CASE REPORT
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ISTANBUL UNIVERSITY CERRAHPASA

Camouflage Treatment of an Adult Patient with Skeletal Class III Malocclusion and Severe Crowding Using Passive Self-ligating Braces

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Abstract

This case report presents the camouflage treatment of an adult patient with skeletal class III malocclusion and severe crowding who was treated with a passive self-ligating bracket system. A 15-year-old female patient presented with a chief complaint of asymmetric and concave profile due to mandibular prognathism and retrusive upper lip with severe maxillary and mandibular crowding and anterior crossbite. The treatment plan included double jaw orthognathic surgery for the correction of skeletal class III malocclusion and mandibular laterognathia. However, the patient refused this option because of surgical risks and costs. Since the patient did not have a very severe asymmetry and it was tolerable by the soft tissues, it was decided to apply camouflage treatment. Considering the patient's severe crowding, a self-ligating bracket system (the Damon Q-passive self-ligating system—"0.022 × 0.028" slot; Ormco, Glendora, Calif, USA) was used for camouflage treatment. The basic foundation of the Damon System and the low friction between the Damon brackets and the wide super-elastic CuNiTi (Damon arc form-Ormco) wires create the optimum force to initiate tooth movement. This light and physiological force accelerates tooth movement, and dental arches are shaped by the expansion of the posterior teeth rather than the inclination of the incisors through "lip bumper effect" of m.orbicularis oris and m.mentalis. As a result, it has been claimed that the Damon system eliminates extraction in medium and severe crowding cases. Also, bodily buccal movement of the posterior teeth provides apposition at buccal alveolar bone.[3-6] At the end of the treatment, the patient was functionally and aesthetically optimized, had the anterior crossbite corrected, and had solved severe crowding without extraction.

Keywords: Self-ligating bracket, camouflage treatment, severe crowding

INTRODUCTION

Orthognathic surgery is the common treatment method for adult patients with skeletal class III anomalies. However, in cases where the anomaly is not severe, orthodontic camouflage treatment is an alternative approach for patients who are disturbed by their dental aesthetics rather than their facial appearance. These cases are defined as "borderline cases."[1,2]

Orthodontic camouflage treatment provides correction of the problem by masking the underlying skeletal problem by correcting dentoalveolar structures and occlusion in patients with skeletal problems.[1,2]

The aim of camouflage treatment is to provide an acceptable occlusion, function, and aesthetics with dentoalveolar compensation and distalization of the lower arch, proclination of the maxillary incisors, and retroclination of the mandibular incisors, regardless of skeletal anomaly.[3,4]

While providing dentoalveolar compensation, the health of periodontal tissues is important. During the movement of incisors, gingival recession that may occur following the resorption of the labial cortical bone should be considered. Gingival recession and fenestration formation are related to the frequency and severity of the applied force, the direction of movement, the volume of periodontal tissues, and the buccolingual width of the alveolar bone. While planning for the treatment, the morphology of the bone and position of the teeth should be carefully evaluated.[3,5-7]

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At the same time, due to the surgical risks like edema, loss of sensation, pain, joint problems, or speech disorders that depend on surgery, adolescent and adult patients are looking for alternative treatment methods to orthognathic surgery[8-10] and so camouflage treatment can be considered for some borderline patients.[11]

Orthodontic treatments for class III malocclusions can be classified as:[12-14]

1. non-extraction treatment,
2. tooth extraction treatments (lower incisor extraction, premolar extraction, lower molar extraction), and
3. skeletal anchorage supported orthodontic treatment (with mini screws and mini plates).

The Damon bracket, which is commonly used in camouflage treatments and one of the most popular self-ligating brackets, was introduced by Dr. Damon in 1990 and has been updated from past to present as an alternative orthodontic treatment system (Damon 2, Damon 3, Damon 3MX, Damon Clear, and Damon Q).[15,16]

