

Balancing Act: Personalised Treatment with Self-ligating Brackets in a Case Involving Extraction

RUCHIKA PANDEY¹, RANJIT KAMBLE², JENI MATHEW³, DHWANI SUCHAK⁴, HARIKISHAN KANANI⁵

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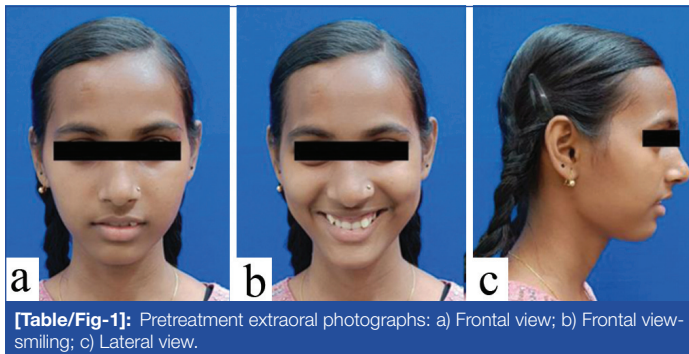
ABSTRACT

The present report explores the use of self-ligating brackets in treating Class I malocclusion with mild crowding and a constricted maxillary arch. Self-ligating brackets, designed as an alternative to expansion appliances, prove effective in expanding the maxillary arch by allowing larger archwires. The benefits include reduced friction, potentially faster and more comfortable tooth movement, and easier dental hygiene. While commonly associated with non extraction orthodontics, self-ligating brackets are adaptable to cases requiring tooth extraction for severe crowding. This assessment guides a personalised treatment plan, which may involve extraction, with careful placement of self-ligating brackets on remaining teeth. Hereby, the authors present a case report of 15-year-old female patient showcasing a unique technique for dealing with such cases, in which the advantages of self-ligating brackets are utilised to alleviate crowding with much simpler movement while also enhancing confidence.

Keywords: Crowding, Fixed orthodontics, Orthodontic extraction, Sliding mechanics

CASE REPORT

A 15-year-old female patient reported to the Orthodontic Department with the chief complaint of misaligned teeth and poor aesthetics. During the extra-oral examination, it was observed that the patient had a face with a symmetrical mesoprosopic form, and her lips were incompetent. The upper lip was hypotonic, while the lower lip was everted. On the profile examination, the patient had a convex facial profile. Her smile was symmetrical, and it showed more than 50% incisor display, which was non-consonant [Table/Fig-1a-c].

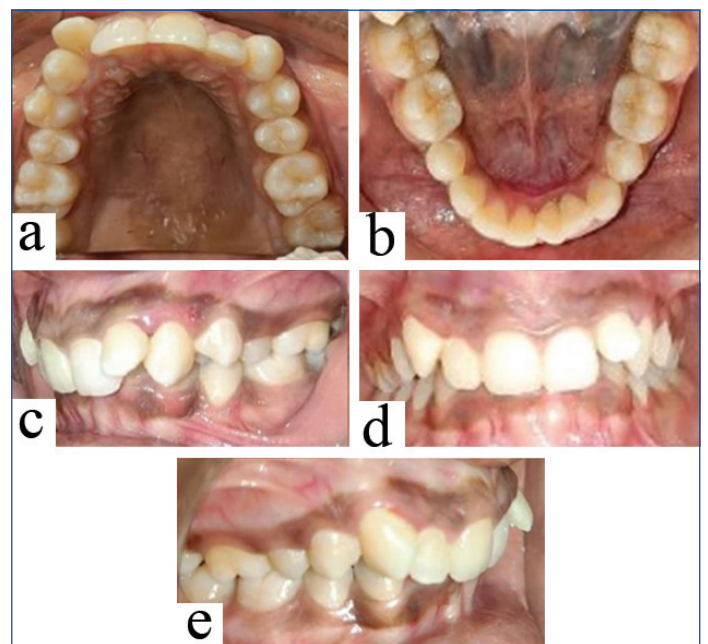


[Table/Fig-1]: Pretreatment extraoral photographs: a) Frontal view; b) Frontal view-smiling; c) Lateral view.

