NITANIUM PALATAL EXPANDER - A NEW ADDITION TO CONTEMPORARY ORTHODONTICS

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ABSTRACT

With the advent of 'Shape Memory' (NiTi) alloys and their subsequent introduction in the field of Orthodontics, there have been enhanced efforts to utilize this property in different types of archwires and springs. Greater familiarity and skill has led to designing of Nitanium Palatal Expander (NPE). This appliance has been introduced for slow maxillary expansion and leads to dramatic reduction of clinical time and enhancement of successful results.

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KEYWORDS: Nitanium Palatal Expander; Shape memory; Slow expansion.

Introduction

The introduction of Nickel Titanium (NiTi) alloys in the middle of last decade has provided the Orthodontist with the twin benefits of *shape memory* and *transition temperature*. These principles have been utilised in orthodontic prescriptions meant to create additional room by utilising slow expansion of the maxilla. The unique appliance named "Nitanium Palatal Expander" combines the benefits of both NiTi and stainless steel alloys. This helps the appliance to deliver a constant, uniform, slow and continuous force for maxillary expansion.

Historical Review

Slow maxillary expansion is usually carried out in mixed dentition. It brings about better physiologic adjustments. Use of constant forces provides continuous stimulus to the midpalatal suture leading onto less potential for relapse.

It was in light of above that Dr W. Arndt [1] is credited with introducing the fixed removable appliance-Nitanium Palatal Expander (NPE). This appliance incorporates primarily NiTi and also stainless steel alloy components. This appliance utilizes the Shape memory and thermal activation properties of the NiTi alloy to achieve the desired expansion of the maxilla.

Philosophy

As it is well established that NiTi alloy basically can exist in two phases i.e. Martensite (Parent phase) and Austenite (Beta phase). This alloy is different from other alloys in the sense that it demonstrates

thermoelastic martensitic transformation behaviour. This is due to cooling (lowering of the temperature) of the alloy. The austenite phase undergoes transformation to the martensitic phase. The alloy in this phase can be readily deformed. Once the temperature is raised, this alloy becomes stiff and regains its original shape (Shape memory). This phenomenon is due to the reverting of the alloy to its original austenitic phase. The temperature at which there is change from one phase to the other is known as the transition temperature.

Nitanium Palatal Expander(NPE)

Armamentarium

(i)Design

The appliance incorporates an innovative palatal attachment (sheath) with .036" stainless steel alloy (ortholoy) arms joined to the nitanium expander portion (thermal activated Nitanium wires) through molar (ortholoy adjusting) loops. A locking indentation in the sheath fastens the appliance through stainless steel tab to the maxillary molar band. An E-chain/steel ligature can also be additionally utilized for preventing accidental dislodging.

This appliance comes in sizes ranging from 26 mm to 44 mm in 2 mm increments. The appliance is packed in sterile packets separately. There is inbuilt pre-programmed force application of 350g in 3 mm increments and is therefore self limiting. However slight adjustments can still be made by the operator to either constrict or add further expansion into the appliance. The transition temperature of NPE is at 94°F.

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(ii) Other components

Any good quality glass ionomer luting cement (containing Fluoride) should be used for cementation of the bands.

Ice cold spray containing tetraflouroethane is utilized onto the NPE to further dead soften the appliance just prior to placement inside mouth. This ensures ease in seating of the bands by the operator.

Few of the specialised pliers like NPE 3-jaw plier, how weingart, lingual arch placing plier and heavy duty cutter are some of the essential ones to aid in handling of the appliance inside the mouth.

(iii) Procedure for selection of NPE

A large number of cases selected to undergo slow maxillary expansion need at least 4 mms of expansion at the maxillary first molar region i.e. 2 mm per side. One might require another NPE if more than 8 mms of expansion is needed.

(iv) Steps

Measure the width between mandibular first molars between the tips of right & left distobuccal cusps.

Now measure the arch width between central pits of maxillary right & left first molars.

The difference between the two measurements is the amount of expansion required. Measure the distance between right and left maxillary first molars from the lingual surfaces where the sheaths will be placed. Add this value to the required expansion. The total will indicate the size of the NPE to use allowing for the prescribed expansion plus 1.5-2mm of overcorrection to compensate for the combined widths of band material, cement and lingual sheaths.

(v) Chairside appliance preparation

Adequate separation of the maxillary first molars of

the patient is achieved. This will facilitate fit and placement of the bands with lingual sheaths on these teeth.

The bands are removed. The bands and the NPE are now assembled outside the mouth as a single passive unit. SS ligature wire/E-chain is utilised to secure the appliance to the molar bands.

To be extra careful- a trial fit can be done. Any adjustment required can then be done with the help of special 3-jaw NPE plier.

A good quality glass ionomer cement (normal/light cure) is used. It is mixed and applied onto the bands which are supported by a piece of the wax on the occlusal side to prevent flow of the cement.

Ice cold spray is now sprayed onto the expander portion to dead soften' the appliance. This facilitates easy placement of the bands.

(vi) Mode of action

As the mouth temperature starts to warm the appliance, the nickel titanium wire will start becoming stiff and regains its original shape. This is due to the fact that shape memory is being restored. With the stiffening of the appliance, the expander will begin to exert a low, continuous force on the teeth and the midpalatal suture. The patient is instructed to sip cold fluid to relieve the pressure as and when required. Expansion is normally completed in two to four months. The appliance is then left in place for two to three months to act as passive retainer.

REFERENCES

1. Corbett MC. Slow and continuous maxillary expansion, molar rotation, and molar distalization, *J Clin Orthod* 1997;31:253-63.
2. Instructional Manual of Nitantium Palatal Expander issued by Ortho Organiser Inc USA 1997.