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NITI PALATAL EXPANDER – COMPREHENSIVE REVIEW

Orthodontology

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ABSTRACT

Transverse expansion of the maxilla has been used by orthodontists for many years to correct maxillary arch discrepancy. Rapid mechanical maxillary expansion procedures as presently employed, utilize large loads designed to produce a maximal skeletal effect,but most of the case it is unstable. Correction of transverse discrepancy usually requires combination of both orthopaedic and orthodontic effect in order to correct crossbite. Tandem-loop nickel titanium NiTi, temperature-activated palatal expander with the ability to produce light, continuous pressure on the midpalatal suture and it helps in achieve both skeletal and dental effect on maxillary arch.

KEYWORDS

Crossbite, Niti Expander, Expansion.

INTRODUCTION

One of the most common transverse plane malocclusions in the posterior area of the dental arch is the 'crossbite'. Correction of a transverse discrepancy usually requires expansion of the palate by a combination of both orthopaedic and orthodontic tooth movements.

The amount of orthopaedic versus orthodontic change depends greatly on the patient's age. Initially, transverse forces will tip the buccal segments laterally[1] .With advent of proper appliance design, 3rd-order moments will induce bodily translation[2-5] If the force is strong enough, separation occurs at the maxillary suture.

Conventional rapid palatal expansion (RPE) causes large forces at the sutural site over a short period of time. These heavy forces cause maximum skeletal effect and this traumatic separation in the sutural area cause patient discomfort, whereas the slow expansion appliances allows for more physiologic adjustment to sutural separation.

Slow expansion appliance like NiTi palatal expander which was introduced by arndt[6] and it produces stability and less relapse potential[7]. Tandem-loop nickel titanium (NiTi), temperature-activated palatal expander with the ability to produce light, continuous pressure on the midpalatal suture and simultaneously it causes uprighting, rotating and distalizing the maxillary first molars.

This review discusses about appliance size selection, clinical techniques, advantages, disadvantage, indication, contraindication of niti palatal expander.

RATIONALE OF SLOW EXPANSION

Increases in arch width obtained through slow palatal expansion procedures results in orthodontic response rather than orthopaedic effect. It produces forces in the range of 450-900g, which may be insufficient to split a progressively maturing suture[8].

Cotton, L.A studied sutural opening in slow expansion for animals in 1978. He have demonstrated orthopedic effects in contrast to rapid palatal expansion.[9] Histologic findings suggest that sutural separation does occur, but that maintains the integrity of the maxillary sutures by allowing for bone remodeling.

Many clinical studies of human patients in the deciduous or early mixed dentition have been done[10,11,12] It substantiate these findings such as maxillary arch-width increases which ranged from 3.8mm to 8.7mm with slow expansion of as much as 1mm per week by using the force of 900g [13]. Slow expansion has been found to promote greater post-expansion stability, given an adequate retention period.

In addition to these biological benefits, slow expansion techniques offers a number of clinical advantages. An ideal slow expansion appliance requires minimal adjustment throughout its use, but it permits easy adjustment when necessary. It delivers a constant physiologic force until the required expansion is obtained.

The appliance is light and comfortable enough to be kept in place for sufficient retention of the expansion. Prefabrication of the appliance eliminates extra appointments for impressions , time and expense of laboratory fabrication.

NICKEL TITANIUM PALATAL EXPANDER

The nickel titanium expander generates optimal, constant expansion forces . Its central component is fabricated from a thermally activated nickel titanium alloy. The rest of the component is made up of stainless steel which includes anterior arm.

The NiTi expander has a transition temperature of 94 F. At temperature below the transition temperature the interatomic forces are weaker, making the metal much more flexible. when the transition temperature is more the interatomic forces bind the atoms tighter and the metal tends to stiffens. When it is chilled before insertion, it becomes flexible and can be easily bent to facilitate placement.

As the mouth begins to warm the appliance, the metal stiffens, the shape memory is restored, and the expander begins to exert a light continuous force on the teeth and over the midpalatal suture area. This expander generate forces of 180-300 g. This appliance requires little patient cooperation and laboratory work.

A 3mm increment of expansion exerts only about 350g of force and the nickel titanium alloy provides relatively uniform force levels as the expander deactivates. The expander is available in sizes from 26mm to 44mm. In most cases, the simplest way to determine the appropriate size is to measure the mandibular intermolar width at the central fossae. Since the mesiolingual cusps of the maxillary molars should occlude in these fossae, expansion to the mandibular intermolar width will provide optimal occlusion .