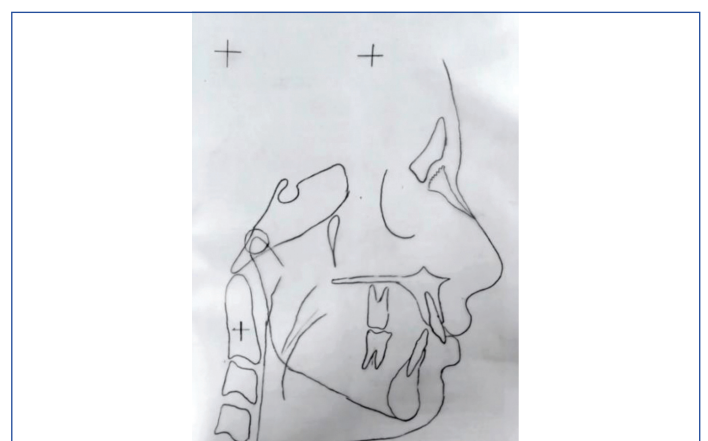
Intraoral examination revealed that all teeth are present in both arches except for the third molars: Class I molar on both sides and Class II canines relation on both sides were present. Reduced overjet and increased overbite was also seen. Crowding was seen in the upper arch [Table/Fig-2a-e].

Cephalometric analysis done by Hassel and Farman AG method revealed that the patient was in Cervical Vertebral Maturation Index (CVMI) stage V (maturation) and had Class I skeletal bases, vertical growth pattern [Table/Fig-3] [1]. There was retroclination of the upper incisors. The soft-tissue analysis revealed a decreased nasolabial angle and deep mentolabial sulcus. Orthopantomogram analysis shows the presence of all permanent teeth with developing third molars in the third and fourth quadrants with a normal glenoid fossa condyle relationship [Table/Fig-4a,b].

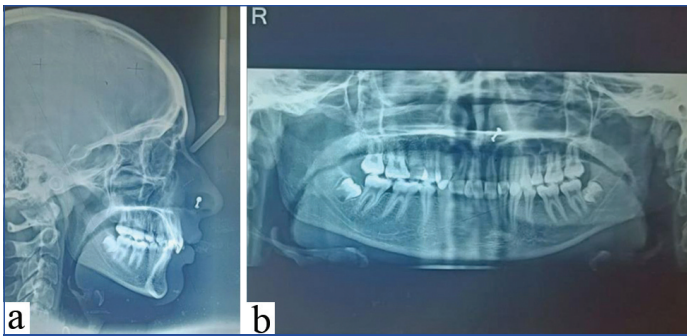
The problem list of the patient includes retroclination of upper incisors with moderate crowding in the upper and lower anteriors analysed by Carey's arch perimeter analysis [2]. Reduced overjet and increased overbite are also seen, along with incompetent lips and a convex profile.



[Table/Fig-2]: Pretreatment intraoral photographs: a) Maxillary occlusal view; b) Mandibular occlusal view; c) Left molar in occlusion; d) Frontal view in occlusion; e) Right molar in occlusion.



[Table/Fig-3]: Cephalometric tracing showing CVMI staging by Hassel and Farman AG method.



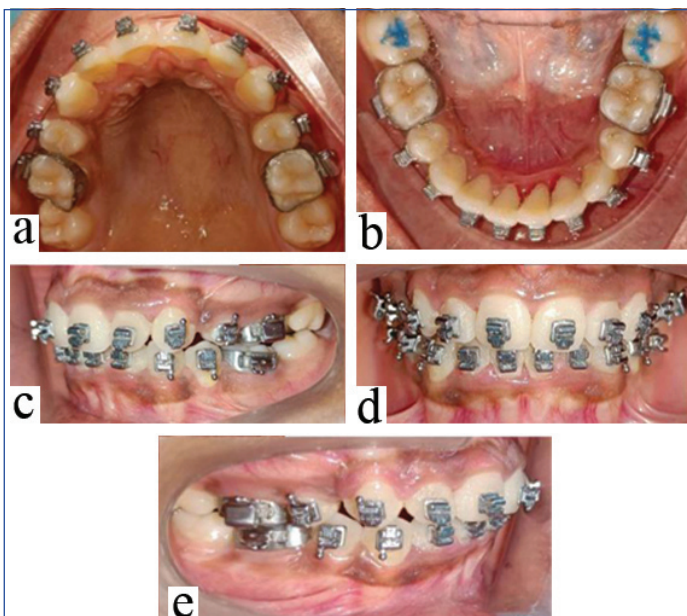
[Table/Fig-4]: a) Pretreatment lateral cephalogram; b) Pretreatment orthopantomogram.

