

Simple treatment of a complex malocclusion: a case report

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Background and aim: Clinical signs of tooth-size– arch length discrepancy are crowding, impaction, and incisor proclination. The controversy persists over whether to increase the size of the arch by expansion or decrease the size of the teeth by interproximal enamel reduction or extraction to resolve the discrepancy.

Method: This report describes the treatment of a 17-year-old girl with a severe tooth size-arch length discrepancy. The patient had a mild Class II skeletal relationship, a high mandibular plane angle, a Class I molar relationship, bilateral posterior cross bites, and deviated midlines. The final treatment protocol was non-extraction treatment of both arches using passive self-ligate brackets.

Results and Conclusion: The final treatment result was satisfactory. Proper over- bite and over jet, facial balance and good occlusion were achieved. Expansion of posterior segments and distal movement of molars solved tooth size-arch length discrepancy.

Key words: tooth size-arch length discrepancy dental crowding non-extraction treatment passive self-ligating brackets

Received 10 February 2014; accepted 4 March 2014;Published 7 May 2014

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Introduction

Tooth size-arch length discrepancy is a common problem in orthodontics⁽¹⁾. In addition to esthetic concern, which is the main factor for patients to seek orthodontic treatments, dental crowding can produce functional side effects⁽²⁾, oral hygiene problems and periodontal disease⁽³⁾.

In treating dental crowding, the controversies persist over whether to increase the size of the arch by expansion or decrease the size of the arch by interproximal enamel reduction or extraction of teeth to resolve the discrepancy⁽⁴⁾. The other choice for this problem is distal movement of molars⁽⁵⁾.

With teeth extraction, as an efficient way to resolve dental crowding, treatment duration would become shorter and less patient's cooperation would be need, but it may also negatively affect the patient's facial and smile aesthetics⁽⁴⁾. Furthermore, tooth extraction is not a grantee for stability⁽⁵⁾.

Non-extraction treatment at an early age can be done by expansion with removable appliances or distal movement of molars with headgear and lip bumper⁽⁴⁾. However, patient compliance must be excellent in these treatment plans.

Case presentation:

A 17- year old female with a chief complaint of dental irregularities referred to a private orthodontic clinic in Hamedan. Clinical examination in frontal view revealed that the chin was deflected to right, lips were competent and incisor display in smile was 80% of clinical crown of incisors. In profile view, she had a convex profile with retruded upper lip regarding E line. Class I molar relationship with extremely severe dental crowding was seen in intra oral examination. Space deficiencies in upper and lower arch were approximately 13mm and 8

mm, respectively. Mandibular dental midline was deviated to right. Upper canines were high buccal due to the severe space deficiency.

At older ages, if fixed appliances are used, without active distal movement, arch length can increase through the incisors proclination and lateral expansion in posterior segments⁽⁶⁾. However, increased inter-canine width and excessive proclination of mandibular incisors have been considered partially unstable^(7,8).

With the advent of self-ligate brackets, the claim arise that anterior-posterior and lateral expansions in this system are different in nature from conventional brackets⁽⁶⁾. Harradine says self-ligate brackets and edgewise brackets have equally long history⁽⁹⁾. Benefits such as decreased risk of decalcification and resorbition of teeth, secure engagement of arch wires, shorter treatment duration⁽¹⁰⁾ and most importantly reducing the frictional resistance resulting in applying more favorable force have been proposed for self-ligate brackets^(11,12). About these benefits, conflicting results are obtained in studies. For example, the overall duration of treatment in patients with severe dental crowding by self-ligate brackets was similar to the overall duration of treatment of these patients by conventional brackets, but overall duration of treatment in patients with moderate crowding by self-ligate brackets was two times less than the total time of treatment in these patients by conventional brackets⁽¹⁰⁾. However, studies suggest that although pattern of alignment and leveling with self-ligate brackets is similar to that of conventional brackets, their mechanisms are different. Amount of incisors proclination in both systems may be similar but increases in inter-molar width in patients treated with self-ligate brackets are more than those in patient treated with conventional brackets⁽¹⁰⁾. This article reports a complex patient that treated with a self-ligated system.

mm, respectively. Mandibular dental midline was deviated to right. Upper canines were high buccal due to the severe space deficiency.

Maxillary and mandibular inter-canine widths were constricted with posterior palatal cross bite. She had a normal over jet and decreased over bite in anterior and open bite in right posterior segments. Cephalometric analysis expressed mild skeletal class II relationship and hyperdivergent profile. Inclination of upper and lower incisors was in normal range.



