ISSN: 1110-435X
ONLINE ISSN: 281-5258

Egyptian
Orthodontic Journal

Short term evaluation of the effectiveness of crosspom fixed retainer

Abdeldayem F. Ramy [a], Tag Eldin Sara [b], Abdellatif S. Marwah [c]

Abstract:

***Objective**: Clinically evaluate the effectiveness of Crosspom® fixed retainer, over 6 months after its placement in orthodontically aligned mandibular anterior teeth.*

***Material and Methods**: This prospective study was performed on 15 adult patients in the age range of 18-25 years. For each subject, a Crosspom® retainer was inserted on the lingual surface of the lower anterior teeth at the same visit of brackets debonding after the conclusion of the fixed orthodontic phase. Three intraoral scans were performed for each patient: T0 at the time of retainer insertion as well as T1 and T2 at 3- and 6-months post-retention respectively. Little's irregularity index and intercanine width were measured on each scan for each patient. Data were collected, tabulated and statistically analysed.*

***Results:** No statistically significant difference in the inter-canine width measurements between the 3-times-point measurements. However, a statistically high significant difference between the measurements was observed for the Little's irregularity index reaching an irregularity of 1.49 mm over the observed post-retention period. Intra-observer and inter-observer measurements showed excellent reliability.*

***Conclusion:** Esthetic Crosspom® retainer could achieve a good short-term stability for the mandibular anterior alignment.*

Introduction

Maintaining the stability of orthodontic treatment results is one of the greatest challenges faced by an orthodontist and may present an even greater challenge than the orthodontic treatment itself. Various factors have been proposed as a cause of this instability, for example, growth changes, and tendency of teeth to return to former position, bone and periodontal ligament need to reorganize and adapt to the new position. Our ignorance of precise causes of relapse further complicates the problem of retention. [1,2,3]

Retention is the passive phase during which orthodontists aim to hold the teeth in an ideal aesthetic and functional relation and combat the inherent tendency of the teeth to return to their former positions. Various designs for retainers as well as different adjunctive surgical and non-surgical procedures (stripping, frenectomy and fiberotomy) to attain stability were proposed.

Removable appliances were the first to be used for retention. They are hygienic, easy to use and allow settling (beneficial relapse) to occur increasing the number of occlusal contacts, however depending on patient's compliance hindered the use of removable retainers for all patients. [4]

Early attempts toward non-compliance fixed retainers, banded appliance was used; yet

a Lecturer, Department of Orthodontics, Faculty of Dentistry, Ain Shams University, Cairo, Egypt.
b Pedodontist, Egyptian Ministry of Health, Cairo, Egypt.
c Lecturer, Department of Orthodontics, Faculty of Dentistry, Ain Shams University, Cairo, Egypt.

decalcification and metallic display of the bands were the main drawback of this appliance. When bonding was first introduced in orthodontic treatment it opened the way for the idea of bonded retainers, widening the spectrum of non-compliance retainers. Different wire materials, sizes and shapes were introduced, used and studied.[5,6,7]

The most commonly used type of fixed bonded retainer is formed from a small diameter multi-strand wire, usually 0.0175 inch or 0.0215 inch, the flexibility of this wire enabled bonding each tooth in the retained segment. An additional benefit was gained, as the surface roughness of the wire increased the mechanical interlock with the bonding material. On the other hand, a disadvantage of metallic wire retainers is that they might be subjected to mechanical stresses and, if too thin, or not placed passively onto the enamel surface, they might result in undesirable tooth movement, also the metallic colour was never preferred along with the possibility of causing allergy due to the nickel content. [8,9,10]

Searching for an alternative to multistranded wire, different types of fibers were investigated ex, fiberglass and polyethylene fiber strips. The main advantage of a fiber-reinforced composite (FRC) retainer compared with the classic twist-flex retainer was its high transparency, resulting in an almost invisible retainer. The retainer can thus be placed close to the incisal edge. This was a benefit from both biological and biomechanical points of view.[11,12,13]