Treatment plan

The case was started by educating and motivating the patient about the treatment approach. Four premolar extractions were done in this case. Following oral prophylaxis and extraction of all four premolars, type A anchorage preparation was done, and a 0.22 MBT slot prescription (North American Braces SELFY Passive Self-ligating Bracket System) was used. Bonding of the upper and lower arches was done with banding of all four first molars. Initial leveling and alignment of both arches were done using 0.14 Cu Niti, 0.16 Cu Niti, 0.16*0.22 Cu Niti, and 0.18*0.25 Cu Niti. Retraction and space closure in both arches were done using 0.19*0.25 Cu Niti. After finishing and detailing in both arches, permanent lingual bonded retainers will be given in both arches [Table/Fig-5a-c,6a-e].

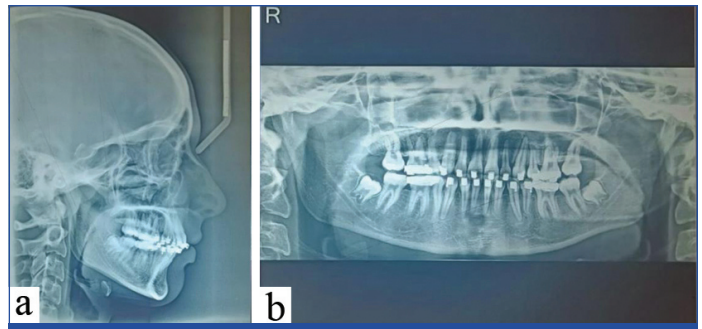


[Table/Fig-5]: Post-treatment extraoral photographs: a) Frontal view; b) Frontal view-smiling; c) Lateral view.



[Table/Fig-6]: Post-treatment intraoral photographs: a) Maxillary occlusal view; b) Mandibular occlusal view; c) Left molar in occlusion; d) Frontal view in occlusion; e) Right molar in occlusion.

Class I canine and molar relationships with optimal overjet and overbite were achieved bilaterally following treatment, yielding satisfactory results [Table/Fig-6a-e,7a,b]. The time taken to achieve this correction was around 15 months.



[Table/Fig-7]: a) Post-treatment lateral cephalogram; b) Post-treatment orthopantomogram.

The cephalometric and clinical Class I canine and molar relationships with optimal overjet and overbite were achieved bilaterally following treatment, yielding satisfactory results [Table/Fig-6,8]. The time taken to achieve this correction was around 15 months. Before and after treatment were evaluated [Table/Fig-8,9a,b].

Measurement	Mean value	Pre treatment	Post treatment
SNA	82°	73°	71°
SNB	80°	68°	68°
SND	76°	67°	67°
ANB	2°	5°	3°
Facial angle/depth	87.8°	83°	80°
Go-Gn to SN	32°	35°	32°
1 to NA	22°	29°	22°
1 to NB	25°	30°	24°
IMPA	90°	100°	87°

[Table/Fig-8]: Cephalometric readings.

SNA: the angle between the sella-nasion plane and the nasion-A plane
 SNB: the angle between the sella-nasion plane and the nasion-B plane
 SND: the angle between the sella-nasion plane and the nasion-D plane
 ANB: the angle between the A-nasion plane and the nasion-B plane
 Facial Angle: the angle between the Frankfurt Horizontal plane and the nasion-Pogonion plane
 Go-Gn to SN: the angle between the Gonion-Gnathion plane and the Sella-Nasion plane
 1 to NA: the angle between the long axis of Maxillary Incisor and the nasion-A plane
 1 to NB: the angle between the long axis of Mandibular Incisor and the nasion-B plane
 IMPA: Incisor mandibular plane angle



[Table/Fig-9]: a) Pretreatment photograph; b) Post-treatment photograph.