Fig 1.facial and intra oral photograph before treatment



Fig 2.photograph of dental casts, before treatment

Treatment objectives:

Resolving severe dental crowding through the elimination of tooth size-arch length discrepancy and transverse

discrepancy was the primary objective of her orthodontic therapy. Other goals include the desire to preserve the vertical position of the central incisors and molars. Also

.class I molar relationship and over jet must be preserved during treatment, whereas the over bite should be increased .Also, the midlinediscrepancy should be corrected.

Alternative treatment plans:

The most important factor for choosing appropriate treatment plan in this case was correcting extremely severe dental crowding, while improving facial esthetic or maintaining at least the same. Ideal treatment plan for this patient would be surgery for upper arch expansion (surgically assisted rapid maxillary expansion) and after surgery, extraction in both arches. However, because the patient refused surgery, this treatment planwas rejected.

Expansion with a fixed expander like a hyrax appliance could be another treatment plan. However, due to age, there was no possibility of suture opening and movements would be dental tipping only. Another treatment plan that came in mind according to severe space deficiency was extraction of four first premolars for providing space.Because of retrudedlips, this treatment plan was a

threat for facial esthetics. For these reasons after consultation with the patient, itwas decided to use a passive self-ligate system.

The patient's final treatment plan was dental irregularitieselimination with the aid of self-ligate system to obtain maximum widening of dental arches.

In addition to resolving intra and inter arch problems, this treatment plan would improve facial esthetics in smile view due to better lips support and increase in transverse dimension of dental arches.

Treatment progress:

Damon 3MX were bonded to all the teeth in upper and lower arches at the beginning of treatment .Initial alignment was done with the 0.014 CuNiTiwire engaged in all the brackets in the upper and lower arches. The treatment process continued with 0.016 CuNiTi and 0.016×0.025CuNiTi wirein upper arch and 0.014×0.025 CuNiTiin the lower arch with the four- month intervals.



Fig3.treatemnt progress.A.4 month after treatment.B.8 month after treatment

0.018×0.025 CuNiTi wires were engaged in upper and lower arches in the next step for 8 weeks.

Up to this point, alignment of teeth midlines found some improvements. Also, good posterior occlusion was achieved. 0.019×0.025 stainless steel arch wires were engaged in both arches (lower and upper arch was

shaped based on the lower arch form).In this stage, inter-maxillary elastics were used to improve occlusion. At the end of treatment, dental irregularities in upper and lower arches were eliminated, and functional occlusion with molar and canine in class I relationship and canine guidance in lateral movements was achieved.



Fig4.facial and intra oral photograph at the end of the treatment



Fig 5.photogharaph of dental casts ,after treatment

Teeth alignment and an increase in width of buccal corridor improved esthetics of patient's smile. In addition, the support of upper lip was preserved during the treatment. A significant increase in inter-molar width of upper molars (42mm to 50mm) and inter-premolar width of upper first premolar (31mm to 42 mm) was observed in intraoral examination. A slight increase

(1mm) in inter-canine width of upper arch was observed with no change in lower inter-canine width. Dental midline discrepancies were corrected.

Cephalogramanalysis obtained before and after treatment and their superimposition revealed that: Inclination of lower incisors was increased, and inclination of upper

incisors was decreased, but both were in normal and acceptable range. Another remarkable finding was an increased SNA angle due to the forward movement of A point and backward downward rotation of mandibular

plane. The most important visible change in superimposition of cephalograms and occlusograms was distal movement of upper molars.

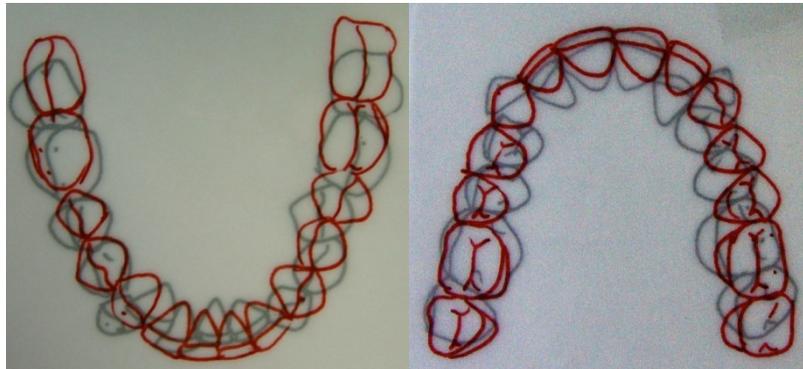


Fig 6. superimposition of occlusograms before and after the treatment. A. lower arch B. upper arch

