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A comparison of the quadhelix and the nickel-titanium palatal expander in the treatment of narrow maxillary arches: A prospective clinical study

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Abstract:

OBJECTIVES: The study aimed to compare the effects of quadhelix and nickel-titanium (NiTi) expander appliances on lower facial height, to quantify, and evaluate dentoalveolar and orthopedic changes in transverse plane, respectively, to estimate the difference in changes between these two appliances.

MATERIALS AND METHODS: Twenty patients, ten for the quadhelix and NiTi expander in the two-appliance group, respectively, participated in this study. A total of 8 readings, 1 for clinical facial height, 2 for model analysis, and 5 for posteroanterior cephalometric analysis were recorded. The statistical tests used were, Student's unpaired and paired *t*-tests.

RESULTS: Both appliances individually, produced statistically highly significant ($p < 0.01$) expansion every month in both premolar and molar areas with more uniform expansion for quadhelix and less expansion in NiTi palatal expander in the premolar region initially. The skeletal to dental change ratio showed that there was more dental change than skeletal with no inter-appliance differences statistically while assessing the PA cephalometric readings.

CONCLUSIONS: This study infers that both appliances are equally efficacious maxillary expanders, which are primarily dentoalveolar and not skeletal ($p < 0.05$).

Keywords:

Ashley Howe's model analysis, auto CAD, nickel-titanium palatal expander, posteroanterior cephalogram, quadhelix

Introduction

One of the most common transverse plane malocclusions in the posterior areas of the dental arch is the crossbite resulting from maxillary constriction. Maxillary transverse constriction presents itself usually as a unilateral or bilateral posterior crossbite. Correction of transverse discrepancy usually advocates expansion of the palate by a combination of orthopedic and orthodontic tooth movements.[1]

If the force is strong enough, separation occurs at the maxillary suture. The amount of orthopedic versus orthodontic change depends mainly on the patient's age. Normal palatal growth is nearly completed by the age of 6 years[2] and increasing interdigitation of the suture makes its separation difficult to achieve after puberty.[3,4] The rationale for sutural expansion mainly depends on the fact that a skeletal discrepancy should be treated by orthopedic correction whenever possible moreover dental correction by buccal translation or tipping is undesirable because of the thin layer of buccal cortical bone which is prone to fenestrations.[5]

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Sutural expansion can be achieved by either rapid maxillary expansion or slow maxillary expansion (SME). Rapid palatal expansion (RPE) has been traditionally considered to be the only means of achieving an orthopedic expansion whereas SME has been considered to bring about primarily dental expansion.

The rationale for RPE is to reduce the resultant undesirable orthodontic tooth movement and tipping while delivering the essential force of 2--5 kg/quarter turn and to overcome the tendency of the anchor teeth to move, thereby maximizing the orthopedic response by causing separation at the suture.[6]

In contrast to RPE, SME generates only 450--900 g[5] of force which may be insufficient to separate a progressively maturing suture and is generally thought to result in an orthodontic response with practically minimal orthopedic component if any.[2,7]

In addition to these biological benefits, slow expansion techniques offer several clinical advantages namely minimal and easy adjustment, comfortable, and the capability of delivering constant physiologic force.[5]

With the introduction of the tandem loop nickel-titanium (NiTi) expander by Arndt[8] (1993), the concept of SME has been reinvigorated. NiTi expander has been claimed to be the 'Holy Grail' among the various slow expanders based on its low load deflection, high spring back as well as its temperature dependent memory, in addition to skeletal effects.[9] Quad helix constructed from Elgiloy emulates stainless steel in behavior. Theoretically, the NiTi expander appears to be more ideal. Some of the studies have evaluated the clinical effects of either of the two individually, however, there have been no comprehensive studies comparing the effects of the two except for Donohue *et al*. (2004),[10] who conducted a preliminary investigation on this subject and concluded that there are no differences between the expansive effects of the two. Their method was to determine expansion using study casts and hence a change in the skeletal parameters was not assessed.