According to the study by Keim et al[16], the rate of using self-ligating brackets in the United States has increased from 8.7% in 2002 to 42% in 2008 and this ratio is rapidly increasing today. This philosophical approach claims to have many benefits over conventional bracket systems, including less force applied to the teeth, reduced amount of pain experienced by patients, and higher treatment efficiency.[17,18] The Damon bracket is advertised as "a nearly friction-free" system. Thus, compared to the conventional bracket and the use of ligating ties, it has been claimed that a passive self-ligating bracket, like the Damon, allows a wire to slide through the brackets with lower resistance to sliding, resulting in faster level and alignment of teeth. This philosophical approach also involves the use of the term "optimal force zone," which implies that the force applied to teeth should generate an optimal pressure to allow uninterrupted vascular supply to the tooth and its surrounding system. In addition to the suggested benefits listed above, this philosophy argues that the light force produced by the system allows the connective tissue and alveolar bone to follow tooth movement, and therefore, more expansion of the maxillary arch can be achieved.[19,20] The other advantages of the Damon system include shortening of the chair time and the treatment time and increased patient comfort and oral hygiene.[3,7,19]

Main Points

- Because of the complications of orthognathic surgery, camouflage treatment can be considered for some borderline patients.
- The Damon bracket, which is one of the most popular self-ligating brackets, has been updated from past to present as an alternative orthodontic treatment system (Damon 2, Damon 3, Damon 3MX, Damon Clear, and Damon Q).
- This case revealed the clinical effectiveness of self-ligating brackets in properly selected borderline cases.

Considering all these advantages and disadvantages of these treatment methods and also the suitability of the case, camouflage treatment with the Damon system was planned in this case.

CASE PRESENTATION

Diagnosis and Etiology

The patient was a 15-year-old female. She was concerned about dental crowding and smile aesthetics. She had trauma history when she was 2 years old. She had internal motivation and good oral hygiene (Figure 1).

The patient had an asymmetrical face and the chin deviated toward the right. She had a straight facial profile, retrusive upper lip, and protrusive lower lip. The intraoral photographs showed super class I relationship on the right side and super class I molar and canine relationships on the left side, anterior deep bite with 5.25 mm (55.6%) overbite according to tooth 11 and anterior crossbite with −1.8 mm negative overjet. According to facial midline, maxillary dental midline was deviated 2.3 mm toward the right and mandibular dental midline was deviated 2.8 mm toward the right. She had severe maxillary crowding with right ectopic canine and moderate mandibular crowding localized on anterior, tooth 42 was seen in lingo position. She had a disrupted parabola upper arch form and "V" shaped lower arch form. Arch length discrepancies in the upper and lower arches were −11.8 mm and −4.7 mm, respectively (Figure 1).

Greulich-Pyle Atlas was used to determine the skeletal age of the patient. According to the hand and wrist radiograph, the patient is in the post-peak period and has completed 98.3% of growth development. Therefore, it can be said that the patient is in the late adolescent period (Figure 2).

According to pretreatment lateral cephalometric analysis, she had class III skeletal relationship due to mandibular prognathism (SNA 82°, SNB 83°, Witt's −2.8 mm), retroclined maxillary and mandibular incisors (U1 to N-A 18°/2.3mm, U1 to N-B 18°/2.2mm), and concave profile (S'-Sn-Pg' 173°) (Figure 3A). The posteroanterior cephalometric analysis showed skeletal asymmetry of the mandible, the left ramus was longer by 3 mm than the right ramus, and there was a 2 mm chin deviation toward to right. No pathological condition is observed in panoramic radiography (Figure 4A).

Treatment Alternatives

1. The ideal treatment plan was double jaw orthognathic surgery. However, the patient refused orthognathic surgery option because of surgical risks and financial constraints.
2. Camouflage treatment using conventional fixed orthodontic appliances with 4 premolars extraction would be

Figure 1. Pretreatment extraoral and intraoral photographs.

