

A REVIEW ON DIFFERENT METHODS FOR MANDIBULAR EXPANSION

¹*Dr. Saptarshi Roy, ²Dr. Kuldeep D'mello, ³Dr. Atul Singh, ⁴Dr. Nibedita Biswas and
⁵Dr. Sachin Kumar Mishra

^{1,5}Ind Year PG Student, Department of Orthodontics and Dentofacial Orthopaedics, KD Dental College, Mathura.

²Professor and Head of the Department, Department of Orthodontics and Dentofacial Orthopaedics, KD Dental College, Mathura.

³Reader, Department of Orthodontics and Dentofacial Orthopaedics, KD Dental College, Mathura.

⁴IIIrd Year PG Student, Department of Orthodontics and Dentofacial Orthopaedics, KD Dental College, Mathura.

*Corresponding Author: Dr. Saptarshi Roy,

Ind Year PG Student, Department of Orthodontics and Dentofacial Orthopaedics, KD Dental College, Mathura.

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ABSTRACT

Mandibular Expansion is a very challenging task in the Orthodontic treatment procedure due to the very increased chance of relapse. But so many authors have done this very efficiently and got good results. **Clinical Relevance-** This review article will help clinicians to compare different methods of Mandibular Expansion methods.

KEYWORDS: Mandibular Expansion, Orthodontic treatment.

INTRODUCTION

The controversy that is still continuing from the era of Sir Edward Angle is, Orthodontic Treatment by Extraction or Non Extraction. The heated Extraction and Non extraction argument originated because Mandible has no suture. Rapid maxillary expansion can increase the transverse dimensions of the maxillary arch by Separating the Mid palatal Suture; But In mandible this expansion effect is only limited to the alveolar bone and primarily causes changes in tooth inclination. These effects are thought to be the one of the reason for relapse.

A study by Gardner and Chaconas^[3] Sheds some light on the stability of position of Cuspids, Premolars and molars after Non extraction treatment. They noted the following in non extraction cases: 1) Molar width increased an average of 2.04mm during treatment and showed little relapse (2.9%). 2) Second premolars showed 1.8 mm mean expansion and 31.5% relapse. 3) First premolars averaged 2.86 mm mean expansion and 13.6% relapse 4) Cuspids showed an average of 1.23 mm expansion and 58.5% relapse.

These results make it clear that Molars are expandable on the order of 2 mm with little relapse, while cuspids showed almost 60% relapse when expanded slightly over 1 mm. However considerable variation in stability was noted from patient to patient. The stability of intermolar width is contradiction to McCauley^[6], Litowitz^[5], Dona^[1] and Welch.^[15] However, Walter^[14] concluded that mandibular arch width could be permanently increased. He found that, in nonextraction cases, 72% maintained an average increase of 1.8 mm Intermolar width.

Cuspid relapse showed an average of 58% by Gardner, which is comparable with the conclusions of Riedel^[10] that these teeth cannot be permanently expanded. However Riedel later reported the potential of cuspids being expanded in Class II div 2 facial patterns. Strang^[13] stated that the intercanine width of mandible is an infallible guide to the individual and dictates the limit of denture expansion in this area. Dona^[1] has also concluded that intercanine widths have a tendency to remain the same or return to the original dimentions, as have Welch and Arnold. But Walter again on the expansion side, found that 62% of the non extraction cases maintained an average increase of 2 mm of intercanine width. Steadman found intercanine width increases and decreases and could not reach a conclusion.

First premolars shows ineterstingly a stability after being expanded. Litowitz^[5] reported that expansion between the first premolars demonstated the least relapse tendencies and in fact, usually showed a width gain.

In Summation

- The greatest risk in expansion lies in the intercuspil width. However, in some cases it can be expanded.
- First premolar expansion poses for stable change up to greatest potential.
- First Molar might be expanded to a limited extent.
- Some cases relapse and some do not.

Methods of expansion

1. Removable mandibular Schwarz expansion appliance (REM-Sz)^[8]

Paul W. O'Grady et al compared the long-term effects of 2 treatments with 2 phases (RME-only and RME-Sz followed by comprehensive orthodontic treatment) with a well-matched untreated group. The first part of the treatment for the 23 patients in the RME-Sz group was the full-time wearing of a removable mandibular Schwarz appliance which is a horseshoe-shaped acrylic appliance that fits along the lingual border of the mandibular dentition, extending to the distal aspect of the permanent first molars. The inferior border of the acrylic was below the gingival margin and contacted the gingival tissues. The Schwarz appliance typically was used in patients who had mandibular incisor crowding or lingually inclined mandibular posterior teeth. Thus, the midline expansion screw was activated one-quarter turn per week (0.2 mm); this resulted in about 1 mm of expansion per month. The Schwarz expander typically was activated for about 5 months, until the desired amount of expansion was achieved. The Schwarz appliance was used to upright the posterior segments (i.e. dental decompensation), thereby providing a reference as to how far the clinicians could expand the maxillary arch. Then a maxillary acrylic splint expander was bonded to widen the maxilla (8-10 mm of expansion), with the same protocol described previously for the RME-only group. At that point, the Schwarz appliance continued to be worn full-time as a passive retainer until the maxillary expander was removed.

