



## ARTICLE

# “SELF LIGATING BRACES FOR TREATMENT OF A BORDERLINE EXTRACTION CASE BY NON EXTRACTION PROTOCOL” – A CASE REPORT

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## Abstract

This case report evaluates the management of a crowded borderline extraction case in a male patient with Class I malocclusion using Self Ligating bracket system. The case ideally required extraction of 1<sup>st</sup> premolars for correction of crowding in the upper and lower anterior region, but was managed with non-extraction merely by moderate arch expansion using self-ligating braces. Clinical and cephalometric evaluation revealed skeletal Class I malocclusion with crowding, an average to horizontal growth pattern, with an orthognathic facial profile. Following fixed orthodontic treatment using self-ligating braces, a marked improvement in patient's smile, facial profile and occlusion was achieved and there was a remarkable increase in the patient's confidence and quality of life. The profile changes and treatment results were demonstrated with proper case selection and good patient cooperation with fixed appliance therapy.

**Keywords:** Self-ligating bracket system, arch expansion, Borderline extraction case, Fixed Appliance Therapy, Class I malocclusion, Crowded dentition, Leptoprosopic facial form, Aesthetic Improvement, Unaesthetic smile, reverse smile arc, Non extraction protocol

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## 1 | INTRODUCTION

Self-ligating brackets are a ligatureless bracket system that has a mechanical device built into the bracket to close off the slot. The concept of Self ligating brackets was not new to orthodontics. It was existing for surprisingly long time in orthodontics, Russell lock edgewise attachment being described by Dr Jacob Stolzenberg in 1935. Newer designs of these bracket have continued to appear even today. This continued popularity of self-ligating brackets has attracted more than a small percentage of brackets manufacturers, sales and users<sup>[1]</sup>. In Today's times, Fixed Appliance treatment can significantly alter and improve facial appearance in addition to correcting irregularity of the teeth. Class I malocclusion is the second most prevalent occlusion after Class II malocclusion.<sup>[2-3,14-15]</sup> Over the last few decades, there has been an increase in the awareness about orthodontic treatment which has led to more and more adults demanding high quality treatment in the shortest possible time with increased efficiency and reduced costs.<sup>[4,16-18]</sup> There are many ways to treat Class I malocclusions, according to the characteristics associated with the problem, such as anteroposterior discrepancy, age, and patient compliance.<sup>[5-6,20]</sup> The indications for extractions in orthodontic practice have historically been controversial.<sup>[7-9,21]</sup> On the other hand, correction of Class I malocclusions in growing patients, with subsequent dental camouflage to mask the skeletal discrepancy, can involve either retraction by non-extraction means simply by utilizing the available spaces or by extractions of premolars.<sup>[10-11]</sup> Lack of crowding or cephalometric discrepancy in the mandibular arch is an indication of 2 premolar extraction.<sup>[12-13,22-25]</sup> Fortunately, in some instances satisfactory results with an exceptional degree of correction can be achieved without extraction of permanent premolars. This case presents the correction of a Class I malocclusion in an adult male patient with spaced upper and lower anterior teeth and presence of maxillary midline diastema by executing a non-extraction fixed orthodontic protocol. The Non-Extraction protocol shown in this case is indicative of how an unesthetic smile can be converted into an aesthetic and pleasant one by routine

fixed Orthodontic treatment without need for any extractions simply by utilizing the existing available spaces.

### 1.1 | CLASSIFICATION OF SELF LIGATING BRACES

Single Interactive System Eg: Speed

Twin Interactive System Eg : Activa  
Active

1. Speed – Orec – 1980 – Herbert Hanson
2. Time - Adenta - 1994 –Wolfgang Heiser
3. EvolutionIt – Adenta – 2002 - Wolfgang Heiser
4. Inovation – Gac – 2000 – Micheal C Alpern
5. Inovation – R – Gac –2002 - Micheal C Alpern