If the mandibular molars are lingually inclined as a dental compensation for a skeletal posterior crossbite, as often occurs, it is appropriate to add another 1-2mm to the expansion requirement. In any case, 2-3mm should be added for overexpansion. If more than 8mm of expansion is needed, two expanders must be used in succession.

If the molars are rotated, the anterior arms of the expander may not initially contact the buccal segments. It is usually not necessary to adjust these arms until some derotation has occurred.

The rate of expansion will depend on the age of the patient. Patients in the primaryor early mixed dentition can be expanded in one to two months, depending on the severity of the case. Expansion in adolescents can take as long as three months, and even longer expansion and retention times should be expected in adults. The retention period should be 50-100% of the expansion time.

CLINICAL TECHNIQUE

1. Alginate impressions of the maxillary and mandibular dental arches were taken for fabrication of study models.
2. Maxillary occlusal radiographs and intraoral radiographs of the maxillary arch were taken prior to insertion of the appliance.
3. The periodontal status of the teeth were clinically examined and evaluated and rectified if the need arose.
4. The distance from the maxillary 1st left molar palatal surface to the right 1st molar surface (SITES of lingual sheaths) was measured. In accordance with the specification of the manufacturer, 4 mm was added to the measured inter molar distance to choose the appropriate nitanium palatal expander.
5. Adjust the anterior arms of the expander as needed.
6. Wrap the central component with moist gauze and place the expander in the freezer.
7. Determine the appropriate band sizes, and fit bands with lingual sheaths.
8. Cement the bands with a dual- or light-cured cement.
9. Remove the expander from the freezer, and with the gauze still in place, inserts into the molar sheaths.
10. Remove the gauze from the expander An alternative method involves assembly of the expander and bands extraorally and cementation as one unit. This procedure is preferable where unable to access palatal region and difficult in insertion. The drawback of this method is that it requires rapid band placement and cementation as the expander warms to oral temperature.

FOLLOWING METHODS CAN BE FOLLOWED IF ICE SPRAY IS NOT AVAILABLE

1. Keep the blue ice pack in freezer and remove it when needed. Place nickel titanium palatal expander (NPE) on frozen pack for 3-5 min before insertion.
2. Place the Niti palatal expander in freezer prior to application for 3-5 min.
3. A refrigerant spray such as ethyl chloride or tetrafluoroethane can be used immediately prior to insertion to chill the expander, thereby increasing the working time.

Once band was seated and cotton rolls were placed on the teeth asking the patient to bite for the setting of the cement. Care was taken to make sure that the bands were completely seated before the excess cement was wiped off.

Oral hygiene instructions were given The patient was asked to report once in 15 days for review to make sure the appliance is seated properly and oral hygiene is maintained to satisfactory level. After 2 months of treatment, the appliance was activated by expanding the anterior wire for bicuspid expansion and the distal wire for molar expansion .

After an interval of 3 months, the appliance was removed and alginate impressions of the maxillary dental arches were taken for comparative study. The same appliance was cemented back in the maxillary arch for 3 months for retention purpose.

INDICATION OF EXPANSION

1.Maxillary deficiency
2.Bilateral maxillary constriction
3.High arched palate
4.Septal deformity
5.Cleft palate

CONTRAINDICATION OF EXPANSION

1.True unilateral crossbite
2.Pathological lesion in pressure bearing area of the palate.

ADVANTAGE OF SLOW EXPANSION

1.Low magnitude force
2.Does not need patient control
3.Uses continuous force
4.Derotation of molar

DISADVANTAGE OF SLOW EXPANSION

1.Prolonged treatment time
2.Dental changes rather than skeletal change

CONCLUSION

The nickel titanium expander provides a viable alternative to rapid expansion for correction of transverse discrepancies. Incorporation into an existing fixed appliance eliminates a separate laboratory phase and extra appointments for delivery, impressions, adjustments, and rebanding of the molars after removal.

The buccal molar attachments are free for use with intrusion arches, utility arches, wire segments, extraoral appliances, or comprehensive fixed appliances. The expander is not cumbersome or uncomfortable and thus can be kept in place for retention and anchorage, even while other procedures are being performed[14]

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