Recently, a preformed fixed retainer material (Crosspom®) has been introduced to be used as fixed lingual retainer (Ortho Apply Innovations, Voormedia, Amsterdam, Netherland) which is made of polyamide 11. Polyamide 11; is a material used in various medical devices as tubes, angioplasty catheters and biopsy forceps. Polyamide monomers are a renewable resource obtained from the castor oil plant, and it has been synthesized for more than 60 years. The Crosspom® retainer has two separate sizes for the lower and upper arch, with the midline marked to guide its correct placement. It also, has a 40° slope mesiodistally from canine to canine to allow for more gingival placement. Its high polymeric flexible structure allows natural movements of the teeth and is ease of adaptation during bonding. It has been proven that it is non-allergenic and hygienic. It is also aesthetically pleasing with its similarity to natural tooth colour. Only one report was found on the Crosspom® retainer in the literature.[14]

Interestingly, despite the high reliability of fixed retainers bonded to the lingual surfaces of the lower six anterior teeth, some studies have shown that unexpected tooth movements can occur, which in severe cases requires orthodontic retreatment. Orthodontic relapse has been well documented in the literature, and mandibular anterior crowding has been shown to undergo greater relapse after orthodontic treatment compared with other malocclusion types. [15]

It was noted that post-retention crowding of mandibular incisors is the first evidence of the progressive instability of orthodontic treatment. Regardless of the relapse etiology, irregularity of the mandibular incisors seems to be the

precursor of maxillary crowding, overbite, and deterioration of treatment. [16,17]

The purpose of this study is to clinically evaluate the effectiveness of Crosspom® fixed retainer, over 6 months after its placement in orthodontically aligned mandibular anterior teeth.

Materials and methods

This study was approved by the ethical committee at the Faculty of Dentistry, Ain Shams University (FDASU-Rec IR032403). All subjects were selected from the outpatient clinic of the Orthodontic Department, Faculty of Dentistry, Ain Shams University. All patients had been informed about the purpose of the study and possible complications; and signed a consent form.

All patients met the following inclusion criteria: (1) age ranging from 18-25 years with good oral hygiene ;(2) no history of attrition, abrasion, erosion or bruxism;(3) had lower anterior crowding less than 6 mm;(4) treated with full orthodontic fixed appliance;(5) had non extraction treatment;(6) no circumferential supracrestal fibretomy were performed.

Sample size calculation was based on the study by Hosny et al., where the effective size ratio was calculated to be 1.223 using G*power software (Universität Düsseldorf, Germany). The power set at 0.8 and the Type I error probability (alpha) associated with the test was set as 0.05. The test results showed that a sample of 15 patients was sufficient to achieve 80% power.[18]

For each subject a full set of orthodontic records were obtained along with an intra-oral scan using (TRIOS 3 ,3Shape Inc., Copenhagen, Denmark) of the lower arch at the visit of placement of the permanent retainer and debonding, (T0).

The Crosspom® retainer was measured intraorally and adapted to the retained area. The lingual surfaces of the lower anterior teeth to be bonded were cleaned, polished, isolated, dried and 37% phosphoric acid etching solution was applied on it for 20 seconds, and then rinsed thoroughly for another 20 seconds; then dried. The bonding agent (Transbond XT, 3M Unitek) was applied, and air sprayed to spread slightly then light cured with (3M ESPE EliparTM S10).

Dental floss were used interproximally under each contact area from the lower right canine to the left canine. The mark on the middle part of Crosspom® was placed symmetrically at the midline between the central incisors. The floss was used to adapt the retainer in place and small amount of the adhesive (Filtek™ Z350XT Flowable composite,3M Unitek) were applied on each tooth after proper adaptation then light cured. Additional adhesive was added to embed the ends of the retainer and to cover it where it contacted the cingulum area of each tooth. All areas of composite were then fully cured (Fig. 1). Excess composite material was removed.

A written postoperative instruction form was given and explained to the patient. It included instructions of strict oral hygiene measures, which involved proper tooth brushing and rinsing with chlorohexidine mouthwash 0.02% twice daily. In case of fracture or looseness of the retainer the patient was informed to return

for repair as soon as possible. The patients were scheduled for intraoral scanning after 3 and 6 months.

For each patient 3 scans of the lower arch were obtained at(T0): pre-retention; (T1): three months post-retention and (T2): six-months post retention. The scans then were rendered into a 3D stereolithographic digital model (.stl) through specific software (ScanIt™ Orthodontics ,3shape A/S, Copenhagen, Denmark). The measurements carried on the digital models included inter-canine width (Fig. 2) and Little's irregularity index (Fig. 3).