Passive

1. Edgelock – Ormco – 1972 –Jim Wildman
2. Mobil Lock – Forestadent – 1974 – Franz Sander
3. Activa – A Company – 1986 – Erwin Pletcher
4. Damon SI – A Company 1996 - Dwight Damon
5. Twin Lock – Ormco – 1998 – Jim Wild Man
6. Damon 2 - A Company – 2000 - Dwight Damon

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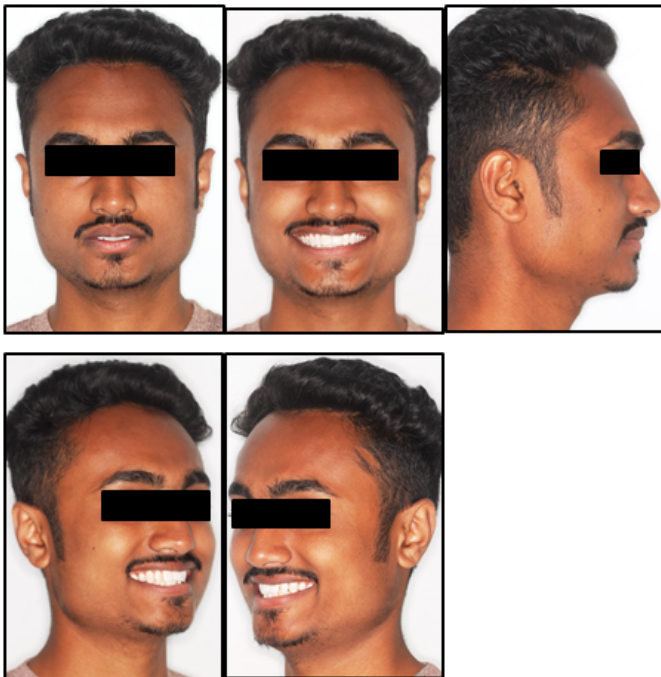
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## 2 | CASE REPORT

### 2.1 | EXTRA-ORAL EXAMINATION

A 23 year old male patient presented with the chief complaint of irregularly placed upper and lower front teeth and was seeking treatment for the same. On Extraoral examination, the patient had an almost orthognathic facial profile, grossly symmetrical face on both sides, competent lips, moderately deep mento-labial sulcus and an obtuse Nasolabial Angle, a Leptoprosopic facial form, Dolicocephalic head form and average width of nose and mouth. The patient had no relevant prenatal, natal, postnatal history, history of habits or a family history. On Smiling, there was presence of an unaesthetic reverse smile arc, wide buccal corridor spaces bilaterally and a toothy smile. He was very dissatisfied with his smile.



**FIGURE 1:** PRE TREATMENT EXTRA-ORAL PHOTOGRAPHS

### 2.2 | INTRA-ORAL EXAMINATION

Intraoral examination on frontal view showed presence of an average overjet and overbite with non-coincident dental midlines. The patient's lower dental midline was shifted to the left by 0.5mm. There was presence of mild crowding in the upper arch and

moderate crowding in the lower anterior region with a non-consonant reverse smile arc. On lateral view the patient showed the presence of Class I incisor relationship, a Class I Canine relationship bilaterally and a Class I molar relationship bilaterally. The upper and lower arch shows the presence of a "U" shaped arch form.



**FIGURE 2:** PRE TREATMENT INTRA-ORAL PHOTOGRAPHS

## 3 | DIAGNOSIS

This 23 year old male patient was diagnosed with a I malocclusion on a Class I Skeletal base with an horizontal growth pattern, slightly proclined upper and lower incisors, crowding in the upper and lower anterior region with non-coincident dental midlines and an increased and wide buccal corridor space bilaterally

