



Non – Extraction Management Of Severe Crowding With Self –Ligating Bracket System- A Case Report

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Abstract

Background: While the debate of extraction vs non-extraction still continues in the field of orthodontics, non-extraction approach using arch development concept is becoming more popular now-a-days and passive self-ligating bracket system forms a major inventory of the same.¹⁻³

Case Report: A 13 year old female patient reported to the clinic with severe crowding in both the arches and high-labially placed upper canines. Extraoral examination showed average facial form with well balanced facial profile and non-consonant smile arc. Intraoral examination revealed class I molar relation with constricted arch in upper canine premolar region.

Discussion: This case report reflects the possibility of effective non-extraction management of severe crowding using self-ligating bracket system maintaining the straight facial profile. The passive expansion effect exerted with the help of self-ligating bracket and wire system has been utilized here to relief crowding without the need of extraction.

Conclusion: Passive self-ligating bracket system offers a viable alternative to extractions in severe crowding in growing patients¹.

Keywords: NIL

Introduction

Orthodontics is an ever-evolving science. Recent advancements in the bracket systems have reignited the debate between the extraction vs non-extraction treatment philosophies. Arch development using expansion is a contemporary philosophy that is best served with passive self-ligating bracket system and heat activated copper Niti wires¹. This allows the clinician to provide a satisfactory non-extraction orthodontic treatment in moderate and severe crowding cases without disturbing the facial harmony^{2,3}. This treatment option offers the additional advantages of reduced appointment time, low friction and increase efficacy of treatment. This

article is a report of one of such cases of severe crowding treated with the non-extraction approach.

Case Report

Clinical Examination And Diagnosis

A 12-year-old Bengali girl reported with the chief complaint of irregular arrangement of front teeth as well as high labially placed canine teeth in the upper arch. No relevant medical as well as past dental history was elicited by the patient.

Extra-oral examination revealed that she had a symmetrical face with mesoprosopic facial form, competent lips, and prominent chin button. Profile

view revealed a vertically proportionate face showing orthognathic or straight profile, straight facial divergence, prominent lower lip and vermillion and obtuse nasolabial angle. On smile, she had a full upper incisor display with 1-2 mm gingival display and a flat smile arc (**Figure 1**).

Intra-oral examination revealed class I molar relationship (bilaterally) with ectopically erupted high labially placed 13 and 23 with buccally displaced 34, rotated 43 with mild crowding & retroclination of lower incisors. She had a good buccal occlusion with reduced overjet & overbite. Upper arch was found to be ‘V’ shaped with narrowing in canine-premolar region whereas lower arch was ‘U’ shaped. Upper dental midline shifted to the right from facial midline by 1 mm (**Figure 2**).

Model Analysis

Study model analysis revealed arch length-tooth material discrepancy of 11.5 mm in the upper arch and 9 mm in the lower arch. Pont’s and Linder-Harth’s analysis showed significant upper arch constriction in premolar and molar region (Table 1). Ashley Howe’s analysis revealed maxillary arch constriction in canine-premolar region and borderline situation. Bolton’s analysis showed mandibular tooth material excess of 1.5 mm in overall and 2 mm in anterior ratio.

Radiographic Interpretation

Pre-treatment orthopantomogram (OPG) showed full complement of erupted permanent teeth except all third molars (**Figure 3**).

Cephalometric evaluation revealed skeletal class III (ANB = - 2 °) malocclusion with horizontal to average growth pattern (FMA of 22° and Y axis angle 56°). Upper incisors showed near normal inclination (upper 1 to NA: 4 mm /24°) whereas the lower incisors showed significant retroclination (lower 1 to NB: 2 mm / 15° and IMPA= 84 °). Soft tissue analysis revealed a normal nasolabial angle of 98° and lips were positioned normally as Rickett’s E-line showed values of -3.5 mm and -1.5 mm for upper and lower lips respectively. (**Figure 3, Table 2**)

Diagnosis

Based on the above findings the patient was diagnosed as having a skeletal class III malocclusion

(Dental class I) with retroclined lower incisors and severe tooth size-arch length discrepancy in the form of high labially displaced canines in the narrow upper arch with harmonious soft tissue and average growth pattern.

Problem List:

1. High labially placed & ectopically erupted upper canines
2. Lower arch crowding and buccally displaced lower left 1st premolar
3. Less display of teeth during smile and flat smile arc
4. Mild depression in mid-face and prominent chin button
5. Narrow upper arch
6. Lack of adequate overjet and overbite

Treatment Objectives:

1. To alleviate the crowding and align both the upper and lower arches
2. To establish adequate overjet and overbite
3. To achieve a consonant smile arc and satisfactory smile esthetics
4. To maintain class I molar relationship
5. To achieve class I canine relationship

Treatment Plan:

After considering all the diagnostic parameters (clinical examination, cephalometric evaluation and study model analysis) following treatment plan was formulated:

- 1) Non-extraction treatment with passive arch expansion using passive self-ligating system .
- 2) Use of Low torque bracket prescription to control the flaring of anteriors during leveling and alignment.