Inter-canine width: is the distance between cusp tips or estimated cusp tips in cases of wear facets.

Irregularity index: as suggested by Little is the sum of the five linear distances from anatomic contact point to adjacent anatomic contact point of anterior teeth.

The digital measurements were carried out on digital models using a specific dental software (OnyxCeph ™ Image Instrument, Chemnitz, Germany) on a calibrated flat 22″ monitor with a mouse, which were both set and checked.

To assess the intra-observer and inter-observer reliability, digital measurements were repeated after two weeks by two specialized operators working independently with 5 years of orthodontic experience.

Statistical analysis

All Data were collected, tabulated, and subjected to statistical analysis. Statistical analysis was performed by SPSS in general (version 20) [iii], while Microsoft office Excel is used for data handling and graphical presentation.

Quantitative variables were described by the Mean, Standard Deviation (SD), the Range (Minimum – Maximum), Standard Error of the Mean (SEM) and 95% confidence interval of the mean. General Linear Model (GLM) Repeated Measure ANOVA was used for analysis of the change of variables with time. Bonferroni method was used for multiple comparison post hoc test. Intra and Inter observer reliability were assessed by Dahlberg Error, Relative Dahlberg Error and the Concordance Correlation Coefficient with its 95% confidence limits. Significance level is considered at $P < 0.05$ (S); while for $P< 0.01$ is considered highly significant (HS). Two tailed tests were assumed throughout the analysis for all statistical tests.

RESULTS

Repeated measure ANOVA test showed that there was no statistically significant difference in the inter-canine width measurements between the 3 times point measurements. Mean at T0 (27±1.85) at T1 (27.01±1.74) and at T2 (27.08±1.72) as shown in (Table 1). This was further validated with Mauchly's sphericity test which was statistically significant as shown in (Table 2). As Mauchly's test was significant, Greenhouse-Geisser correction was applied, confirming that there was no statistically significant change in the inter-canine width with time (Table 3). Bonferroni method for Pairwise comparisons also showed that here was no statistically significant change in the inter-canine width between any two times as shown in (Table 4).

For the Little's irregularity index, Repeated measure ANOVA test showed that there was a statistically high significant difference between the 3 times point measurements. Mean at T0 (1.49±0.76), at T1 (1.75±0.74) and at T2 (2.00±0.77) as shown in (Table 5). This was further validated with Mauchly's sphericity test which was statistically significant as shown in (Table 6). As Mauchly's test was significant, Greenhouse-Geisser correction was applied, confirming that there was a statistically high significant change of Little's irregularity index (Table 7). Bonferroni method for pairwise comparisons also showed that here was a statistically high significant change in the inter-canine width between any two times as shown in (Table 8).

For both measurements an excellent intra-observer reliability and inter-observer reliability were indicated by very small Dehlberg error and small Relative Dehlberg error, (Table 9). Also, Concordance Correlation Coefficient (CCC) was close to one in both intra-observer and inter-observer reliability (Table 10).

Discussion

The purpose of orthodontic treatment is to create a good functional occlusion while achieving good facial and dental esthetic goals. However, maintaining these outcomes for a long term after orthodontic treatment has always been a big challenge for orthodontists, especially regarding the alignment of the lower anterior teeth with non-extraction treatment.[19]

This study evaluated the effectiveness of a relatively recent fixed retainer (Crosspom®) in maintaining post-treatment mandibular anterior alignment and inter-canine width during the first 6 months following conclusion of orthodontic treatment. This period was chosen as it was reported that most of the failures associated with fixed retainers were observed within the first 6 months.[20]

The Crosspom® fixed retainer was used only in the mandibular arch as the risk of failure for fixed retainers in the maxilla was reported to be higher than that in the mandible for all examined types of fixed retainers [21]. In this study a failure rate of 13% was noted which is considered considerably lower than other studies reported a failure rate of up to 71% for resin esthetic fixed retainers [12,22]. This could be related to the polyamide 11 structure of the Crosspom® retainer that allows it to have elastic behavior allowing physiological tooth mobility. A similar failure rate of 9-14% was observed in studies by Cerny R and Lee et al. suggesting that the failure rate of fixed retainer could be related to the placement technique and type of adhesive used [23,24].