The study objectives were to quantify the dentoalveolar changes in the transverse plane and evaluate the difference in the changes between the two appliances, to evaluate the orthopedic changes if any, and their differences between the two appliances in the transverse plane, to compare the effects of the two appliances on lower facial height and finally to derive clinical implications from the study.

Materials and Methods

The present study was prospective with a sample size of 20 patients, undergoing treatment in the Department of Orthodontics and Dentofacial Orthopaedics at SDM College of Dental Sciences and Hospital, Dharwad, Karnataka, India.

Criteria for selection of the sample

1. All the patients had a narrow maxillary arch as determined by Ashley Howe's model analysis.[11]
2. Some patients required expansion to relieve posterior crossbite.
3. Some patients required expansion as a part of pre-functional therapy for mandibular advancement using a functional appliance.
4. All the patients were in late mixed or early permanent dentition.

Age and sex distribution of the patients

The sample included 12 males and 8 female patients who ranged from 10 -16 years with a mean age of 12.5 years. All the patients had normodivergent jaw bases as clinically measured and cephalometrically corroborated.

Appliances

The design of the nickel-titanium Palatal expander (NiTi expander---Ortho Organizers, Carlsbad, CA, USA) was first described by Arndt[14] and was of the "Tandem loop type". However, the NiTi expander design used in this study was of the single loop type as the manufacturer Ortho Organizers had modified the original design and no longer manufactured the "Tandem loop type". [Figure 1]

The design of the quad helix was as described by Ricketts.[12] The quadhelix was made in 0.032" Beta-Titanium Molybdenum Alloy (TMA) wire (Ormco Corporation---Orange, California, USA) and all the quad helices were designed by the same operator to minimize the inter-operator design variations. [Figure 2]

Both the NiTi expander and the quad helix were placed into the palatal sheaths welded onto the upper

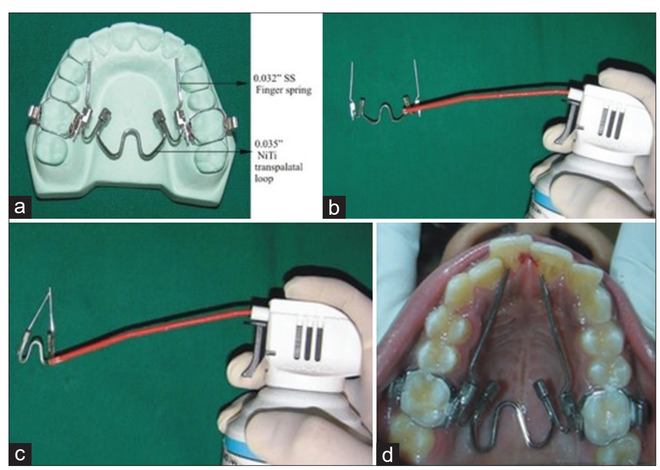

Figure 1: The nickel-titanium (NiTi) palatal expander appliance: (a) NiTi expander on study model, (b) NiTi expander before freezing, (c) NiTi expander after freezing, and (d) NiTi expander placed in the oral cavity

first permanent molar bands and secured using an elastomeric ligature or a 0.010″ stainless steel ligature wire (Ortho Organizers, Carlsbad, CA, USA). The NiTi expander chosen for each case was according to the following guideline.

Measurement in mm was taken from the intermolar lingual groove of the maxillary first molar at the gingiva to the opposite lingual groove and 3-4 mm was added to this measurement to select the appropriate size of the expander –Karaman A. I.[9] Before placement, the NiTi palatal expander was frozen using a tetrafluoroethane refrigerant spray [Floron 22 (R – 22) Ultra-Pure Refrigerant (450 g)---SRF Floron---Haryana, India as recommended by the manufacturer [Figure 1], outside the patient's mouth and placed into the palatal sheath using a Utility/Weingart plier (El dorado---Welcare Orthodontics---Kerala, India).

