Correction of crowding by Soft Elastic Foils: A case-report study

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ABSTRACT

Aim: Everyday because of developing new materials and techniques , more adults become interested in orthodontic treatments . Soft positioner and its new generation in the name of Invisalign System is an example .The present case report was designed to study the effects of soft elastic foils as serial aligners on treating the mild to moderate crowding

Materials and Method: Three teenage patients with crowding not more than 6 millimeters were selected. After the preparation of orthodontic diagnostic records and filling the periodontal chart, manual teeth setup was carried out on working casts with a maximum 0.5 millimeter displacement . Aligners were made up of bioplast foils. The appliance was worn by patient full time for at least 2 weeks. Then the new one was made and this procedure was continued until complete tooth alignment . The last aligner was used as retainer for three months later .These variables were evaluated after treatment : dental alignment , over jet , overbite , inclination of upper & lower incisors , lips relation to E line , mandibular plan angle , clicking in TMJ , periodontal status and tooth pain . Active treatment period lasted between 3-5 months .

Results: Anterior crowding was completely corrected in all patients . Protrusion of upper & lower incisors were seen in lateral cephalograms . Overbite , mandibular plan angle and lips relation to E line did not change . Improvement of periodontal status were recorded in all patients .Low to moderate toothache was reported during the first 2 days .

Conclusion: Mild to moderate crowding could be corrected successfully with soft elastic foils (Serial Aligners) without deleterious effects on TMJ and periodontium however manual tooth setup was time consuming . (IJO 2006; 1: 75 - 78)

Key words: Orthodontics , Crowding , Positioner , Removable appliance , Periodontium
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Introduction

Nowadays despite of the need and demand for orthodontic treatment , some adult patients avoid treatment because of unwillingness and/or disability to use custom fixed appliances . Recently a new method was introduced to overcome this problem called Invisalign System which has advantages such as : esthetically more acceptable , comfortable and removable so allows better control of oral health care .[1,2]

In 1945 Kesling used elastic foils as positioner after orthodontic treatment .He explained that this technique will be available for tooth movement in the future . Bunch in 1961 during a case report suggested that positioners are useful in rotation , space closing , change in overbite and midline correction . In 1970 Wells recommended that positioners are effective in minor tooth movement less than 3 millimeter [3]. Sheridon in 1994 showed that Essix appliance (a modification of positioner) is a useful device for treating the minor relapse of anterior teeth [4] .Bowman and Carano (2002) in their case report , suggested tooth positioners can be effective in finishing [5]. Finally in 2000 Boyd et al treated mild crowd-

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Fig 1. Intra -oral photographs of case 1 before treatment

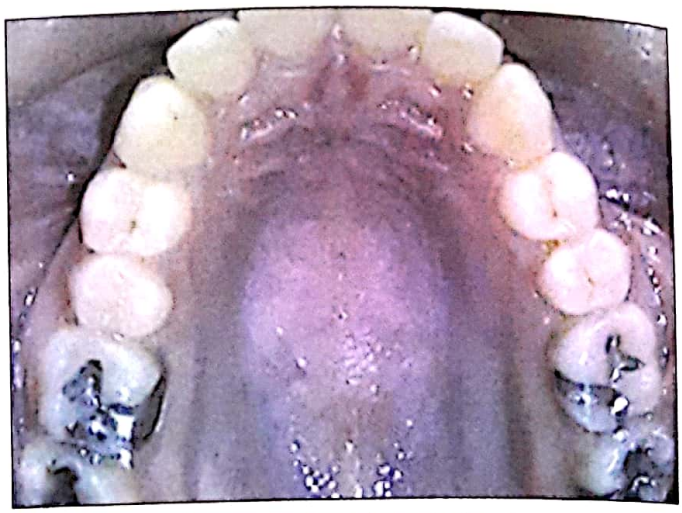

Fig 2. Intra-oral photographs of case 1 after treatment

Fig 3. Upper and lower aligners

ing through Invisalign system . In this computerized method , after 3D scanning of primary casts , several plastic overlays which are called Aligners were made and used to move teeth instead of fixed appliance [6] .

The purpose of present case report study was to experience the efficacy of (hand made) aligners in treating the anterior crowding of patients with mild to moderate crowding .

Diagnosis

Case 1: A 17- year- old girl without systemic problem and previous orthodontic treatment was selected . Clinical examination , periodontal chart and orthodontic records revealed these characteristics : symmetric face , mild convex profile (ANB=5) and mild high angle (FMA=30) , normal lip relation to E line , without any TMJ symptoms , good oral hygiene , bleeding index 8% , plaque control record 65% , without any gingival recession and periodontal pocket , normal over jet and overbite , anterior crowding 5.6 millimeter in lower & 2.1 in upper arch (figure 1).

Case 2: A 14- year- old girl without any systemic disease was selected . She had these characteristics : symmetric face , skeletal Cl 2 (ANB=6) , mild high angle (FMA=30) , normal lip relation to E line , not any TMJ symptoms , good oral hygiene , bleeding index 10.7% , plaque control record 69% , without any gingival recession , periodontal pocket in distal side of right mandibular second molar(10 mm) because of dentigerous cyst of 3rd molar , increased overjet (4mm) & overbite (4.5mm) , anterior crowding 2.7 mm in upper arch , bi-dentoalveolar protrusion .

Case 3 : A 16- year- old boy without any systemic disease and with following characteristics was selected : symmetric face , convex profile with competent protruded lips (ANB=7) , high angle (FMA=34) , not any TMJ symptoms , good oral hygiene , bleeding index 6.7% , plaque control record 62% , gingival recession in buccal aspect of upper & lower canine area (1-2 mm) , normal over jet & overbite , anterior crowding 4.6 mm in lower and 5.8 in upper arch , Bolton index 81.7% , distolingual rotation of upper lateral incisors .