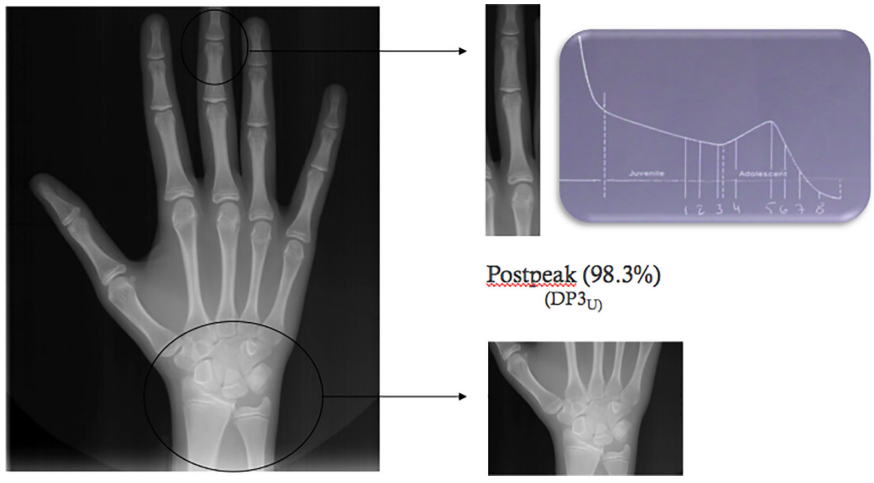

Figure 2. Hand and wrist radiograph.

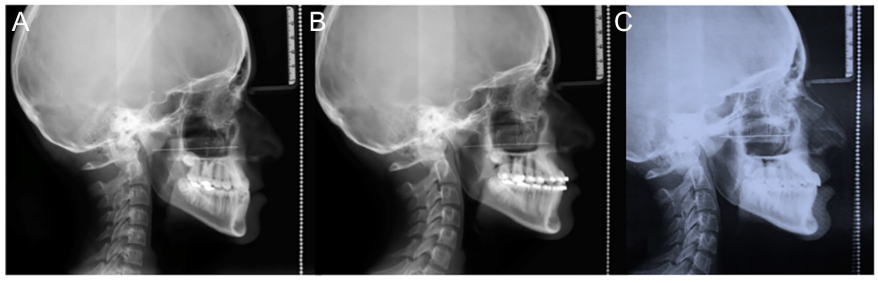

Figure 3. (A) Pretreatment cephalometric radiograph. (B) Mid-stage cephalometric radiograph. (C) Posttreatment cephalometric radiograph.

a treatment alternative. However, this treatment option might worsen the patient's soft tissue profile.

3. The last treatment alternative was using the self-ligating system, which produces an increase in maxillary transverse dentoalveolar width, eliminating tooth extraction.[3-5] As a result, the last treatment alternative was chosen.

Treatment Progress

The Damon Q passive self-ligating brackets (0.022 × 0.028-in slot; Ormco, Glendora, Calif, USA) were bonded. Appointments were given at 6-week intervals and leveling and aligning phase lasted nearly 10 months and the overjet became positive. A 0.017 × 0.025'' purple titanium molybdenum alloy (TMA) archwire with low friction coefficient was used for accelerating tooth movement in sliding mechanics of maxillary anterior teeth (Figure 5). When we use 0.018 × 0.025'' stainless steel archwire in the mandibular teeth, open-coil springs were utilized for gaining space to place 42. Then the tooth 42 was placed in the arch with an auxilliary archwire which is 0.013'' CuNiTi. Leveling and aligning procedures were finished after 14 months of treatment (Figure 4B and 6). Cl I canine relationship was obtained in the working phase using 0.019 × 0.025'' SS archwires, and the upper and lower dental midlines were overlapped using diagonal intermaxillary elastics of 3/16" and 2 oz. After finishing and settling procedures, retention and stability were provided with fixed retainers and Damon essix retainer, respectively (Figures 4C and 6). Total treatment duration was 23 weeks.