This Addition of a mandibular Schwarz appliance to RME treatment induced significant increments in both maxillary (4.3 mm for intermolar width) and mandibular (3.1 mm for intermolar width) arch widths when compared with the control or untreated group. The increases in both maxillary and mandibular arch perimeters (2.7 and 2.8 mm, respectively) were significant as well. The RME-Sz group also showed significant uprighting of the mandibular first molars (11.0°) when compared with the control group. The comparison between the RME-Sz and RME-only groups showed that increases in mandibular arch widths were significantly greater in the former group.

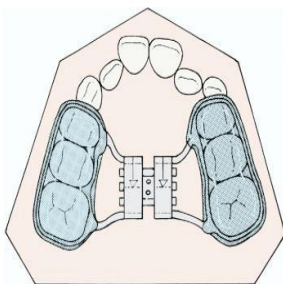


Fig 1. Acrylic splint rapid maxillary expander.

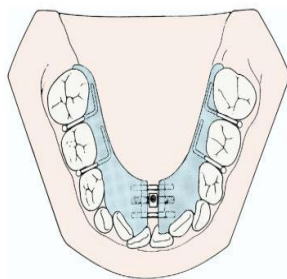
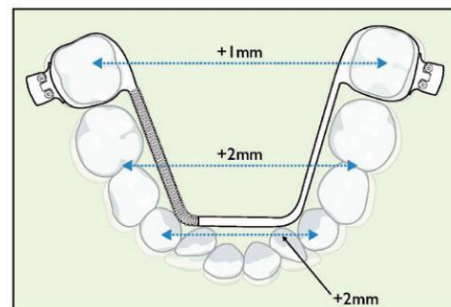


Fig 2. Removable mandibular Schwarz appliance.

2. Mandibular Arnold expander^[7]

The Arnold appliance is a fixed, coil-spring device that was popularized by Berkowitz in the 1970s as a way to produce slow, orthopaedic maxillary expansion in cleft-palate patients. In the mandibular arch, the Arnold appliance can open 4-5mm of space by causing tipping of the buccal teeth and distalization of the first molars. The device has a split lingual frame—an .040" tube on one side and a wire inserted on the other—connected by an .010" × .040" Elgiloy or nickel titanium open-coil spring. Seating the appliance compresses the spring and activates it for expansion. Because there is no need to turn an expansion key or make any further adjustments, the Arnold appliance is ideal for anxious patients. The distal arms of the expander are normally soldered to bands on the mandibular first permanent molars. If these teeth have not fully erupted, the appliance can be fitted to the second deciduous molars; in that case, the laboratory technician should be instructed to add lingual extension arms to the first permanent molars, allowing simultaneous expansion of the posterior teeth.



Before inserting the Arnold expander, an orthodontic elastic is to be wrapped around the lingual frame to compress the coil spring and keep the two sections of the appliance together. Holding the molar band with the fingers, bend the frame slightly downward with a Weingart pincer to help prevent it from rising above the occlusal surface during expansion (Fig A). The appliance

will be seated with the elastic still tightly wrapped around the lingual frame (Fig. B), then the elastic will be removed with a pin-and-ligature cutter. The Arnold expander should be activated for nine to 12 months, depending on the severity of crowding. Most patients will also need a rapid maxillary expander (RME) in the upper arch; the Arnold appliance establishes a "reference" mandibular arch width to guide the maxillary expansion. Since the RME may need to be reactivated for arch coordination, Arnold did not remove the expander or seal the expansion screw until satisfactory mandibular expansion has been achieved.

3. Transverse transforce appliance^[4]

Transverse transforce appliance comes in 2 sizes for upper arch (size 1-29mm and size 2- 32mm) and in 2 sizes for lower arch (size 1- 26mm and size 2-28mm). Each expander contains nickel titanium springs generating approximately 200 grams of force. Dr. Jagat Sharda et al described it in their patient, where size 1 transverse transforce for 6 months was given. After 4½ months of delivering this appliance, approximately 7mm expansion in inter canine width was achieved. The appliance was left for 1½ months for retention, after this fixed functional appliance was given.

