanent dentition if left untreated.

Key etiological factors include skeletal discrepancies, dental crowding, functional deviations, and habits like thumb sucking or mouth breathing. Early diagnosis and correction—often via maxillary expansion—are critical to restore normal occlusion, guide jaw development, and prevent long-term functional and aesthetic issues. Treatment is most effective

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25jun126

when performed during active growth phases using appliances such as quad-helix, RME, or removable expanders.

REFERENCES

[1]. Harrison, J.E. (2017). Early Management of Posterior Crossbites. In: Cobourne, M. (eds) Orthodontic Management of the Developing Dentition. Springer, Cham. https://doi.org/10.1007/978-3-319-54637-7_11.

[2]. Steven D. Marshall, Karin A. Southard, Thomas E. Southard, Early Transverse Treatment, Seminars in Orthodontics, Volume 11, Issue 3, 2005, Pages 130-139, ISSN 1073-8746.

[3]. Ronald A. Bell, Thomas J. Kiebach, Posterior crossbites in children: Developmental-based diagnosis and implications to normative growth patterns, Seminars in Orthodontics, Volume 20, Issue 2, 2014, Pages 77-113, ISSN 1073-8746.

[4]. Ugolini, A., Doldo, T., Ghislanzoni, L.T.H. et al. Rapid palatal expansion effects on mandibular transverse dimensions in unilateral posterior crossbite patients: a three-dimensional digital imaging study. Prog Orthod. 17, 1 (2016). https://doi.org/10.1186/s40510-015-0114-9.

[5]. Hassan, A.H., AlGhamdi, A.T., Al-Fraidi, A.A. et al. Unilateral cross bite treated by corticotomy-assisted expansion: two case reports. Head Face Med 6, 6 (2010).

[6]. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 12, Issue 4 (Nov.- Dec. 2013), PP 47-50.

[7]. David Allen, Joe Rebellato, Rose Sheats, Ana M Ceron The Angle Orthodontist 73 (5), 515-524, 2003.

[8]. Caroccia, F.; Moscagiuri, F.; Falconio, L.; Festa, F.; D'Attilio, M. Early Orthodontic Treatments of Unilateral Posterior Crossbite: A Systematic Review. J. Clin. Med. 2021, 10, 33.

[9]. Alsawaf, D.H., Almaasarani, S.G., Hajeer, M.Y. et al. The effectiveness of the early orthodontic correction of functional unilateral posterior crossbite in the mixed dentition period: a systematic review and meta-analysis. Prog Orthod. 23, 5 (2022). https://doi.org/10.1186/s40510-022-00398-4.

[10]. Ilana Brin, Yocheved Ben-Bassat, Yoel Blustein, Jacob Ehrlich, Nira Hochman, Yitzhak Marmary, Avinoam Yaffe, Skeletal and functional effects of treatment for unilateral posterior crossbite, American Journal of Orthodontics and Dentofacial Orthopedics, Volume 109, Issue 2, 1996, Pages 173-179, ISSN 0889-5406.

[11]. Aslihan Ertan , Elif Erbay, A comparison of different treatment techniques for posterior crossbite in the mixed dentition, American Journal of Orthodontics and Dentofacial Orthopedics, Volume 116, Issue 3, 1999, Pages 287-300, ISSN 0889-5406.