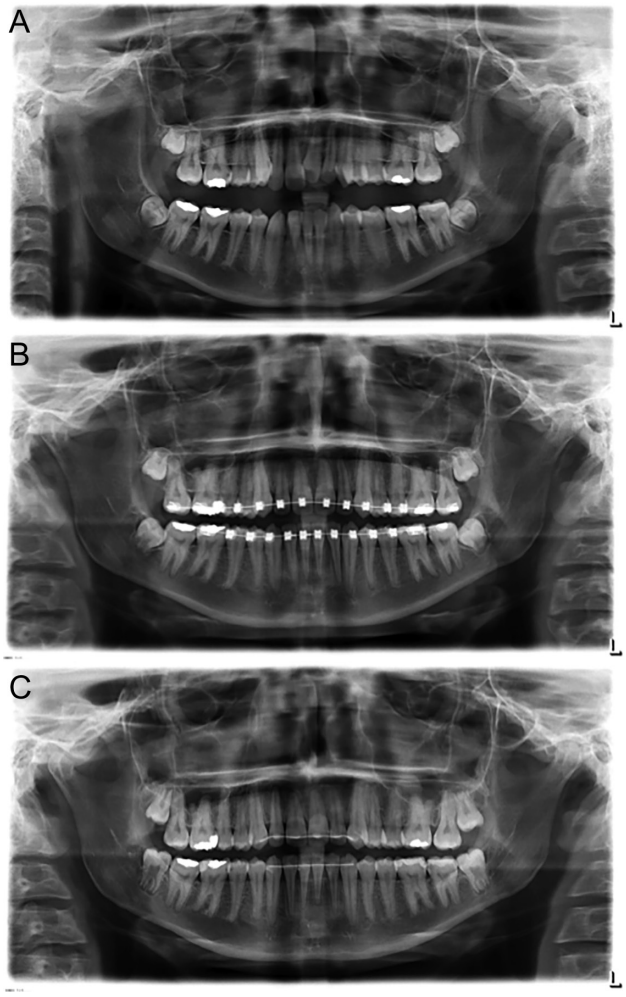

Figure 4. (A) Pretreatment panoramic radiograph. (B) Mid-stage panoramic radiograph. (C) Posttreatment panoramic radiograph.

Treatment Results

At the end of treatment, adult patient with skeletal class III malocclusion and severe crowding was finished with class I molar and canine relationships without the need for premolar extraction using passive self-ligating braces. Negative overjet was corrected, the dark buccal corridors were eliminated, and a huge smile was obtained (Figure 6).

When the cephalometric radiography values were examined at the end of the treatment, in addition to the absence of skeletal changes in the sagittal direction, the vertical development of the patient did not change. An increase in the inclination of the lower and upper incisors and a decrease in the interincisal angle were observed (Figure 7). When the soft tissue values of the patient were examined, an increase in facial convexity was observed (S'-Sn-Pg' 170°). Upper lip moved forward against the S line (from –2 mm to 0 mm). There was a decrease in the nasolabial angle (from 109° to 101°). An increase in the prominence of the labiomental groove was observed (labiomental angle from 156° to 145°) (Figure 6).

Although the inclination of the incisors was slightly increased, camouflage treatment of the patient resulted in functional and aesthetical success (Figure 6 and 8).

Consent form was filled out by all participants.

DISCUSSION

This case revealed the clinical effectiveness of self-ligating braces in properly selected borderline cases. Advantages of self-ligating braces are that they allow better sliding mechanics due to the friction-free design,[5,6] easy to keep clean, require significantly lower treatment times and fewer appointments,[6] and effective at expanding the arch parameters so they can be used in borderline cases.[1,12] The possible disadvantages of this braces system are: the bracket system is inadequate to correct rotations, using self-ligated bracket systems in the border non-extraction patients may cause dehiscences, and fenestrations due to insufficient bone thickness and proper torque control can be challenging with light nickel–titanium wires.[5,18,20] The 2 important factors for treatment with premolar extraction were crowding greater

Figure 5. Using purple TMA archwire with low friction coefficient.

than 7 mm in the maxillary arch and the protrusive profile.[14] However, maxillary premolar extractions would have complicated the correction of the anterior crossbite and might result in a midface deficiency.[14] Therefore, tooth extraction treatment was not preferred in this case. Due to the low inclination of the lower and upper incisors (U1 to N-A 18°/2.3 mm, U1 to N-B 18°/2.2 mm), it was decided that non-extraction treatment could be performed using the protrusion of the incisors and the expansion of the dental arches with the Damon system. However, although the lower incisors' inclination did not increase too much (U1 to N-B 21°/3.4 mm) at the end of the treatment, there was an excessive protrusion of the upper incisors (U1 to N-A 30°/6.5 mm). While we do not prefer the inclination of the upper incisors to increase so much, it is an usual result that can be seen in camouflage treatment.[12,14,18,19]

Figure 6. Posttreatment extraoral and intraoral photographs.