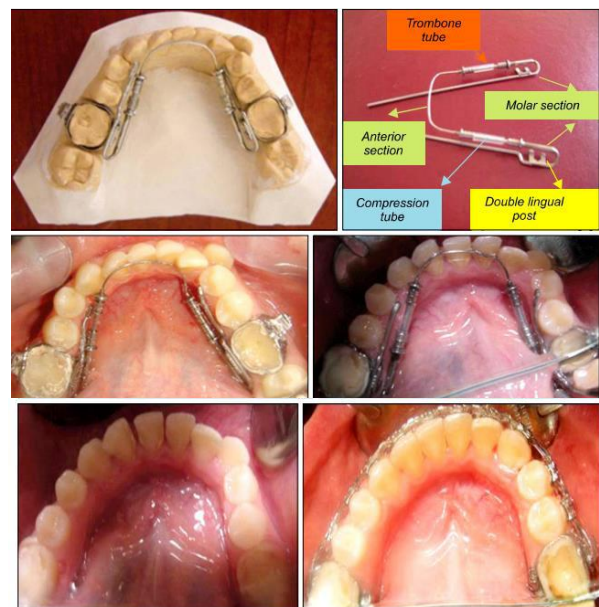


Advantages of transforce appliance are, a) it produces 200gm of gentle biocompatible force, b) it can treat all classes of malocclusion, c) its force module provides gentle biocompatible force, d) no lab work is required, e) no activation is required after the appliance is fitted, and this principle is extended to a series of appliances for sagittal and transverse arch development, f) both sagittal and transverse appliances have additional components to achieve 3-way expansion where this is indicated, and g) the invisible lingual appliances may be used in correction of all classes of malocclusion at any stage of development, from mixed dentition through permanent dentition, and this approach has wide indications in adult treatment.

4. Trombone appliance^[2]

The trombone appliance was designed specifically to assist antero-posterior arch development in the maxilla and mandible. Since the trombone appliance does not interfere with speech and is integrated with conventional fixed appliances, it has excellent potential for adult treatment. The design is based on the slide principle, with an inner tube sliding freely within an outer tube to

extend or contract the length of the appliance in a mechanism similar to that of the slide trombone, from which the appliance derived its name. The molar section of the appliance is retained with double lingual posts and includes a vertical tube attachment for insertion of the trombone section of the appliance. The appliance is preactivated to achieve the initial amount of expansion required. The mechanism is reactivated every 4 - 6 weeks by replacing the silicone tubing with a new tube of an appropriately increased length until the arch form is corrected. The distal portion of wire is recurved and retained in a horizontal sheath on the molar band that extends mesially at the gingival level to engage the anterior segment of the lingual arch. The absence of frictional forces allows rapid tooth movement using gentle, controlled lingual forces.



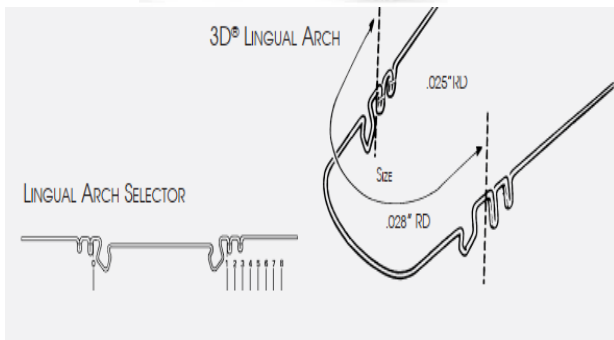
The appliance was positioned along the lingual outline of the mandibular incisors, inserted into the molar tubes, and fitted into the horizontal lingual sheaths in the molar bands. After 4 weeks, the trombone appliance was activated by 1 mm per side. Subsequent bilateral activation was achieved by replacing the silicon compression tubing with tubing that was 1 mm longer, once every 4 weeks to provide 1-mm activation per month until the desired amount of space was achieved.

The mandibular intercanine width was increased by 1.2 mm, the mandibular intermolar width by 3.9 mm, and the arch depth by 3 mm; the total increase in the mandibular arch perimeter was 7.4 mm.