DISCUSSION

An increase in arch perimeter is often necessary for patients with a Class I malocclusion and permanent dentition to correct mild crowding and a constricted maxillary arch. To achieve this, the incisors procline and expand transversely. Self-ligating brackets were invented as an alternative to expansion appliances, allowing larger archwires to expand the maxillary arch in cases of maxillary constriction. In present case, because the patient had mild crowding, a deep curve of Spee, and an increased overbite, an alternate approach was used: extraction

with self-ligating brackets. This not only restored the patient's oral condition but also her profile. Cephalometric readings show skeletal Class II correction (ANB), a counterclockwise rotation of the mandible plane (Go-Gn to Sn), and correction of proclined upper and lower anteriors (1 to NA and IMPA). The benefits of self-ligating brackets include decreased friction and potentially quicker, more comfortable tooth movement, as well as easier dental hygiene due to the absence of ligatures. However, it is important to combine the required sliding mechanics with the least amount of friction possible to aid in leveling and alignment [3]. Self-ligating brackets are commonly associated with non-extraction orthodontic treatments, but they can also be used in cases where tooth extraction is necessary to address severe crowding or other orthodontic issues [4]. The patient's dental condition, including the degree of crowding, tooth size, jaw size, and facial aesthetics, is evaluated by the orthodontist. If severe crowding or other issues require extraction, it is decided during the assessment phase [5]. The initial examination, customised planning, bracket placement, archwire installation, and recurring adjustments are all part of the total treatment strategy. With confidence, present case study offers a tried-and-true extraction method for handling dentoalveolar Class I cases with arch crowding [6]. Other studies have also shown the favourable results that support authors approach.

According to Shivapuja PK and Berger J self-ligating bracket systems have several advantages over traditional methods of orthodontic treatment. These systems reduce both static and dynamic frictional resistance, resulting in benefits for both hard and soft-tissues. Additionally, they decrease the time required for archwire removal and insertion, providing ergonomic and economic advantages. One of the main benefits of self-ligating brackets is that they do not promote poor oral hygiene, which can be an issue with elastomeric ties. They also eliminate the risk of soft-tissue laceration to both the patient and the orthodontist that can occur with the use of stainless steel tie wires [7]. Pandis N et al., in his study, showed that when compared self-ligating and conventional bracket groups, crowding correction was generally correlated with increases in intercanine and intermolar distance; statistically, intermolar width increases were higher with Damon 2 self-ligating brackets than with conventional appliances. In both bracket groups, there was an overall rise in the mandibular incisors' proclination linked to crowding correction [8]. Gebeile Chauty S in his article evaluated the use of self-ligating brackets in terms of extractions, biomechanics, ergonomics, stability of outcomes, and iatrogenic effects. Self-ligating brackets have been shown in tests to increase arch growth, but they do not control tilting or variations in bone thickness [9]. A small number of situations describe the non extraction management of a crowded borderline extraction case using the self-ligating bracket system, in which the extraction of the first premolars was necessary to correct

crowding in the upper and lower anterior region. However, in this instance, a non extraction strategy using a traditional appliance would have led to severe incisor proclination and buccal tilting of posterior teeth; hence, extraction with the advantages of self-ligating brackets was selected [10,11].

CONCLUSION(S)

To achieve a successful and long-lasting orthodontic treatment outcome, it is essential to have a well-thought-out treatment plan based on a reliable diagnosis. In present particular case, the occlusal relationship and the patient's dental and facial aesthetics were significantly improved through the use of self-ligating brackets. These brackets are designed to reduce friction and pressure on the teeth, which can help minimise discomfort and decrease the time it takes for the teeth to move into their proper positions. Additionally, light, regulated forces were utilised to close the extraction area. This was achieved through the use of sliding mechanics. By utilising these techniques, the patient was able to achieve a beautiful, healthy smile with minimal discomfort and in a relatively short period of time.