Parameters	Norms	Initial	Postdebonding
Horizontal skeletal parameters			
SNA (°)	81 ± 3	82	83
SNB (°)	78 ± 3	83	83
ANB (°)	3 ± 2	- 1	0
Witt's appraisal (mm)	± 1	- 2,8	-0.8
N'-Sn-Pg' (°)	169±3	173	170
Angle of convexity (°)	0 ± 5	3	0
Vertical skeletal parameters			
Y-axis (°)	60 ± 4	66	67
SN-MdP (°)	32 ± 5	36	37
Dental parameters			
Interincisal angle (°)	135 ± 6	145	130
U1-MxP (°)	109 ± 6	100	113
U1-NA (mm)	4 ± 2	2.3	6.5
L1-MdP (°)	93 ± 6	81	84
L1-NB (mm)	4 ± 2	2.2	3.4
Soft tissue parameters			
Upp lip-E-line (mm)	- 1	- 3	- 1
Low lip-E-line (mm)	- 2 ± 2	0	+ 1
Nasolabial angle (°)	115 ± 2	109	102

Figure 7. Pretreatment and posttreatment lateral cephalometric parameters.

According to Howe's model analysis, at the beginning of the treatment, the distance between the premolars and the apical bone base width decreased in both the maxilla (–4.9 mm/–2.9 mm) and mandibula (–6.3 mm/–5.2 mm). When the intraoral photographs are examined, thick alveolar bone thickness is seen on the buccal side of the posterior teeth. At the end of the treatment, as a result of the expansion effect of the Damon system, the molar and premolar teeth have buccal tipping, and the intermolar distance has increased. The arch forms were corrected. However, according to current literature, it may be useful for dental volumetric tomography to examine the presence of dehiscence and fenestration on the root surfaces.[3-5,20]

Retrochelie superior was seen according to S line (–2 mm) at the beginning of the treatment. An improvement in soft tissue profile was achieved with the upper lip supported by the protrusion of the incisors, but no change was obtained in the patient's mandibular asymmetry. However, the treatment plan was made considering the severity of the asymmetry and the patient's main complaint and wishes. In the future, this mild asymmetry can be corrected with dermal filler applications according to the request of the patient.[9,10]

Even if the desired result is achieved at the end of the treatment in borderline cases, it is important to ensure long-term stability.[7,17,19] As a routine procedure, fixed retainers and essix plaques are made at the end of the treatment. In the current literature, when the long-term treatment results of the Damon system are examined, it has been reported that a contraction in arch parameters is observed.[16,19] For this reason, in this case, in addition to fixed retainers, a fixation

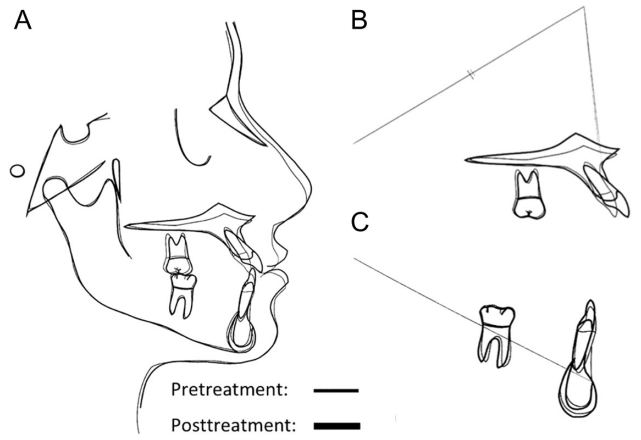

Figure 8. (A) Total superimposition. (B) Maxillary superimposition. (C) Mandibular superimposition.

appliance was made, which is special to Damon system, and consists of upper and lower essix plaques adhered to each other.[3,7] Even so, the long-term stability of the treatment results should be follow up.

In this case report, severe crowding in the upper and lower arch has been solved with passive self-ligating bracket systems. The patient achieved a satisfying facial aesthetic and dental occlusion. Severe crowding in the upper and lower arch has been solved with a passive self-ligating bracket system. The patient's smile has improved as a result of a direct positive effect that has been seen on her quality of life including increasing self-esteem and self-confidence besides functional gains. Although the patient is satisfied with treatment results, the long-term stability of the treatment results should be followed up.

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

Peer-review: Externally peer-reviewed.

Declaration of Interests: The author declare that they have no competing interest.