5. Wilson's 3D Lingual Arch^[16]

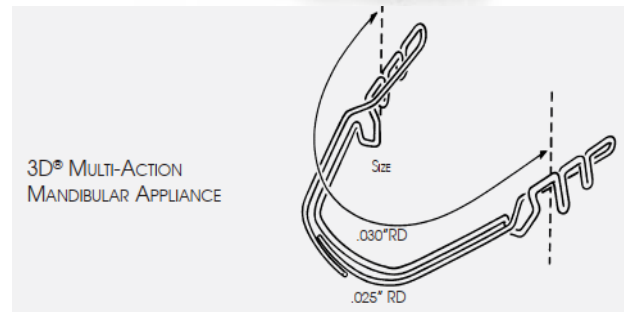
3D Lingual Arch Easy Vertical insertion (plug-in/plug-out), with a friction lock produces maximum anchorage and permits multiple auxiliary functions not possible with horizontal insertion. Twin vertical posts for positive molar control, torque and rotations that are geometrically predictable. The diamond loop design of the 3D

Activator has dynamic three-dimensional force mechanics and multidirectional movement possibilities with predictable forces. It has a lingual offset to avoid mucosa compression. There are five angles in the Activator that can be adjusted slightly to give geometrically predictable force vectors. Force is dissipated 100%, resulting in a rapid controlled movement. The resilience of the Activator produces the force. Measurement is from mesial post to mesial post.



3D Multi-action Mandibular Appliance

Designed to effectively expand the lower arch, it is used as an alternative to sagittal and expansion appliances. Designed to be fixed/removable and is interchangeable for each plug-in into the 3D Lingual Tubes. It is easily adjusted, with flexible .025" extenders providing many treatment movements and functions.



Insertion of the 3D Lingual arch immediately after the extraction of the second premolars. Holding arch with anterior bite plane in the upper arch.^[17]



One month later: a) occlusal picture shows the correction of lingually tipped molars; (b) left lateral view showing the correction of scissor bite on left side.^[17]

CONCLUSION

However Mandibular expansion is very hard to achieve but various authors got such good post treatment results by the above mentioned appliances. So the Mandibular expansion depends, and varies case to case. Somewhere there is no relapse and somewhere there is relapse.

REFERENCES

1. Dona, A. An analysis of Dental Casts of Patients made before and after orthodontic treatment, Masters Thesis, University of Washington, 1952.
2. Fidan Alakus Sabuncuoglu et al. Expansion of the mandibular arch using a trombone appliance.. Korean J Orthod, 2011; 41: 3.

3. Gardner, S. D. and Chaconas, S. J. Posttreatment and Postretention changes following orthodontic therapy. *Angle Orthod* 1976; 46(2): 151-131.
4. Jagat Sharda, Gaurav Sharma, Promod Shetty, Archana Sharda. Mandibular Arch Expansion- A New Treatment Approach by Transverse Transforce: A Case Report. *International Journal Of Dental Clinics*, 2011; 3(1).
5. Litowitz, R. A study of the measurements of certain teeth during and following Orthodontic treatment. *Angle Orthod*, 1948; 18: 113-131.
6. McCauley, D. R. The Cuspid and its function in retention. *Am. J. Orthod*, 1944; 30: 196-205.
7. Neal D. Kravitz, DMD, MS. Treatment with the Mandibular Arnold Expander. *J of Clin Orthod*, 2014; 11: 689-696.
8. Paul W. O'Grady, a James A. McNamara, Jr. A long-term evaluation of the mandibular Schwarz appliance and the acrylic splint expander in early mixed dentition patients. *American Journal of Orthodontics and Dentofacial Orthopedics*, 2006; 130(2).
9. Ricketts, R. A. et al. An overview of computerised cephalometrics. *Am. J. Orthod*. 1972; 61-1: 1-28.
10. Riedel, R. A. A review of the retention problem. *Angle Orthod*, 1960; 30: 179-194.
11. Steadman, S. R. Changes in intermolar and intercuspid distance following Orthodontic treatment. *Angle Orthod*, 1961; 31: 207-215.
12. Schulhof, R.J.; Lestrel, P.E.; Walters, R.; and Schuler, R. The mandibular dental arch, Part 3: Buccal expansion. *Angle Orthod*, 1978; 48: 303-310.
13. Strang, R.H.W. The fallacy of denture expansion as a treatment procedure. *Angle Orthod*, 1949; 19: 12-22.
14. Walter, D. C. Changes in the face and dimensions of Dental arches resulting from Orthodontic treatment. *Angle Orthod*, 1962; 32: 232.
15. Welch, K. N. A study of treatment and postretention dimensional changes in mandibular dental arches resulting from Orthodontic treatment. *Angle Orthod*, 1953; 23: 3.
16. Wilson 3D, rocky mountain orthodontics
17. Sunil Sunny et al. Three-Dimensional Control on Lingually Rolled in Molars using a 3D Lingual Arch. *Journal of Clinical and Diagnostic Research*, 2017; Vol-11(8): ZR01-ZR03.