Clinical examination

Clinical facial height measurements of all the subjects were taken before treatment and after expansion using digital Vernier Caliper---Absolute digimatic (Mitutoyo Corporation---Takatsu Ward, Kawasaki, Kanagawa, Japan) [Figure 3]. This was done to ascertain the finding by numerous authors[9] that maxillary expansion using the dentition as support increases the lower face height.

Cephalometric records

The procedure described below was followed uniformly for the entire sample.

Two posteroanterior cephalograms were taken, one before the insertion of the expansion appliance, either quad helix or NiTi expander, and the second one after the expansion was completed. The posteroanterior cephalometric radiographs were taken on a PLANMECA PM 2002 Ceph CA PROLINE machine (Planmeca---Helsinki, Finland). The radiographs were exposed at 75--80 kVp/10 mA for 0.8--1.2 s. The film to source distance was standardized at 5 feet and the distance between the film and the patient was 6 inches. The posteroanterior cephalograms were taken with the teeth in centric occlusion. The head position in the cephalostat was carefully checked so that the Frankfort horizontal plane was parallel to the floor. Care was also taken to see that there was no rotation of the head.

The cephalograms were obtained on 10 x 8-inch diagnostic film (KODAK X-OMAT K film---EKTA speed plus---Eastman Kodak Company---Rochester, New York, USA). Following the standardized technique, the head was stabilized in the cephalostat with the help of ear rods.

The distance between the film cassette and ear rods and the source of radiation, being fixed, the magnification was standardized concerning these factors.

Landmarks, planes, and ratios used in the study

Each radiograph was traced on a 0.003″ acetate matte tracing paper (Garware---Mumbai, Maharashtra, India) with a 0.3 mm lead pencil (Sakura Cushioning Point Mechanical Pencil---Yellow body---Sakura Colour Products Corp. Japan). Each tracing was done by the same operator to minimize inter-operator errors. The pre-treatment and post-expansion tracings of a single patient were traced at the same time to minimize variability in landmark identification for the same patient. [Figures 4 and 5]

Occlusograms

Occlusograms were obtained by scanning the study models on Umax Astra 3450 scanner (UMAX Technologies, Inc.---Taiwan, Republic of China) after grading the casts on X and Y coordinates for 10 mm [Figure 6]. The scanned images were imported

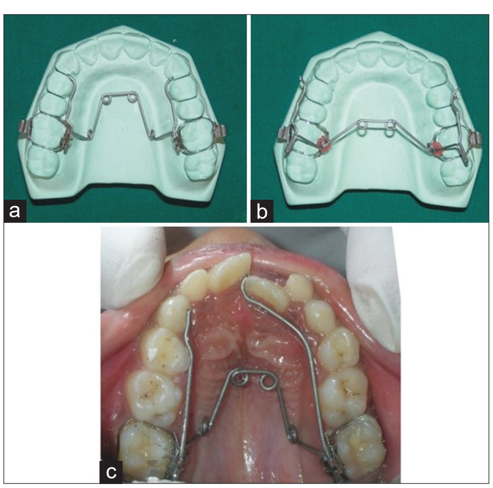

Figure 2: The Quadhelix appliance: (a) Quadhelix on study model before activation, (b) Quadhelix on study model after activation, and (c) Quadhelix intraorally in the maxillary arch

Figure 3: Clinical facial height measurements taken using Digital Vernier Calliper

on the AutoCAD 2002 (Autodesk---Mill Valley, CA, USA) for Microsoft Windows software (Microsoft Corporation---Albuquerque, New Mexico, USA) and the photographs were aligned and scaled [Figure 6]

The measurements evaluated followed guidelines proposed by Karaman.[9]

1. P1 to P1 upper interpremolar width was measured from the central fossa of the right first premolar to the central fossa of the left first premolar.
2. M1 to M1 upper intermolar width was measured from the central fossa of the right first molar to the left first molar.

