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Case Report
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NON-EXTRACTION ORTHODONTIC TREATMENT WITH DAMON SYSTEM: TWO CASE REPORTS

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Abstract: Self-ligating braces offer shorter orthodontic treatment, more comfortable follow-up and less chair time. Passive braces are more preferred in self-ligating systems as they cause less friction. Damon system is also one of the most popular passive self-ligating braces. In addition to protrusion of incisors, it is one of the most important advantages of this bracket system that it provides expansion in dental arches. The purpose of these case reports is to present the treatments of two patients treated with Damon System. It can be concluded as; thanks to the Damon braces system, moderate and severe crowding cases were successfully treated in appropriate cases. Treatment times were also shorter compared to average orthodontic treatments. Instead of stripping and tooth extraction, which are among the methods of gaining space in orthodontics, success can be achieved in suitable cases.

Keywords: Damon System, Orthodontic treatment, Expansion, Orthodontic brackets

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1. Introduction

Today, with the advancing technology in orthodontic practice, many brackets, arch wires and material options for connecting them have emerged. Steel and elastomeric ligature wires are often used to connect the arc wire to the bracket. With the introduction of self-ligating brackets in orthodontic applications, it has brought many advantages in terms of ligaturing (Harradine, 2003).

The advantages of self-ligating brackets include the ability to securely connect the arch wire, less friction, fast and easy insertion and removal of the arch wire, and shorten the time spent at the patient (Damon, 1998; Eberting et al., 2001; Harradine, 2003). Manufacturers claim faster treatment, less pain, and fewer appointments (Miles, 2009). Self-ligating brackets are divided into three categories as active, passive or interactive according to the basic differences in their designs. The purpose of the active system is to insert the arc wire into the bracket slot for effective rotation and torque control. In the active system, the cover of the bracket narrows the lumen of the housing, causing more friction to occur. Since the actively placed angular arc wire will touch the cover, the friction will increase further (Karataş et al., 2013).

In passive brackets, after the slide is closed, the bracket becomes a tube and rotation and crowding is corrected with large diameter flexible wires filling the slot. Damon braces system is the most popular self-ligating bracket with passive system (Ormco Corp., 1332 South Lone Hill, Ave., Glendora, CA, USA). It is a passive self-ligating system introduced by Dwight Damon in 1996 (Damon, 2004). A distinctive feature of this system is that these low profile brackets do not require auxiliary elastics and steel ligatures like traditional brackets or clips holding the arch wire in the bracket as in active brackets. Damon talked about a new expansion method provided by the brackets he designed. This method is called "Damon bracket system"; the straight wire technique is based on the principle of using super elastic NiTi wires together with passive self-ligating braces. Damon argues that the light forces created by the arch wires cannot overcome the lip muscles and cause posterior expansions. Studies have emphasized that the orbicularis oris and mentalis muscles create a 'lip bumper' effect, preventing the proclination of the anterior teeth and widening the posterior segment (Birnie, 2008).

The purpose of these case reports is to present the treatments of two patients treated with Damon System.

2. Case Reports

2.1. Case 1

A 12-year-old girl presented to our clinic with complaints of dental crowding and the appearance of high canines. In the detailed clinical examination of the patient, it was observed that the discrepancy of maxillary arch (-7.5 mm) and the patient was found to have Class II subdivision malocclusion with 2 mm overjet and 1.5 mm overbite (Figure 1). In cephalometric measurements, it was found that skeletally Class I (SNA: 79.6°, SNB: 77.7°, ANB: 1.9°) malocclusion was found, vertical direction dimensions (SN / GoGn: 32.8°) were within normal limits and the inclinations of the upper incisors (U1 / PP: 107.8°) was found to be in a retrusive position relative to

the cranial base.

Figure 1. Initial photographs of Case 1.

Orthodontic treatment without extraction was planned for our patient with Damon braces system. Braces were placed in the first session and treatment was started with 0.014 NiTi (Figure 2).

Figure 2. Damon braces system (Damon Q2, ORMCO, Glendora, Calif)

0.016, 0.014x0.025, 0.016x0.025, 0.018x0.025 NiTi wires and finally 0.019x0.025 SS were used. Session breaks are planned as 8 weeks. The total treatment time is 11 months.When the cephalometric parameters after treatment are examined, it is seen that the skeletal Class I relationship at the beginning is preserved (SNA: 80.4˚, SNB: 78.7˚, ANB: 1.7˚). It has been determined that the teeth approach the ideal inclination with the protrusion in the lower and upper incisors (U1 / PP: 110.2˚; IMPA: 94˚). A minimal increase was observed in vertical direction parameters (SN / GoGn: 33.1˚).