### 3.1 | LIST OF PROBLEMS

1. Crowding in maxillary and mandibular anterior teeth
2. Non coincident dental midlines

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**TABLE 1: PRE TREATMENT CEPHALOMETRIC READINGS**

PARAMETERS	PRE- TREATMENT
SNA	83°
SNB	82°
ANB	1°
WITS	0mm
MAX. LENGTH	89mm
MAN. LENGTH	108mm
IMPA	93°
NASOLABIAL ANGLE	106°
U1 TO NA DEGREES	26°
U1 TO NA mm	3mm
L1 TO NB DEGREES	25°
L1 TO NB mm	2mm
U1/L1 ANGLE	129°
FMA	23°
Y AXIS	61°
L1 TO A-POG	1mm
CONVEXITY AT PT. A	0mm
LOWER LIP- E PLANE	1mm
N-PERP TO PT A	0mm
N-PERP TO POG	1mm
CHIN THICKNESS	11mm

- Fixed appliance therapy with Self ligating 0.022 inch bracket slot
- Initial leveling and alignment with 0.012”, 0.014”, 0.016”, 0.018”, 0.020” Niti archwires
- Piggy back Niti arch wire in the lower arch for getting the lower lateral incisors in alignment
- Retraction and closure of spaces by use of 0.019” x 0.025” rectangular NiTi followed by 0.019” x 0.025” rectangular stainless steel wires. Group A anchorage in the upper and lower arch to maintain a Class I incisor, canine and molar relationship
- Final finishing and detailing with 0.014” round stainless steel wires
- Retention by means of vacuum formed Essix retainers along with lingual bonded retainers in the upper and lower arch.

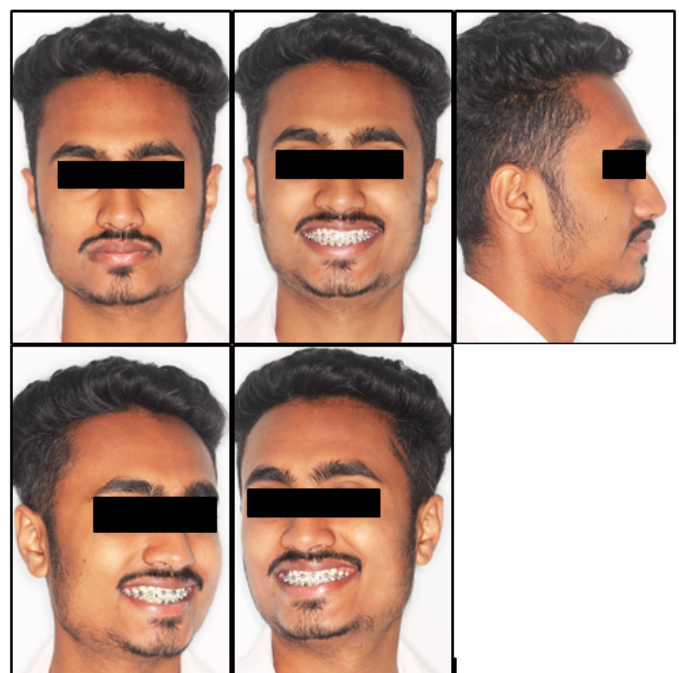
## 3. Reverse smile arc

### 3.2 | TREATMENT OBJECTIVES

1. To correct crowding in maxillary and mandibular anterior teeth
2. To correct the non-coincident dental midlines
3. To correct the reverse smile arc
4. To maintain Class I incisor, canine and molar relationship
5. To achieve a pleasing smile and a pleasing profile