Statistical analysis

Statistical significance was considered to be highly significant at 0.1% ($p < 0.01$) level, significant at 5% ($p < 0.05$) level and non-significant above 5% ($p > 0.05$) level.

Methodology

All the samples that were selected to be a part of this study had expansion requirements as supported by Ashley Howe's model analysis.[11] However, this criterion was only for selecting the patients. The patients that were selected for this study required expansion in the maxillary arch as part of the treatment either for buccal segment crossbites or as a pre-functional regimen.

Our study comprised twenty patients who required expansion as per their original treatment plan. Ten patients were treated with the quadhelix appliance and ten were treated with the NiTi palatal expander appliance [Figures 7 and 8].

The study was carried out by assessing the changes in the following records

1. *Clinical lower facial measurements*---The lower facial height was measured at two different time period namely pre-treatment and post-treatment. The measurement was taken using digital calipers from points subnasale to pogonion [Figure 3]. This measurement reflected the change in the mandibular plane angle which could be a result of the upper first molars tipping with their crowns buccally and their palatal cusps hanging which resulted in occlusal interferences and resultant opening in the mandibular plane angle.
2. *Study models*---The study models were taken at each monthly interval up to the completion of expansion was analyzed for the following differences in the transverse intermolar and interpremolar width: Difference in the intermolar and interpremolar width between the study model of pretreatment and 1-month interval, 1-month interval and 2-month interval, 2-month interval and 3-month interval, 3-month interval and 4-month interval, and 4-month interval and 5-month interval. The expansion was considered adequate once the occlusal aspect of the

Figure 4: Cephalometric Landmarks

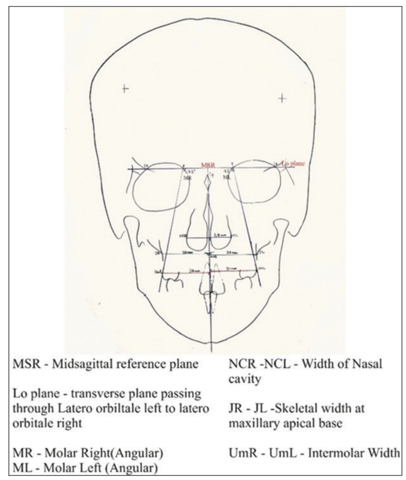

Figure 5: Reference planes---Linear and angular measurements used to measure transverse changes

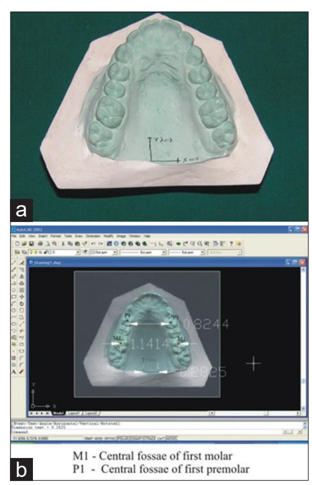

Figure 6: Study model analysis: (a) Scanned Occlusograms, (b) Scaling and Aligning on AutoCAD