A post Little's Irregularity Index (LII) of 1.49 mm was noted in this study with a mean relapse of 0.26 mm over 3 months duration (T1) and a mean total relapse of 0.51 mm after 6 months (T2). According to Little, this relapse is considered small [25,26] and it was also less than previous studies [16,25,27]. A similar increase in irregularity index was reported by Moussa et al,[28], Sadowsky et al[29] and Glenn et al[30].This small relapse could probably be related to the initial mild-to-moderate irregularity in the sample as previously suggested [31].Since it is known that tendency for mandibular anterior crowding increases with time [1,25], another

contributing factor to differences in the relapse could be shorter evaluation period for this study when compared to longer post-retention observation period of other studies [25,26].

Regarding the inter-canine width, the results showed stable measurements throughout the examination period with a negligible increase of 0.08 mm. This is similar to the results obtained by Freitas et al [16] and Xu et al[32] that showed either stable inter-canine width measurements or minimal non-clinically significant increase during the posttreatment phase.

The findings regarding ICW agreed with previous findings based on wire properties. The more flexible wires provide better stability of ICW as they conform better to the surfaces on which they were placed in contrast to rigid wires that are subject to permanent deformation[33].

Another factor that could affect the inter-canine width changes during the retention phase is the changes that occurred to ICW during the treatment. Freitas et al found no difference in the amount of ICW relapse between the group that had inter-canine width increase and that without increase during treatment [16]. This contrasts with the concept of original inter-canine width maintenance [30, 34].

Conclusions

-The use of Crosspom® retainer could provide short-term stability for the post-treatment mandibular anterior alignment.

-Negligible changes in the inter-canine width were noted during the first six months of retention using the Crosspom® fixed retainer.

Declaration of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

The authors declare that there is no conflict of interest, and the article was not funded or supported by any research grant.

References

1. RIEDEL RA. A review of the retention problem. Angle Orthod. 1960; 30:179-99.
2. NANDA R, BURSTONE CJ. Retention and stability in orthodontics. Philadelphia: W.B. Saunders;1993.
3. HELLMAN M. Fundamental principles and expedient compromises in orthodontic procedures. Am J Orthod Oral Surg. 1944-1945; 42:46-53.
4. Rowland H, Hichens L, Williams A, Hills D, Killingback N, Ewings P, Clark S, Ireland AJ, Sandy JR. The effectiveness of Hawley and vacuum-formed retainers: a single-center randomized controlled trial. Am J Orthod Dentofacial Orthop. 2007 Dec;132(6):730-7.
5. Zachrisson BU. Clinical experience with direct-bonded orthodontic retainers. Am J Orthod. 1977 Apr;71(4):440-8.
6. Dahl EH, Zachrisson BU. Long-term experience with direct-bonded lingual retainers. J Clin Orthod. 1991;25(10):619-30.
7. Liou EJ, Chen LI, Huang CS. Nickel-titanium mandibular bonded lingual 3-3 retainer: for permanent retention and solving relapse of mandibular anterior crowding. Am J Orthod Dentofacial Orthop. 2001 Apr;119(4):443-9.

8. Störmann I, Ehmer U. A prospective randomized study of different retainer types. J Orofac Orthop. 2002 Jan;63(1):42-50.

9. Renkema AM, Al-Assad S, Bronkhorst E, Weindel S, Katsaros C, Lisson JA. Effectiveness of lingual retainers bonded to the canines in preventing mandibular incisor relapse. Am J Orthod Dentofacial Orthop. 2008 ;134(2):179e1-8.

10. Lie Sam Foek DJ, Ozcan M, Verkerke GJ, Sandham A, Dijkstra PU. Survival of flexible, braided, bonded stainless steel lingual retainers: a historic cohort study. Eur J Orthod. 2008 Apr;30(2):199-204.

11. Lucchese A, Manuelli M, Bassani L, Albertini P, Matarese G, Perillo L, Gastaldi G, Gherlone EF. Fiber reinforced composites orthodontic retainers. Minerva Stomatol. 2015 Dec;64(6):323-33.

12. Tacken MP, Cosyn J, De Wilde P, Aerts J, Govaerts E, Vannet BV. Glass fibre reinforced versus multistranded bonded orthodontic retainers: a 2 year prospective multi-centre study. Eur J Orthod. 2010 ;32(2):117-23.

13. Jedliński M, Grocholewicz K, Mazur M, Janiszewska-Olszowska J. What causes failure of fixed orthodontic retention? - systematic review and meta-analysis of clinical studies. Head Face Med. 2021, 24;17(1):32.