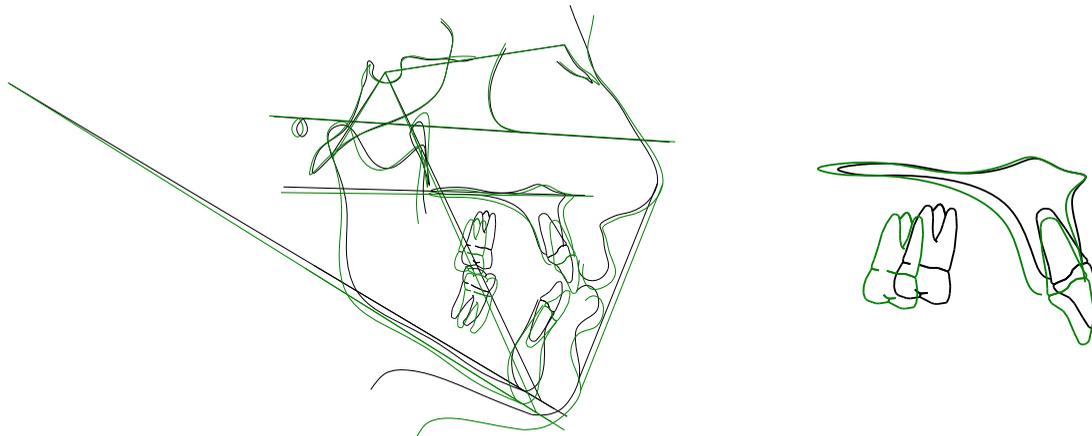


Fig7. superimposition of cephalograms before (black) and after (green) treatment.

	Initial	Final	Normal
Saddle/Sella Angle (SN-Ar) (°)	132.2	130.7	124
Articular Angle (°)	129.9	139.4	138
Gonial/Jaw Angle (Ar-Go-Me) (°)	136.6	129.4	120.8
Sum of Angles (Jarabak) (°)	398.4	399.5	380
SN - GoGn (°)	35	37	32.9
FMA (MP-FH) (°)	26.4	27.6	22.9
Y-Axis -- Downs (SGn-FH) (°)	60.3	61.8	60
Palatal-Mand Angle (PP-MP) (°)	28.4	30.5	25
SNA (°)	79.4	81.1	82
SNB (°)	77.6	77.1	80.9
ANB (°)	1.7	4	1.6
NF - FH (PP-FH) (°)	-2	-2.9	2.3
N-A-Pg (°)	3.2	8	3.9
Facial Angle (FH-NPo) (°)	89.7	89	89.6
IMPA (L1-MP) (°)	86.9	96	95

FMIA (L1-FH) (°)	66.7	56.4	65.7
U1 - FH (°)	116.2	109.9	111
U1 - SN (°)	104.2	98	103.1
U1 - NA (°)	24.9	16.9	22.8
U1 - NA (mm)	5.6	4.6	4.3
U1 - Palatal Plane (°)	114.2	107	110
U1 - Occ Plane (°)	121	116.5	121
L1 - NB (°)	22.9	33.2	25.3
L1 - NB (mm)	4.7	8.8	4
Holdaway Ratio (%)	0.1	0	1
Interincisal Angle (U1-L1) (°)	130.5	126	130
Occ Plane to FH (°)	4.9	6.7	4.7

Table 1.cephalometric measurements before and after treatment



Fig 8. Panoramic radiographs. A. before treatment B. late stage of treatment

Fixed retainer with coaxial 0.0175 wire in palatal upper lateral incisors from one side to another, in addition to Hawley retainer, was used in upper arch .

In lower arch, we used fix retainer with coaxial 0.0175 wire in lingual of canine from one side to another. We

recommended her wearing removable retainer for a year of full time, and extracting the third molars. Treatment record after one year indicated good stability of the treatment results. However, the occlusion of the right first molars was in cusp-to-cusp relationship, which is acceptable.



Fig9.facial and intra oral photograph one year after completion of treatment

The patient was advised to take care and maintain fixed retainers and refer for annual visits.