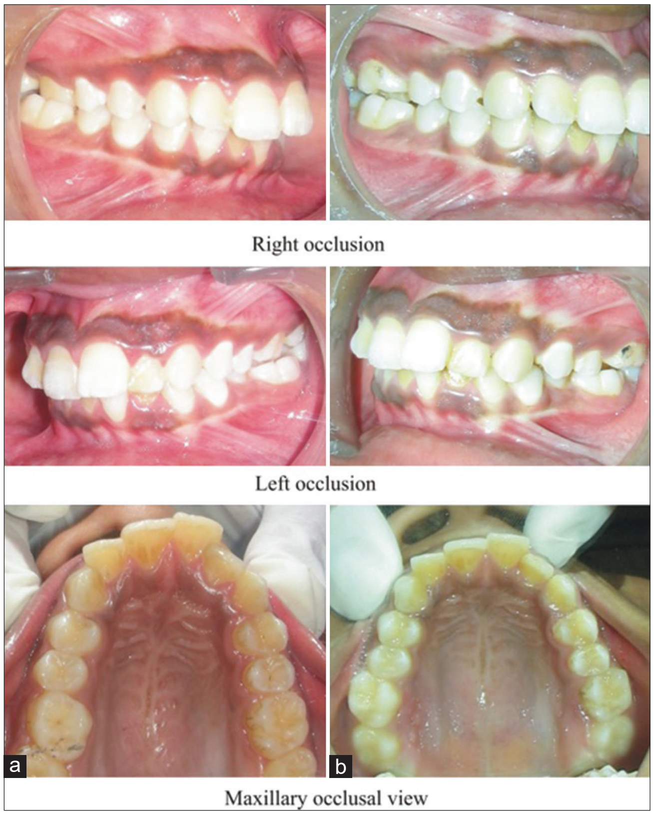

Figure 7: Patient record 1: (a) Pre-treatment, (b) post-treatment

Figure 8: Patient record 2: (a) Pre-treatment, (b) post-treatment

maxillary palatal cusp of the permanent first molar contacted the occlusal aspect of the mandibular facial cusp of the first molar as per the guidelines mentioned by Karaman.[9]

3. *Posteroanterior cephalometric radiographs*---The posteroanterior cephalometric radiographs were taken before the start and after treatment and were traced by a single operator at a single point in time and a total of 5 readings were analyzed with 2 and 3 angular and linear readings, respectively. [Figures 4 and 5]
4. *Maxillary occlusal radiograph*---This radiograph was taken at two time periods, before the start and after treatment. The occlusal radiographs were taken under the following standardized guidelines for cross-sectional maxillary occlusal projection as given by White and Pharoah.[14]

All the results were analyzed statistically using either the student's t-test or the student's paired t-test depending on the variables in question.

Results

When all the ten samples in one group were compared with the other ten irrespective of the degree of transverse plane malocclusion it was observed that:

1. The statistical tests for the change in facial heights in Quadhelix and NiTi expander appliance group [Table 1] suggested that the increase in the facial height associated with the use of either of these appliances is statistically significant ($p < 0.01$).
2. Statistically significant differences between these two groups of appliances at all the 3-time intervals (t-test) studied, showed greater expansion rates in the pre-molar region with the quadhelix appliance when compared to the NiTi palatal expander appliance [Table 2].
3. The quad helix and the NiTi expander were equally efficacious expanders in the molar region at all time intervals except at 1-month post-treatment when the NiTi expander was found to be more effective probably because of the higher force level generated by the quadhelix and the resultant longer lag phase on account of periodontal ligament hyalinization ($p < 0.05$) [Table 2].
4. There were significant differences between pre and post-treatment readings of the different variables like Mid sagittal reference plane (MSR), a transverse plane passing through latero-orbital left to right (Lo plane), the width of the nasal cavity (NCR-NCL), Molar right and left (MR-ML), skeletal width at the maxillary apical base (JR-JL) and intermolar width (UmR-UmL) in the posteroanterior cephalometric analysis within each appliance group ($p < 0.01$) [Tables 3 and 4].
5. There was no evidence of any sutural split as verified on pre- and posttreatment maxillary occlusal radiographs. The skeletal to the dental component in the expansion ratio decreased from a pretreatment

Table 1: Lower face height measurements---quadhelix versus NiTi expander.

Appliance	Mean	SD	Mean	SD	Paired *t*	*P*	Significance
Qx							
Pre	51.6000	2.7968					
Post	53.8000	2.5298	–2.2000	0.9189	–7.5707	0.0000	S
NiTi							
Pre	53.1000	3.9847					
Post	55.3000	3.6225	–2.2000	0.6325	–11.0000	0.0000	S

S---Significant, *P*<0.05---Significant, *P*<0.01---Highly significant, *P*<0.001---Very highly significant, NS---Non-significant

Table 2: Comparison between Qx and NiTi expander for change in inter premolar width at different time periods (*t*-test).