## 4 | TREATMENT PLAN

- Non Extraction protocol was followed



**FIGURE 3: MID TREATMENT EXTRA-ORAL PHOTOGRAPHS**





**FIGURE 4: MID TREATMENT INTRA-ORAL PHOTOGRAPHS**

#### 4.1 | TREATMENT PROGRESS

Complete bonding & banding in both maxillary and mandibular arch was done, using Self ligating 0.022X0.028" slot. Initially a 0.012" NiTi wire was used which was followed by 0.014, 0.016", 0.018", 0.020" Niti archwires. Piggy back Niti was used in the lower arch to get the in standing lateral incisors in alignment. After 8 months of alignment and leveling NiTi round wires were discontinued. Use of 0.019" x 0.025" rectangular NiTi followed by 0.019" x 0.025" rectangular stainless steel wires was done. Reverse curve of spee in the lower arch and exaggerated curve of spee in the upper arch was incorporated in the heavy arch wires to prevent the excessive bite deepening during retraction process and also to maintain the already existing normal overjet and overbite. Group A anchorage was needed in the upper and lower arch to maintain a Class I incisor, canine and molar relationship. The space required for correction of crowding was achieved by arch expansion in the maxillary and mandibular arch facilitated by the self-ligating bracket system. After unraveling of existing crowding and getting the dentition in a proper arch form, light settling elastics were given with rectangular steel wires in lower arch and 0.012"

light NiTi wire in upper arch for settling, finishing, detailing and proper intercuspation. The upper and lower anterior crowding was corrected with an ideal occlusion at the end of the fixed appliance therapy. There was improvement in occlusion, smile arc and position of chin at the end of the treatment.

**TABLE 2: MID TREATMENT CEPHALOMETRIC READINGS**

PARAMETERS	MID- TREATMENT
SNA	82°
SNB	82°
ANB	0°
WITS	0mm
MAX. LENGTH	88mm
MAN. LENGTH	107mm
IMPA	92°
NASOLABIAL ANGLE	107°
U1 TO NA DEGREES	25°
U1 TO NA mm	2mm
L1 TO NB DEGREES	24°
L1 TO NB mm	2mm
U1/L1 ANGLE	131°
FMA	24°
Y AXIS	60°
L1 TO A-POG	2mm
CONVEXITY AT PT. A	0mm
LOWER LIP- E PLANE	2mm
N-PERP TO PT A	0mm
N-PERP TO POG	2mm
CHIN THICKNESS	12mm

#### 5 | DISCUSSION

In orthodontic sliding mechanics, friction is determined by the type of archwire, the type of bracket and the method of ligation. In active Self-ligating system, friction is produced as a result of the clip pressing against the archwire. These brackets have greater torque control without unduly increasing the friction. In the passive self-ligating system, there is no actual contact of the clip with the archwire. The full bracket expression is achieved only when higher dimensional wires are used. The low friction of interactive brackets allows the application of

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consistent, light forces for efficient flow mechanics during retraction. This, in turn, reduces posterior anchorage loss. Lower net force deflects the arch wire and facilitates release of binding force between arch wire and bracket, thus enhancing sliding of bracket along the arch wire. The high friction of conventional twin brackets with repeated elastomeric or metal ligation eventually controls tooth movement, but resists flow mechanics and thus taxes anchorage. Brackets with shoulders that lift ligatures away from large round archwires have near-zero friction and avoid straining anchorage, but can compromise tooth control<sup>1</sup>. Treatment of a crowded Class I malocclusion without extractions premolars is challenging. A well-chosen individualized treatment plan, undertaken with sound biomechanical principles and appropriate control of orthodontic mechanics to execute the plan is the surest way to achieve predictable results with minimal side effects. Class I malocclusion might have any number of a combination of the skeletal and dental components. Hence, identifying and understanding the etiology and expression of Class I malocclusion and identifying differential diagnosis is helpful for its correction. The patient's chief complaint was irregularly placed upper and lower front teeth. The case was of a clear bimaxillary dentoalveolar protrusion with proclined upper and lower anterior dentition with crowding. In this case we choose to use Self- ligating bracket system as this was a borderline extraction case with crowding in the upper and lower anterior region and increased buccal corridor spaces. The execution of all 1<sup>st</sup> premolar extraction followed by Fixed appliance therapy would appropriately help in achieving all pre-treatment goals in this case. The most important point to be highlighted here is the decision to not extract the premolars. After analysing the case thoroughly and reading all pretreatment cephalometric parameters along with evaluating the case clinically, a decision was made of proceeding with the treatment without extraction of any premolars. The case was indicative of a borderline extraction case with need for arch expansion. The patient had wide unaesthetic looking buccal corridor spaces and hence a decision was made to use self-ligating brackets in this case as self-ligating brackets did provide moderate arch expansion for gaining space for correction of exist-