At the end of the treatment, ideal overjet and overbite were provided. Class I canine and molar relationships were obtained in the patient (Figure 3 and 4).

Figure 3. Final photographs of Case 1.

Figure 4. Initial and final radiographs of Case 1.

2.2. Case 2

A 21-year-old female patient applied to our clinic for orthodontic treatment due to the complaint of crowding. No systemic or dental problems were encountered in the patient that would interfere with orthodontic treatment. In the intraoral examination, the patient was found to have Class I malocclusion with 1.5 mm overjet and 1.5 mm overbite (Figure 5).

In cephalometric measurements, it was found that skeletally Class I (SNA: 80.3˚, SNB: 78.2˚, ANB: 2.1˚) relationship was found, vertical direction dimensions (SN / GoGn: 33.4˚) were within normal limits and the

inclinations of the upper incisors (U1 / PP: 109.6˚) was found to be in a retrusive position relative to the cranial base.

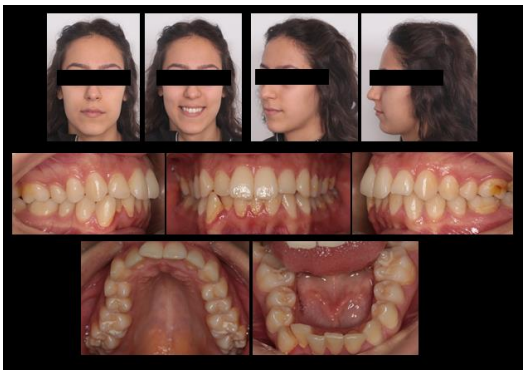

Figure 5. Initial photographs of Case 2.

Fixed orthodontic treatment was planned for our patient to ensure ideal overbite, overjet and Class I molar and canine relationship. Damon braces system (Damon Q2, ORMCO, Glendora, Calif) was preferred to provide dental expansion as well as protrusion of incisors. Brackets were attached in the first session, and treatment was started with 0.014 NiTi archwires. 0.016, 0.014x0.025, 0.016x0.025, 0.018x0.025 NiTi archwires and finally 19x25 SS wires were used respectively (Figure 6). Session breaks are planned as 8 weeks. After treatment, cephalometric values increased, SNA and SNB angles increased and ANB angles decreased compared to baseline (SNA: 80.9˚, SNB: 79.2˚, ANB: 1.7˚). As a result, it is seen that skeletal Class 1 relationship is preserved. Protrusion has also occurred in the upper and lower incisors (U1 / PP: 111.4˚; IMPA: 95˚). A minimal increase was observed in vertical direction parameters (SN / GoGn: 34 ˚).

Figure 6. Damon System brackets (intraoral view).

End of the treatment, Class I molar and canine relationship was established. As a result, in the case with moderate perplexity in the anterior mandible, a good occlusion with normal overbite and overjet was achieved with dental Class I relationships after 10.5 months of treatment (Figure 7 and 8).

2.3. Ethical Consideration

All procedures followed during the publication of the case report were in accordance with the ethical standards (institutional and national) of the committee responsible for human experiments and the 1964 Helsinki Declaration and its later versions. Informed consent was obtained from the parents for the Case 1, and from the patient for the Case 2. In addition, a letter was received stating that the treatment materials can be used in scientific publications.

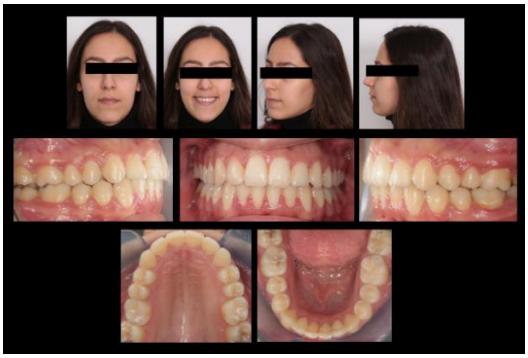

Figure 7. Final photographs of Case 2.