Variable	Appliance	Mean	SD	*t*	*P*	Signi.
Pre Rx	Qx	29.1620	2.5482	–2.5842	0.0187	S
	NiTi	31.8530	2.0858			
1 month	Qx	30.3250	2.5366	–2.0674	0.0534	NS
	NiTi	32.5850	2.3486			
Pre-1 month	Qx	1.1630	0.3572	2.2685	0.0358	S
difference	NiTi	0.7320	0.4831			
2 months	Qx	32.1840	3.0394	–0.9272	0.3661	NS
	NiTi	33.2950	2.2629			
1--2 month	Qx	1.8590	0.9942	3.5183	0.0025	S
difference	NiTi	0.7100	0.2794			
3 months	Qx	33.9070	2.9782	0.0557	0.9562	NS
	NiTi	33.8420	2.1806			
2--3 month	Qx	1.7230	1.0615	3.3965	0.0032	S
difference	NiTi	0.5470	0.2682			

mean to a posttreatment mean with both quadhelix and NiTi expander indicating that there has been a fair contribution from the dentoalveolar component to the total expansion that has occurred ($p < 0.05$) [Table 5]

Discussion

It is interesting to note that the process of evolution in orthodontic diagnosis and treatment planning has been gradual. Orthodontists are daily confronted with decisions that take into consideration the possibility of growth modification or surgical intervention, in addition to routine fixed appliance therapy, in the treatment of skeletal mal-relationships. Initial emphasis was placed on sagittal relationships, as indicated by Angle's classification of the malocclusion. According to McNamara Jr.,[1] the skeletal imbalances in the transverse dimension often are ignored or simply not recognized, and thus the treatment options for such patients by necessity are more limited than if the transverse skeletal problems are recognized. Yet it appears that the transverse dimension of the maxilla may be the most adaptable of all the regions of the craniofacial complex.[1] Maxillary transverse deficiency may be one of the most pervasive skeletal problems in the craniofacial region. Several studies have been carried out in the past on how to tackle the transverse discrepancies. Different treatment methodologies, study design, sample size, and research approach has produced disparate outcomes among these studies.

Donohue *et al*.[10] conducted a comparative study to assess the narrow maxillary arch expansion efficacy of both the quad helix appliance and the NiTi palatal expander appliance in 28 consecutive patients in the late mixed or permanent dentition having posterior buccal segment crossbites and concluded that both the appliances are equally effective. However, in our study, significant differences have been noted between the expansion characteristics of these two appliances. The differences noted were as follows: when the two appliances were compared it was observed that there were no statistically significant differences in the rates of expansion in the molar area except for the difference between the readings at pre-treatment and 1-month post-expansion where the NiTi expander appliance showed a greater amount of expansion when compared to the quadhelix appliance. And it was observed that there were statistically significant differences between the two groups with the quadhelix appliance showing greater expansion rates in the premolar area when compared to the NiTi palatal expander appliance at all intervals. Donohue *et al*.[10] analyzed the quantitative effects of NiTi palatal expander where they evaluated study models, posteroanterior and lateral cephalograms, and periapical film radiographs of the midpalatal suture region and found that the molar and the premolar expansion with the NiTi palatal expander was almost in the same ratio. However, in the present study, the NiTi palatal expander showed lesser expansion capability in the premolar region. Donohue's study did not include any radiographs for evaluation. Patient discomfort was assessed using visual analogue scores (VAS), and cost-effectiveness was also considered. The overall inference was, that quadhelix and NiTi palatal expander elicit similar discomfort, but significantly less discomfort was seen with NiTi palatal expander following the second activation.