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REFERENCES

1. Stellzig-Eisenhauer A, Lux CJ, Schuster G. Treatment decision in adult patients with Class III malocclusion: orthodontic therapy or orthognathic surgery? *Am J Orthod Dentofacial Orthop*. 2002;122(1):27-37; discussion 37. [CrossRef]
2. Park JH, Yu J, Bullen R. Camouflage treatment of skeletal Class III malocclusion with conventional orthodontic therapy. *Am J Orthod Dentofacial Orthop*. 2017;151(4):804-811. [CrossRef]
3. Damon DH. The Damon low-friction bracket: a biologically compatible straight-wire system. *J Clin Orthod*. 1998;32(11):670-680.
4. Eliades T, Pandis N. *Self-Ligation in Orthodontics*. UK: Blackwell Publishing Ltd; 2009.
5. Birnie D. The Damon passive self-ligating appliance system. *Semin Orthod*. 2008;14(1):19-35. [CrossRef]
6. Eberting JJ, Straja SR, Tuncay OC. Treatment time, outcome, and patient satisfaction comparisons of Damon and conventional brackets. *Clin Orthod Res*. 2001;4(4):228-234. [CrossRef]
7. Damon D. Damon system: the workbook. *Ormco*. 2005.
8. Kiyak HA, McNeill RW, West RA, Hohl T, Heaton PJ. Personality characteristics as predictors and sequelae of surgical and conventional orthodontics. *Am J Orthod*. 1986;89(5):383-392. [CrossRef]
9. Kiyak HA, McNeill RW, West RA. The emotional impact of orthognathic surgery and conventional orthodontics. *Am J Orthod*. 1985;88(3):224- 234. [CrossRef]
10. Edgerton Jr MT, Knorr NJ. Motivational patterns of patients seeking cosmetic (esthetic) surgery. *Plast Reconstr Surg*. 1971;48(6):551-557. [CrossRef]
11. Mihalik CA, Proffit WR, Phillips C. Long-term follow-up of Class II adults treated with orthodontic camouflage: a comparison with orthognathic surgery outcomes. *Am J Orthod Dentofacial Orthop*. 2003;123(3):266-278. [CrossRef]
12. Tseng LLY, Chang CH, Roberts WE. Diagnosis and conservative treatment of skeletal Class III malocclusion with anterior crossbite and asymmetric maxillary crowding. *Am J Orthod Dentofacial Orthop*. 2016;149(4):555-566. [CrossRef]
13. Keim RG, Gottlieb EL, Nelson AH, Vogels 3RD DS. 2008 JCO study of orthodontic diagnosis and treatment procedures, part 1: results and trends. *J Clin Orthod*. 2008;42(11):625-640.
14. Janson G, Souza JEP, Alves FA, Andrade Jr P, et al. Extreme dentoalveolar compensation in the treatment of Class III malocclusion. *Am J Orthod Dentofac Orthop*. 2005;128:787-794.
15. Wainwright WM. Faciolingual tooth movement: its influence on the root and cortical plate. *Am J Orthod*. 1973;64(3):278-302. [CrossRef]
16. Dibiase AT, Nasr IH, Scott P, Cobourne MT. Duration of treatment and occlusal outcome using Damon3 self-ligated and conventional orthodontic bracket systems in extraction patients: a prospective randomized clinical trial. *Am J Orthod Dentofacial Orthop*. 2011;139(2):e111-e116. [CrossRef]
17. 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 Orthod Dentofacial Orthop*. 2003;124(4):395-402. [CrossRef]
18. Stefanos S, Secchi AG, Coby G, Tanna N, Mante FK. Friction between various self-ligating brackets and archwire couples during sliding mechanics. *Am J Orthod Dentofacial Orthop*. 2010;138(4):463-467. [CrossRef]
19. Chen SS-H, Greenlee GM, Kim J-E, Smith CL, Huang GJ. Systematic review of self-ligating brackets. *Am J Orthod Dentofac Orthop*. 2010;137(726):e1-e726.
20. Yagci A, Veli İ, Uysal T, Ucar FI, Ozer T, Enhos S. Dehiscence and fenestration in skeletal Class I, II, and III malocclusions assessed with cone-beam computed tomography. *Angle Orthod*. 2012;82(1):67-74. [CrossRef]