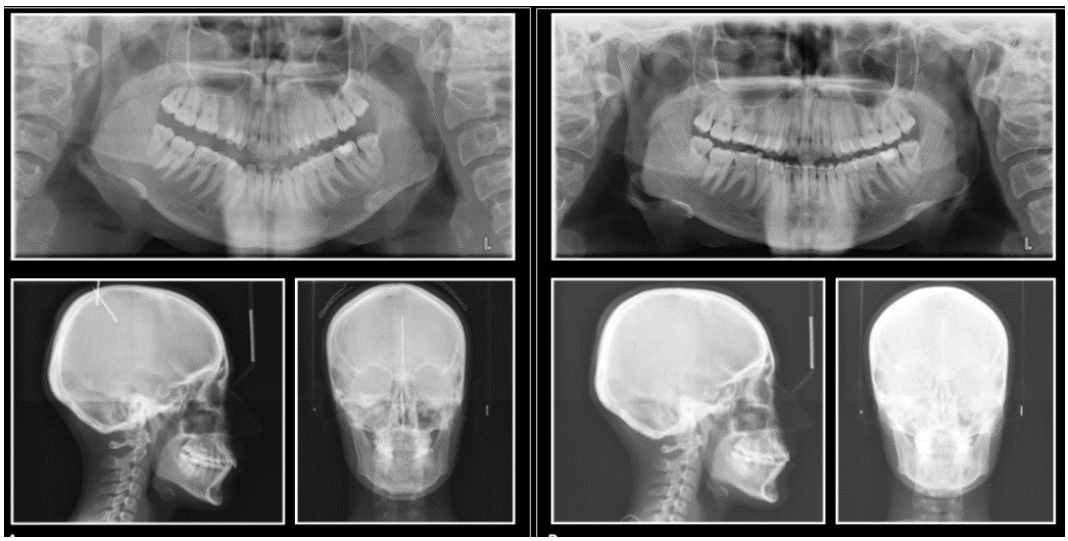

Figure 8. Initial and final radiographs of Case 2.

3. Results and Discussion

Damon thought that the best way to achieve biologically appropriate forces was through a self-locking bracket system. In the early years of orthodontic applications, physicians thought that passing an arch wire through a tube was more advantageous than connecting it to a bracket. One of the first tube systems, "twin-wire cap" and "channel" (Johnson, 1976) appliances shed light on the self-ligating systems used today. Difficulties in placing the covers, lack of memory wires, preset bracket slots and modern mechanics caused these appliances not to be used over time.

The development of self-ligating brackets has accelerated after 1995 and active and passive brackets have been introduced to the market. Damon braces system is the most popular self-ligating bracket with passive system. Damon system is based on the principle of applying only enough force to initiate tooth movement. So the threshold force is sufficient. The force at the threshold value is the force that prevents the occlusion of the blood vessels in the periodontal membrane and allows the transport of cells and necessary biochemical transmissions in the region of bone resorption and apposition. Thus, tooth movements will occur faster (Karataş et al., 2013).

Damon system creates natural strength systems compatible with normal growth and development in every phase of treatment. Although Damon appliances are defined as a bracket system, it is actually a tube system and consists of tubes with wings. It has been reported that when the Damon passive SL bracket is closed, it behaves like a tube that provides rotation control (Damon, 2004).

Damon believes that posterior expansion causes the tongue to be positioned above and further back, allowing a new balance with the cheeks and lips. This expansion causes an increase in arc length. Damon thinks that during the development of this new balance, the teeth will expand physically. While the mechanics of the Damon bracket system enable expansion, this new balance also provides the stability of the expansive arch. In our cases, this expansive effect of the Damon system was used rather than the protrusion of the incisors to gain a place in the treatment of dental crowding. The fact that the U1-PP and IMPA angles did not increase much in the cephalometric analysis results and the increase in interpremolar and intermolar distances in model analysis also support these results.

In the Damon system, the treatment time is shorter than the traditional treatment method, and fewer appointments are required during the treatment. Harradine et al. reported in the results of their study that the treatment period was shortened by 4 months and the average number of appointments decreased by 4 months in the group treated with the Damon system compared to the traditional technique (Harradine et al., 2006). Eberting et al, in their study comparing traditional fastening systems with Damon SL, examined the duration of treatment and the total number of appointments of patients treated with 108 Damon SL and 107 traditional brackets (Eberting et al., 2001). As a result of the study, they stated that the duration of treatment decreased from 31 to 25 months in patients using Damon SL, and the total number of appointments decreased from 28 to 21. Thorstenson et al., (2001) reported that the treatment with Damon System lasted 7.2 months shorter in 2001 in a clinical study in which they compared traditional systems with the Damon System. In our cases, the orthodontic treatments of the patients were also completed in less than 1 year.

4. Conclusion

Thanks to the Damon braces system, moderate and severe crowding cases were successfully treated in appropriate cases. Treatment times were also shorter compared to average orthodontic treatments. Instead of stripping and tooth extraction, which are among the methods of gaining space in orthodontics, success can be achieved in suitable cases.

Author Contributions

All tasks have been done by the single author.

Conflict of Interest

The author declared that there is no conflict of interest.

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