In the posteroanterior cephalometric analysis, Karaman[9] found significant differences in only the skeletal width (JR-JL), the intermolar width (UmR-UmL), and the inclination of the upper first molars, as shown by the MR, ML angles. However, they did not find any significant differences in the nasal cavity width (NCR-NCL). In

Table 3: Comparison of various PA cephalometric readings with Qx at different time periods (paired *t*-test).

Parameter	Time	Mean	SD	Mean Diff	Paired *t*-test	*P*	Signi.
MR angle	Pre	99.3000	1.2517				
	Post	102.8000	2.0976	–3.5000	–6.7082	0.0001	S
ML angle	Pre	99.4000	2.5906				
	Post	102.6000	2.0656	–3.2000	–4.1466	0.0025	S
JR-JL	Pre	57.8000	4.9171				
	Post	60.2000	4.1042	–2.4000	–5.0410	0.0007	S
NCR-NCL	Pre	30.8000	0.9189				
	Post	31.6000	1.0750	–0.8000	–6.0000	0.0002	S
UmR-UmL	Pre	54.4000	4.0056				
	Post	60.1000	2.3310	–5.7000	–6.8620	0.0001	S

Table 4: Comparison of various PA cephalometric readings with NiTi expander at different time periods (paired *t*-test).

Parameter	Time	Mean	SD	Mean Diff	Paired *t*-test	*P*	Signi.
MR angle	Pre	100.0000	1.2472				
	Post	103.8000	1.9322	–3.8000	–5.8791	0.0002	S
ML angle	Pre	99.5000	1.1785				
	Post	103.8000	1.5492	–4.3000	–7.2001	0.0001	S
JR-JL	Pre	53.5000	8.9350				
	Post	55.9000	8.1165	–2.4000	–5.0410	0.0007	S
NCR-NCL	Pre	32.2000	2.0440				
	Post	32.9000	2.1833	–0.7000	–3.2796	0.0095	S
UmR-UmL	Pre	53.4000	5.2957				
	Post	58.2000	4.1846	–4.8000	–10.2857	0.0000	S

Table 5: Skeletal versus dental change ratio JR-JL/UmR-UmL ratio with Qx and NiTi expander (paired *t*-test).

Appliance	Mean	SD	Paired *t*	*P*	Significance
Qx					
Pre	1.0639	0.0807			
Post	1.0025	0.0722	3.9019	0.0036	S
NiTi					
Pre	0.9966	0.0810			
Post	0.9565	0.0793	4.0085	0.0031	S

our study, we found significant differences in all the posteroanterior cephalometric parameters including the nasal cavity width (NCR-NCL). Further, the ratio of increase in the skeletal width to increase in the intermolar width according to Karaman[9] showed that the intermolar width expanded more than the skeletal width. This finding was confirmed by our study also. In Karman's study opening of the midpalatal suture was demonstrated in a total of eight patients. Whereas, in our study, no such observation was noted as seen in the maxillary occlusal radiographs though our samples were in the same age group as in the study by Karaman.[9] These observations were in agreement with other radiographic studies on slow expansion. However, our study refutes these claims. The reason could be that the slow expansion forces are so low that they cannot separate the suture radiographically except in very young children.[13,15]

Lagravere *et al*.[16] decided to systematically review or perform a meta-analysis on the dental or skeletal changes associated with SME. The authors included in their evaluation clinical trials that assessed skeletal and dental arch changes through measurements on dental casts or cephalometric radiographs. They found only a low level of evidence. Therefore, they could make no strong conclusions on dental or skeletal changes that occurred after SME treatment. They concluded that the clinicians need to rely on their clinical experience, expert opinions, and the presented limited evidence concerning SME treatments.