14. Sandalci, Songül. "Crosspom Pekiştirme Apareyi Uygulanmış Bireylerin Kısa Dönem Klinik Sonuçlarının Değerlendirilmesi ve Apareyin Laboratuvar Testlerinin Incelenmesi." Doctoral Thesis, August 06, 2018. https://acikbilim.yok.gov.tr/handle/20.500.12812/410172.

15. Chacón-Moreno A, Ramírez-Mejía MJ, Zorrilla-Mattos AC. Relapse and inadvertent tooth movement post orthodontic treatment in individuals with fixed retainers: A review. Rev Cient Odontol (Lima). 2022 ,28;10(3):e116.

16. Freitas KM, de Freitas MR, Henriques JF, Pinzan A, Janson G. Postretention relapse of mandibular anterior crowding in patients treated without mandibular premolar extraction. Am J Orthod Dentofacial Orthop. 2004;125(4):480-7.

17. Erdinc AE, Nanda RS, Işiksal E. Relapse of anterior crowding in patients treated with extraction and nonextraction of premolars. Am J Orthod Dentofacial Orthop. 2006;129(6):775-84.

18. Hosny S. (2014). Metallic versus non-metallic bonded lingual retainers; a comparative in vivo study. [Master's Thesis, Ain Shams University]

19. Anwar Ali Shah. Postretention changes in mandibular crowding: a review of the literature Am J Orthod Dentofacial Orthop 2003;124:298-308.

20. Kartal Y, Kaya B. Fixed Orthodontic Retainers: A Review DOI: 10.5152/TurkJOrthod.2019.18080.

21. Bolla E, Cozzani M, Doldo T, Fontana M. Failure evaluation after a 6-year retention period: a comparison between glass fiber-reinforced (GFR) and multistranded bonded retainers. Int Orthod 2012; 10: 16-28

22. Ardeshna AP. Clinical evaluation of fiber-reinforced-plastic bonded orthodontic

retainers. Am J Orthod Dentofac Orthop 2011; 139: 761-7.

23. Cerny R. The reliability of bonded lingual retainers. Aust Orthod J 2007; 23: 24.

24. Lee KD, Mills CM. Bond failure rates for V-loop vs straight wire lingual retainers. Am J Orthod Dentofacial Orthop 2009; 135: 502-6.

25. Little RM, Wallen TR, Riedel RA. Stability and relapse of mandibular anterior alignment first premolar extraction cases treated by traditional edgewise orthodontics. Am J Orthod 1981;80:349-65.

26. Little RM, Riedel RA, Årtun J. An evaluation of changes in mandibular anterior alignment from 10 to 20 years postretention. Am J Orthod Dentofacial Orthop 1988;93:423-8.

27. Little RM. Stability and relapse of mandibular anterior alignment: University of Washington studies. Semin Orthod 1999;5:191-204.

28. Moussa R, O'Reilly MT, Close JM. Long-term stability of rapid palatal expander treatment and edgewide mechanotherapy. Am J Orthod Dentofacial Orthop 1995;108:478-88.

29. Sadowsky C, Schneider BJ, BeGole EA, Tahir E. Long-term stability after orthodontic treatment: nonextraction with prolonged retention. Am J Orthod Dentofacial Orthop 1994;106:243-9.

30. Glenn G, Sinclair PM, Alexander RG. Nonextraction orthodontic therapy: posttreatment dental and skeletal stability. Am J Orthod Dentofacial Orthop 1987;92:321-8.

31. Azizi M, Shrout MK, Haas AJ, Russell CM, Hamilton EH Jr. A retrospective study of Angle Class I malocclusions treated orthodontically without extractions using two palatal expansion methods. Am J Orthod Dentofacial Orthop 1999;116:101-7.

32. Xu XC, Li RM, Tang GH. Clinical evaluation of lingual fixed retainer combined with Hawley retainer and vacuum-formed retainer. Shanghai Kou Qiang Yi Xue. 2011;20(6):623–6.

33. Shim H, Foley P, Bankhead B, Kim K. Comparative assessment of relapse and failure between CAD/CAM stainless steel and standard stainless steel fixed retainers in orthodontic retention patients: A randomized controlled trial. Angle Orthod. 2022 Jan; 92(1): 87–94.