Treatment Alternatives:

Extraction of premolars to gain sufficient space for resolution of crowding and alignment of arches could have been done but after careful consideration of patient’s facial profile, constricted upper arch, retroclined lower incisors and mildly depressed mid face, extraction plan was not considered as it might have worsened the patient’s profile and smile esthetics.

Treatment Progress:

A passive self-ligating bracket system with 0.022 slot and low torque was selected and bonded using direct technique with smile arc protection (SAP)⁴ methods up to 2nd molars⁵. Initial alignment was started with 0.013” CuNiTi in both the arches which was kept for 8 weeks followed by 0.014” CuNiTi, placed for another 12 weeks. Open coil spring was placed between 33,35 regions to gain space for alignment of buccally displaced 34. (Figures 4)

Sequentially 0.014” X 0.025” CuNiTi and 0.018” X 0.025” CuNiTi were placed for a total period of 12 weeks. After 32 weeks of leveling and alignment, 0.019” X 0.025” SS wire was placed for arch stabilization for a period of 4 months. Final settling was done using light settling elastics (5/16”, 3.5oz) using drop in hooks in canine premolar region.

The case was debonded after 14 months of treatment and fixed spiral retainers (0.030” SS) were given in 13-23 region and 34-44 region respectively. Removable Hawley’s retainers were also given to

maintain arch width and aid in stabilization in both the arches. (Figure 6) .

Results:

The total duration of the orthodontic treatment was 14 months. Post treatment final records showed a significant improvement in facial esthetics along with well co-ordinated ovoid arch forms with complete leveling and alignment. End results showed a class I molar and canine relationship with good intercuspation of posterior teeth, pleasing facial profile and good soft tissue balance (Figure 5,6).

Post treatment OPG showed acceptable root parallelism with no signs of bone or apical root resorption (Figure 7). Post treatment lateral cephalogram showed acceptable hard tissue and soft tissue changes with mild increase in upper and lower incisors inclination within normal limits (Table 2, Figure 7). Overall, the treatment outcome was well accepted by the patient with harmonious and vibrant smile rendered with non-extraction protocol.

Table 1: Pre- and post-treatment maxillary arch width measurement

Table 2: Pre and post –treatment cephalometric variables

Table 1:		
Parameter (mm)	Pre-treatment	Post -treatment
Maxillary inter-premolar width	31 mm	36 mm
Maxillary inter-molar width	40 mm	42 mm

Table 2:			
Variables	Norms	Pre-treatment	Post-treatment
Sagittal Skeletal Relationship			
SNA	82	73	74
SNB	80	75	75

ANB	2	-2	-1
Dental Base Relationship			
U 1 to NA (mm)	4	4	8
U1 to NA (Degree)	22	24	34
L 1 to NB (mm)	4	2	5
L 1 to NB (Degree))	25	15	24
IMPA	90	84	90
Inter-incisal angle (°)	131	140	124
Vertical Skeletal and Dental Relationship			
FMA (°)	25	22	24
Y Axis (°)	59	56	58
Jaraback's ratio	62-65 %	62	63
Angle of convexity (NA-A Pog) (°)	0	-4	-3
Wits Appraisal	0	-3.5	-1.5
Soft Tissue			
Nasolabial angle (°)	90-110	98	94
Upper lip to E-line (mm)	-4	-3.5	-2.5
Lower lip to E-line (mm)	-2	-1.5	0

Figure Legends:

Figure 1: Pre-treatment extraoral photographs.

Figure 2: Pre-treatment intraoral photographs.

Figure 3: Pre-treatment Lateral cephalogram and OPG.

Figure 4: Mid-treatment intraoral photographs.

Figure 5: Post-treatment extraoral photographs.

Figure 6: Post-treatment intraoral photographs.

Figure 7: Post-treatment Lateral cephalogram and OPG

Figure 1:



Figure 2



Figure 3

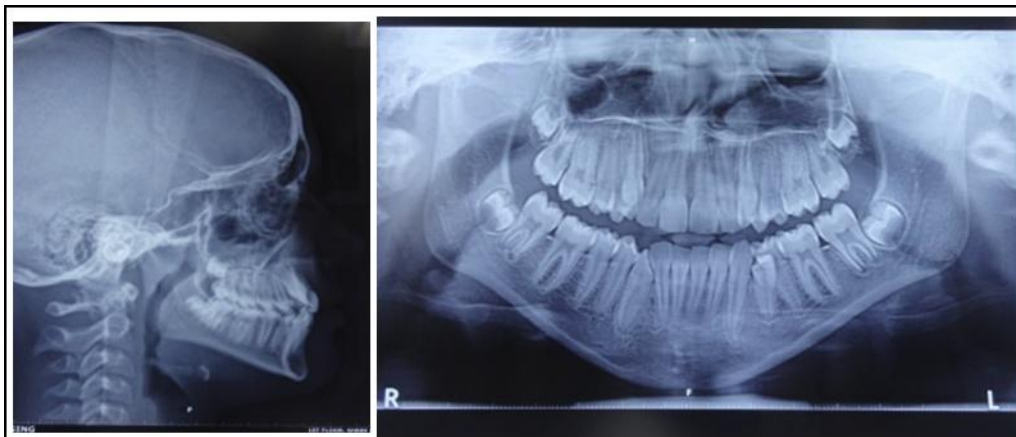


Figure 4:



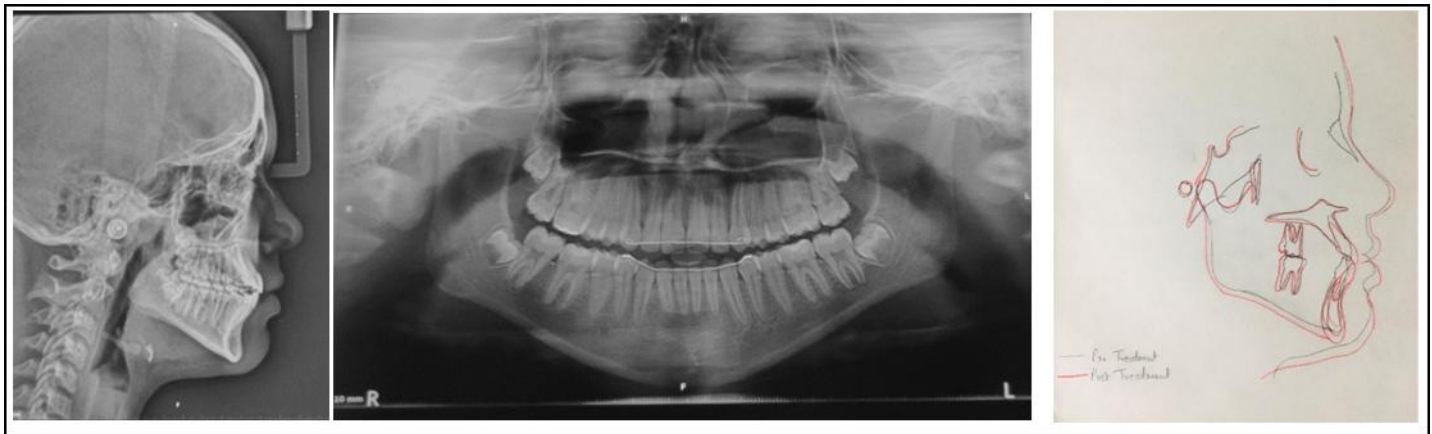
Figure 5



Figure 6



Figure 7



Discussion:

Several factors hindered the mass adoption of the self-ligation system in the orthodontic practice in the past. Significant imperfections in bracket design and performance can be cited as two of the major contributory factors⁵. With the progress of Orthodontics, patients are more accepting this system instead of increased cost of the treatment, but in return of more comfort. There have been a number of studies claiming that self-ligation system leads to less patient discomfort, but opinions and findings have differed⁽⁷⁻⁹⁾. A landmark study by Yamaguchi found that treatment with Damon brackets significantly lowered pain and inflammation levels compared with conventional ligation at 24 hours after archwire placement⁽¹⁰⁾. For one school of thought self-ligation system has become an alternative for extraction. This

system provides a combination of least friction and good archwire control that is believed to facilitate relief of crowding without extraction. Hence the choice of treatment for the above case. A well-known case study by Dr. Birnie demonstrated how severe crowding may be treated by non-extraction principle using the Damon philosophy¹¹.

In this case, crowding was relieved in both the upper and lower arches with the high labially placed canines in upper arch using passive self-ligating system. Well-coordinated upper and lower arches with good intercuspation and satisfactory smile esthetics was achieved (Figure 6,7). If we compare the pre- and post-treatment cephalometric variables, there was increase in upper and lower incisor inclination, both within normal limits with lower incisors upright on the mandibular base (Table 2).

The increased upper incisor inclination reduced the obtuse nasolabial angle, thus contributing to lip fullness and better esthetics. The relationship of upper and lower lips to the E-line also point to good esthetic results.

Conclusion:

The self-ligating appliance system is a constantly evolving field in orthodontics. More and more clinicians are turning towards this mode of treatment for ease of ligation and lesser chairside time. However more research needs to be carried out on this aspect contributing to more randomized clinical trials and meta-analysis providing strong evidence supporting the advantages of this system. The self-ligation system does not change a clinician's treatment plan as such but provides the patients as well as the orthodontists with wider treatment options. The rapid improvement in bracket design and ease of use will surely contribute towards more acceptance of this system in the years to come¹.

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