Discussion:

Although studies indicate that the pattern of alignment and leveling by self-ligate brackets is similar to that of conventional brackets^(6,10), in most clinical studies changes in inter-molar and inter-canine widths are similar to conventional brackets and the efficiency of self-ligate brackets on teeth alignment is not greater than conventional brackets^(10,13). It seems that with proper selection of patients (for example in this patient who had decreased dental arch widths) and with newer techniques of orthodontics, some classical treatments in patients will change. Understanding the clinical behavior of these techniques is essential. Moreover, different cases may respond differently to these techniques. A significant expansion achieved in this patient had two reasons: 1.the arch wires in this system are widened, especially when full size arch wires have been engaged for adequate time, arch width will increase. Tipping in posterior teeth

were minimum because of second arch wire dimensions of the system(... $\times 0.025$)⁽¹⁴⁾. 2. The greater the amount of tooth irregularities and lack of space, the more the forces which tend to expand posterior teeth⁽¹⁴⁾. Another event that helped to eliminate dental irregularities in the patient was movement of molars in distal direction, which was due to lip bumper effect⁽¹⁴⁾. Strong perioral muscles that inhibit protrusion of anterior teeth produce this effect. Lip bumper effect may not happen in every patient⁽¹⁴⁾. The resulting transverse expansion is not uniform, lower inter canine width was not increased, which led to improvement of treatment stability and The decreased relapse tendency using very light forces in the first stage of treatment (alignment) accompanied by strong perioral muscle inhibits increase in interaction width.

Conclusion:

1. Case selection is the most important aspect of Damon technique.
2. It seems that with proper case selection (for example in this patient who had decreased dental arch widths) and with newer techniques of orthodontics, some classical treatments in patients will change.

References:

1. Proffit WR, Fields HW Jr, Moray LJ. Prevalence of malocclusion and orthodontic treatment need in the United States: estimates from the NHANES III survey. *International Journal of Adult Orthodontics and Orthognathic Surgery*.1998; 13(2): 97-106.
2. Bishara SE: *Textbook of Orthodontics*, W.B. Saunders Company, 2001: pp. 168-173, 442-444.
3. Chung CH, Vanarsdall RL, Cavalcanti EA, Baldinger JS, Lai CH: Comparison of microbial composition in the subgingival plaque of adult crowded versus non-crowded dental regions. *Int J Adult OrthodonOrthognath Surg.*, 2000; 15(4): 321-330.
4. Roy S. Treatment of a severe arch-length deficiency with anteroposterior and transverse expansion: Long-term stability. *American Journal of Orthodontics and Dentofacial Orthopedics* 2010;137:401-11
5. Little RM, Riedel RA, An^o rtun J. An evaluation of changes in mandibular anterior alignment from 10 to 20 years postretention. *Am J OrthodDentofacialOrthop* 1988;93:423-8.
6. Padhraig S. F., Andrew T. DiBiase, Grammati Sarri, and Robert T. The Comparison of mandibular arch changes during alignment and leveling with 2 preadjusted edgewise appliances. *American Journal of Orthodontics and Dentofacial Orthopedics*.2009; 136:340-7
7. Burke SP, Silveira AM, Goldsmith LJ, Yancey JM, Van Stewart A, Scarfe WC. A meta-analysis of mandibular intercanine width in treatment and postretention. *AngleOrthod* 1998; 68:53-60.
8. Mills JR. The long-term results of the proclination of lower incisors. *Br Dent J* 1966; 120:355-63.
9. Harradine HNW. Self-ligating brackets: where are we now? *J Orthod* 2003; 30:262-73.
10. Nikolaos P., Argy P., and Theodore E.. Self-ligating vs. conventional brackets in the treatment of mandibular crowding: A prospective clinical trial of treatment duration and dental effects. *American Journal of Orthodontics and Dentofacial Orthopedics*.2007;132:208-15
11. Cacciafesta V, Sfondrini MF, Ricciardi A, Scribante A, Klersy C, Auricchio F. Evaluation of friction of stainless steel and esthetic self-ligating brackets in various bracket-archwire combinations. *Am J OrthodDentofacialOrthop* 2003; 124:395-402.
12. Thomas S, Sherriff M, Birnie D. A comparative in vitro study of the frictional characteristics of two types of self-ligating brackets and two types of pre-adjusted edgewise brackets tied with elastomeric ligatures. *Eur J Orthod* 1998; 20:589-96.
13. Paul S., Andrew T. DiBiase, Martyn S., and Martyn T. Alignment efficiency of Damon3 self-ligating and conventional orthodontic bracket systems: A randomized clinical trial. *Am J OrthodDentofacialOrthop* 2008;134: 470.e1-470.e8
14. Rohini V., Ellen B., Budi K., Maria Th. G., Ales O.. Evaluation of incisor position and dental transverse dimensional changes using the Damon system. *AngleOrthod*.2011; 81:647-652.