34. Rossouw PE, Preston CB, Lombard CJ, Truter JW. A longitudinal evaluation of the anterior border of the dentition. Am J Orthod Dentofacial Orthop 1993;104:146-52.

Tables

Table (1) mean, standard of deviation and results of repeated measure ANOVA of inter-canine width.

	Mean	SD	P Value	
Inter-canine Width measurements T0	27.00	1.85	0.6	**P > 0.05 NS**
Inter-canine Width measurements T1	27.01	1.74		
inter-canine Width measurements T2	27.08	1.72		

Table (2) Mauchly's test results of for the change in inter-canine width

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Time	.108	28.885	2	.000	.529	.535	.500

Table (3): Tests of Within-Subjects effects of inter-canine width.

Source		Type III Sum of Squares	df	Mean Square	F	P Value	
Time	Greenhouse-Geisser	0.056	1.057	0.053	0.258	0.63180	**P > 0.05 NS**
Error (Time)	Greenhouse-Geisser	3.055	14.802	0.206			

Table (4) Means, standard error and results of Bonferroni method for the change in inter canine width between any two times.

(I) Time		Mean Difference (I-J)	Std. Error	P Value	95% Confidence Interval for Difference		
					Lower Bound	Upper Bound	
T0	T1	-0.01	0.11	1.00000	-0.30	0.29	**P > 0.05 NS**
T0	T2	-0.08	0.17	1.00000	-0.53	0.37	**P > 0.05 NS**
T1	T2	-0.07	0.07	0.90679	-0.25	0.11	**P > 0.05 NS**

NS: non-significant

Table (5) mean, standard of deviation and results of repeated measure ANOVA of Little's irregularity index.

	Mean	SD	P Value	
Little's irregularity index T0	1.94	0.76	0.00005	**P < 0.001 HS**
Little's irregularity index T1	1.75	0.74		
Little's irregularity index T2	2.00	0.77		

Table (6) Mauchly's test results of for the change in Little's irregularity index.

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
Time	.554	7.686	2	.021	.691	.743	.500

Table (7) Tests of Within-Subjects effects of Little's irregularity index.

Source		Type III Sum of Squares	df	Mean Square	F	P Value	
Time	Greenhouse-Geisser	1.926	1.383	1.393	21.799	0.00005	**P < 0.001 HS**
Error (Time)	Greenhouse-Geisser	1.237	19.359	0.064			

Table (8) Means, standard error and results of Bonferroni method for the change in Little's irregularity index between any two times.

(I) Time		Mean Difference (I-J)	Std. Error	P Value	95% Confidence Interval for Difference		
					Lower Bound	Upper Bound	
T0	T1	-0.261*	0.07	0.00903	-0.46	-0.06	**P <0.01 HS**
T0	T2	-0.507*	0.10	0.00041	-0.77	-0.24	**P < 0.001 HS**
T1	T2	-0.245*	0.05	0.00115	-0.39	-0.10	**P < 0.01 HS**

HS: Highly significant

Table (9) Measurements for intra-observer reliability

Measurement	Mean	SD		Dahelberg error DE	Relative Dahelberg Error RDE	CCC	95% confidence limits	
Inter Canine width	Reading 1	**26.93**	**1.76**	**0.21**	**0.8%**	**0.984**	**0.978**	**0.989**
	Reading 2	**26.91**	**1.67**					
Little irregularity index	Reading 1	**1.70**	**0.43**	**0.09**	**5.1%**	**0.959**	**0.909**	**0.981**
	Reading 2	**1.76**	**0.46**					

Table (10) Measurements for inter-observer reliability

Measurement	Mean	SD		Dahelberg error DE	Relative Dahelberg Error RDE	CCC	95% confidence limits	
Inter Canine width	Examiner 1	26.93	1.76	0.20	0.8%	0.985	0.964	0.994
	Examiner 2	26.85	1.69					
Little irregularity index	Examiner 1	1.70	0.43	0.08	4.6%	0.965	0.931	0.982
	Examiner 2	1.80	0.44					

Figures:

Fig. 1: Crosspom® fixed retainer bonded on lingual surface of lower anterior teeth.

Fig. 2: Inter-canine width measured digitally using OnyxCeph software.

Fig. 3 Little's Irregularity index measured digitally using OnyxCeph software.