ing crowding. Proximal stripping with alignment of anterior crowded dentition was also a good option in this case as this would address the patient concerns at the end of the treatment, but we decided to avoid proximal stripping and execute the same only if it was absolutely necessary. It was decided to evaluate for proximal stripping towards the end of treatment. There was improvement in occlusion, smile arc, profile and position of chin. Successful results were obtained after the fixed Self ligating appliance therapy within a stipulated period of time. The overall treatment time was 14 months. After this active treatment phase, the profile of this 23 year old male patient improved significantly as seen in the post treatment Extra oral photographs. Vacuum formed essix retainers were then delivered to the patient along with fixed lingual bonded retainers in upper and lower arch.

**TABLE 3: POST TREATMENT CEPHALOMETRIC READINGS**

PARAMETERS	POST- TREATMENT
SNA	82°
SNB	82°
ANB	0°
WITS	0mm
MAX. LENGTH	88mm
MAN. LENGTH	106mm
IMPA	91°
NASOLABIAL ANGLE	107°
U1 TO NA DEGREES	22°
U1 TO NA mm	2mm
L1 TO NB DEGREES	23°
L1 TO NB mm	3mm
U1/L1 ANGLE	133°
FMA	24°
Y AXIS	59°
L1 TO A-POG	3mm
CONVEXITY AT PT. A	0mm
LOWER LIP- E PLANE	2mm
N-PERP TO PT A	0mm
N-PERP TO POG	1mm
CHIN THICKNESS	12mm

**TABLE 4: COMPARISON OF PRE AND POST TREATMENT CEPHALOMETRIC READINGS**

PARAMETERS	PRE-TREATMENT	MID-TREATMENT	POST-TREATMENT
SNA	83°	82°	82°
SNB	82°	82°	82°
ANB	1°	0°	0°
WITS	0mm	0mm	0mm
MAX. LENGTH	89mm	88mm	88mm
MAN. LENGTH	108mm	107mm	106mm
IMPA	93°	92°	91°
NA-SOLABIAL ANGLE	106°	107°	107°
U1 TO NA DEGREES	26°	25°	22°
U1 TO NA mm	3mm	2mm	2mm
L1 TO NB DEGREES	25°	24°	23°
L1 TO NB mm	2mm	2mm	3mm
U1/L1 ANGLE	129°	131°	133°
FMA	23°	24°	24°
Y AXIS	61°	60°	59°
L1 TO A-POG	1mm	2mm	3mm
CONVEXITY AT PT. A	0mm	0mm	0mm
LOWER LIP- E PLANE	1mm	2mm	2mm
N-PERP TO PT A	0mm	0mm	0mm
N-PERP TO POG	1mm	2mm	1mm
CHIN THICKNESS	11mm	12mm	12mm

**FIGURE 5: POST TREATMENT EXTRA-ORAL PHOTOGRAPHS****FIGURE 6: POST TREATMENT INTRA-ORAL PHOTOGRAPHS**

## 6 | CONCLUSION

Self-Ligating brackets thus offer valuable combinations of extremely low friction, secure full bracket engagement and reduction in duration of archwire ligation. These development offer the possibility of a significant reduction in average treatment time and also in anchorage requirements, particularly in cases requiring large tooth movements. Whilst further refinements are desirable and further studies essential, current brackets are able to deliver measurable benefit with good robustness and easy to use mechanism. This case report shows how a simple Class



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**FIGURE 7: RETENTION**

I crowding case can be managed without extraction of premolars by means of appropriate use of simplified fixed orthodontic treatment and efficient conservation of anchorage at the same time. The planned goals set in the pre-treatment plan were successfully attained. Good intercuspation of the teeth was achieved with a Class I molar , incisor and canine relationship. The maxillary and mandibular teeth were found to be esthetically satisfactory in the line of occlusion. Patient had an improved smile and profile. The correction of the malocclusion was achieved, with a significant improvement in the patient aesthetics and self-esteem.

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