REFERENCES

- [1] Hassel B, Farman AG. Skeletal maturation evaluation using cervical vertebrae. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 1995;107(1):58-66.
- [2] Carey CW. Linear arch dimension and tooth size; An evaluation of the bone and dental structures in cases involving the possible reduction of dental units in treatment. *Am J Orthod*. 1949;35(10):762-75.
- [3] Zreaqat M, Hassan R. Self-ligating Brackets: An Overview. *Principles in Contemporary Orthodontics*. 2011:01-25.
- [4] Dahiya S, Negi G, Arya A, Chitra P. The Extraction-Non Extraction Conundrum and the Role of Self Ligation in Present Day Mechanotherapy. *Orthodontic Journal of Nepal*. 2018;8(2):60-67.
- [5] Basati MS. Demonstrating the benefit of self-ligating brackets in the management of severe dental crowding on a non-extraction basis. *Orthodontic Update*. 2017;10(4):151-56. Available from: https://www.researchgate.net/publication/325268433_Demonstrating_the_benefit_of_self-ligating_brackets_in_the_management_of_severe_dental_crowding_on_a_non-extraction_basis.
- [6] Initial arch wires for tooth alignment during orthodontic treatment with fixed appliances. *Cochrane Database Syst Rev*. 2013; 2013(4): CD007859. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6465075/>.
- [7] Shivapuja PK, Berger J. A comparative study of conventional ligation and self-ligation bracket systems. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 1994;106(5):472-80.
- [8] Pandis N, Polychronopoulou A, Eliades T. Self-ligating vs conventional brackets in the treatment of mandibular crowding: A prospective clinical trial of treatment duration and dental effects. *Am J Orthod Dentofac Orthop Off Publ Am Assoc Orthod Its Const Soc Am Board Orthod*. 2007;132(2):208-15.
- [9] Gebeile-Chauty S. Are self-ligating brackets an advantageous alternative for non-extraction treatments? *J Dentofac Anom Orthod*. 2014;17(4):402.
- [10] Irshad R, Gupta A, Joshi S, Singh A, Gangwar S. Self-ligating brackets: A case report. *Journal of Dental Sciences and Oral Rehabilitation*. 2021;12(1):48-52. Available from: [Chrome-extension://efaidnbmnibpcajpcjolefindmkaj/https://jdsor.com/wp-content/uploads/2021/09/11.pdf](https://ejournalbmnibpcajpcjolefindmkaj/https://jdsor.com/wp-content/uploads/2021/09/11.pdf).
- [11] Rodrigues L, Chawla Jamenis S, Jamenis, Jawale D bhushan, Shaikh A, Kadam T, et al. Self ligation braces for treatment of a borderline extraction case by non extraction protocol- A case report. *Advanced Research Journal of Medical and Clinical Sciences* 2021;7(05):498-505.

PARTICULARS OF CONTRIBUTORS:

1. Postgraduate Student, Department of Orthodontics and Dentofacial Orthopedics, Sharad Pawar Dental College, Wardha, Maharashtra, India.
2. Professor, Department of Orthodontics and Dentofacial Orthopedics, Sharad Pawar Dental College, Wardha, Maharashtra, India.
3. Postgraduate Student, Department of Orthodontics and Dentofacial Orthopedics, Sharad Pawar Dental College, Wardha, Maharashtra, India.
4. Postgraduate Student, Department of Orthodontics and Dentofacial Orthopedics, Sharad Pawar Dental College, Wardha, Maharashtra, India.
5. Postgraduate Student, Department of Pediatric and Preventive Dentistry, Sharad Pawar Dental College, Wardha, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Ruchika Pandey,
Postgraduate Student, Department of Orthodontics and Dentofacial Orthopedics,
Sharad Pawar Dental College, Sawangi (M), Wardha, Maharashtra-442001, India.
E-mail: ruchika938pandey@gmail.com

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