Treatment procedure

Case 1: Mild protrusion of upper incisors and anterior alignment , stripping of lower incisors (2mm) and anterior alignment with mild protrusion (figure 2) .

Case 2: Protrusion of right incisors and anterior alignment only in upper arch .

Case 3: Mild protrusion of upper centrals and distolabial rotation of upper lateral incisors , stripping (1.5 mm) and protrusion of lower incisors .

Manual teeth setup were carried out on working casts with the maximum 0.5 millimeter displacement of each tooth then checked with occlusogram . After duplicating this cast , an

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Table 1. change in anterior crowding during treatment

Upper \ Lower	before	after
Patient 1	2.1 \ 5.6	0.7 \ 0.54
Patient 2	_ \ 2.7	_ \ 0.65
Patient 3	5.8 \ 4.6	1.1 \ 0.84

Table 2. change in IMPA & U1 to SN during treatment

	IMPA	U1 to SN
	before \ after	before \ after
Patient 1	98 \ 99	104 \ 106
Patient 2	111 \ 111	114 \ 115
Patient 3	94 \ 97	97 \ 100

Table 3. change of plaque control index (PCI) & bleeding gingival index (BGI)

PCI \ BGI	before	after
Patient 1	69% \ 8%	55% \ 6.2%
Patient 2	76% \ 10.7%	52% \ 7.1%
Patient 3	76% \ 8.7%	54% \ 6.7%

Appendix 1

Pain Chart

	No pain	* mild	** moderate	*** severe
1)	———	———	———	———
2)	———	———	———	———
3)	———	———	———	———
4)	———	———	———	———
5)	———	———	———	———
6)	———	———	———	———
7)	———	———	———	———

* tolerable , without interference with daily work
** tolerable but needs medicine
*** interferes with daily function and needs appliance removal

aligner was made up of *bioplast foil with a 2 mm thickness by Biostar machine then delivered to the patient for full time use for at least 2 weeks (figure 3). Serial aligners delivered to the patient with above procedure until complete elimination of anterior crowding . The last one was used as retainer for 3 months then post-treatment records were regained .

Pain chart was filled daily by the patient (appendix 1) .TMJ status and tooth mobility were checked weekly by the advisor . The other variables including : Dental alignment , over jet , overbite , inclination of upper & lower incisors , mandibular plane angle , relation of lips to E line , bleeding index , pocket depth , the height of keratinized gingivae and plaque control records were measured before and after treatment by the advisor.

Results

Active treatment period prolonged between 3 and 5 months . Crowding were reduced according to table 1 . Increase in IMPA and U1 to SN were seen in all patients (table 2).Overbite , lip relation to E line did not change and mandibular plane angles were stable at the end of the treatment . Mild temporary clicking in TMJ was seen only in the first patient .

Periodontal status were improved . Height of keratinized gingivae did not change . Bleeding gingival index were reduced after treatment (table 3) .

Severe pain was recorded only by patient 1 in the first day of appliance delivery . The others recorded low to moderate pain during 2 first days .

Discussion

This case report study was designed to experience the efficacy of aligners which were made in a manual method , in treating the crowding .

Anterior crowding were completely corrected but there were very mild crowding in posterior teeth that were not included

in treatment plan .

Increase of IMPA and U1 to SN were predictable because of protrusion of the incisors according to treatment plan . The stability of lip relation and mandibular plan angle and overbite during the treatment may be due to minor tooth movement and short treatment period .In spite of our study , Wells (1970)[3] and Miller (2002)[7] in their case report studies , reported some intrusion in posterior teeth and increased overbite as a side effect of the aligners .

Clicking in first case was managed by precise occlusal adjustment and reducing the thickness of the posterior bite . Severe toothache in this case during first day of appliance delivery , was probably due to the thickness of the posterior bite and high stress level during first day (any other studies assessed these variables) .

Improvement in plaque control records may be due to emphasis on oral hygiene which this removable appliance allows to do . The same result was reported by Sheridon (2001) [8] and Miller (2002)[7] .

Conclusion

Serial aligner system could be used successfully for elimination of anterior crowding without deleterious effect on TMJ or periodontal status .This transparent appliance is well accepted by adult patients . There are some disadvantages : it needs patient cooperation and lot of laboratory work (that has been resolved by newly digital technique which is expensive) and gradually becomes less clear .

Refernces

1- Proffit W.R.:Contemporary orthodontics , 3rd ed. , Mosby ,St. Louis , 2000, chap:1

2- Internet site: http://WWW.invisalign.com/us/html/faq/index.html : top4

3- Wells N.E.: Application of positioner appliance in orthodontic treatmentAm. J. Orthod. dentofacial Orthop. , 351-366 , 1970

4- Sheridon J.J,.McMinn R: Essix thermosealed appliances , J.Clin. Orthod. , 29: 108-113 , 1991

5- Bowman S.J, Carano A.: Short term , intensive use of the tooth positioner in case finishing J. Clin. Orthod. , 36:216-218 , 2002

6- Boyd R.L, Miller R.J.: The invisalign system in adult orthodontics , J. Clin. Orthod. , 34: 203-212 , 2000

7- Miller R.J,.Doung T.T: Case report: lower incisor extraction treatment with invisalign system J. Clin. Orthod. , 36: 95-102, 2002

8- Sheridon S.J., Armbruster P.: Avoiding demineralization and bite alteration from full- coverage plastic appliances J. Clin. Orthod. , 35: 444-448 , 2001