Kapadia *et al*.[17] conducted a comparative study using a finite element model analysis (FEM) to evaluate the dental, dentoalveolar, and skeletal effects of the three slow expansion devices namely Jackscrew, Quad helix, and NiTi expander-2 on a young maxillary bone. They inferred that the Quad helix and Niti palatal Expander---2 were almost equally efficacious maxillary expanders. Similar results were also obtained in our present study and by Donohue *et al*.[10] in their clinical study, who compared quad helix and NiTi expander for their clinical performance concluding that both the devices are equally efficient maxillary expanders. Donohue *et al*.[10] affirmed that the selection from either of the two should be based on the fact that the quadhelix shows more individual controlled and obvious expansion whereas, the NiTi palatal expander could be an appliance of choice when the patient's comfort is of major concern as this is the least stress-producing device.

Clinical implications of the study

This study provides a comparison between the expansion characteristics of the Quadhelix appliance and the NiTi palatal expander appliance. It also evaluates the claims by other authors[14] that slow expansion can bring about a skeletal expansion and a midpalatal sutural separation and tries to quantify it by direct comparison with the amount of dental expansion. It also examines the effect of SME on the lower anterior face height.

The present study shows that the quadhelix appliance is superior to the NiTi palatal expander appliance as far as premolar expansion is considered. Hence, we advise using the Quadhelix instead of the NiTi palatal expander when greater expansion of the premolar region is required. As far as the molar expansion is considered either of the appliances could be used. The deciding factor then could be the cost involved. The NiTi expander is less cost-effective and also may require more than one appliance size in the same patient when more than 6 mm of expansion is desired.[17] Both the appliances are equally effective in relieving a posterior segment crossbite and take an almost similar amount of time for expansion.

As far as skeletal change is taken into account both these SME appliances do not cause any radiographically visible sutural split as claimed by numerous authors.[14] There was some degree of skeletal change seen when the patients were under active expansion therapy with both the appliances but the differences between them were negligible. Furthermore, this change could be because of growth. When we have a look at the ratio in Table 5, it gives us an idea about the skeletal to the dental component in the expansion, this ratio decreased from a pretreatment mean of 1.0639 to a posttreatment mean of 1.0025 with quadhelix and from a pretreatment mean of 0.9966 to a posttreatment mean of 0.9565 which was statistically significant. Therefore, this ratio indicates that there has been a fair contribution from the dentoalveolar component to the total expansion that has occurred. Both the SME appliances compared lead to increase in the lower anterior face height hence should be used with caution in high mandibular angle cases.

Shortcomings of the study

The sample size selected was small. It cannot be emphatically said that the skeletal changes seen during the expansion phase were the effects of the appliance alone as these patients were of growing age. Further, there were no controls used to compare the arch width changes. No metallic markers, implants were used to locate and compare the posteroanterior cephalometric points and hence there could be an error in the identification of landmarks. This could affect the pre- and postexpansion readings in the same patient as well as errors in the readings of the group as a whole. As the lower anterior face height readings were obtained from landmarks identified on the skin which is a movable tissue, the values obtained tend to lack reproducibility when the same measurements are made by another operator. Within the same patient, the effect of soft tissue growth on the lower face height was not considered.

Suggestions for further studies

The same study could be continued including a larger sample size to verify the results obtained from this study. Further studies could include a control group to evaluate the effects of growth. The frontal cephalometric data could be made more reliable, accurate, and reproducible by using metallic markers or implants.

Conclusion

Slow maxillary expansion irrespective of the appliance used, either the Quadhelix or the NiTi palatal expander causes an increase in the lower face height because of the opening of the mandibular plane angle.

In conclusion, we suggest that both the Quadhelix and the NiTi palatal expander are equally efficacious maxillary expanders, though they have certain differences like expansion as discussed earlier. The Quadhelix is easy to fabricate, is more cost-effective, and brings a greater amount of expansion in the premolar region. Both the appliances do not bring about any great amount of skeletal change in the mixed or early permanent dentition as has been claimed by other authors.[14] Hence these appliances are to be used when the expansion required is primarily dentoalveolar and not skeletal.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent. The patient has given his/her consent for his/her images and other clinical information to be reported in the journal. And the patient understands that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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