

Class I treatment with severe dental crowding and mandibular protrusion: a case report

Tratamento de classe I com apinhamento severo e protusão mandibular: um relato de caso

Tratamiento clase I con apriamiento dental severo y protrusión mandibular: aporte de caso

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Abstract

The use of Corrective Orthodontics to modifying dental aesthetics, has been increasingly effective in modifying and improving the profile of patients. Objective: Review the literature on the treatment of CI I malocclusions with severe dental crowding and to report a clinical case performed in the dental clinic of a private educational institution. Methodology: After dental extraction and fixed orthodontic appliance treatment, the facial and dental aesthetics patient evolution with the diastema presence between dental elements 11 and 21 and supernumerary elements. The case was treated in two phases, with the aim of correcting the dental crowding. In the first phase, the first premolars and a supernumerary tooth were extracted, to initiate the isolated canine retraction and, later, the space closures by means of the retraction of the incisors. In the second phase, after the closure of spaces, the intrusion and molarization verticalization phase was started. For the subject review in case, articles were searched in the Pubmed databases, Lilacs and Scielo and selected 8 articles between the years 2010 and 2019. Results and Conclusions: It was observed that the exodontia provided the necessary spaces for the alignment and leveling of the teeth and the intrusion and mandibular rotation of the molars allowed the mandible to rotate counter clockwise, reducing the convex profile of the patient. At the end of the treatment, a facial response was observed according to the mechanics employed and significant improvement in the dental, facial aesthetics and, consequently, social improvement of the patient.

Keywords: Orthodontics; Intercurrent orthodontics; Tooth extraction; Supernumerary tooth; Aesthetics.

Resumo

O uso da Ortodontia Corretiva para modificar a estética dental, cada vez mais eficaz para alterar e melhorar o perfil dos pacientes. Objetivo: Revisar a literatura sobre o tratamento das más oclusões CI I com um apinhamento dentário severo e relatar um caso clínico realizado na clínica odontológica de uma instituição educativa privada. Metodologia: Após a extração dentária e o tratamento com aparelhos fixos, o paciente de estética facial e a evolução dentária com a presença de diastemas entre os elementos dentários 11 e 21 e elementos supranumerários. O caso foi tratado em duas fases, com o objetivo de corrigir o apinhamento dentário. Na primeira fase, foram extraídos os primeiros pré-molares e um dente supranumerário, para iniciar a retração isolada dos caninos e, posteriormente, os fechamentos dos espaços por meio da retração dos incisivos. Na segunda fase, após a abertura de espaços, inicia-se a fase de intrusão e verticalização da molarização. Para a revisão do tema em questão, procure artigos nas bases de dados Pubmed, Lilacs e Scielo e selecione 8 artigos entre os anos 2010 e 2019. Resultados e Conclusões: Observe que a exodontia proporciona os espaços necessários para a linha e a linha nivelamento dos dentes e da intrusão e rotação mandibular dos molares permite a rotação da mandíbula no sentido contrário ao sentido anti-horário, reduzindo o perfil convexo do paciente. Ao final do tratamento, foi observada uma resposta facial de acordo com a mecânica empregue e uma menor significativa na estética dental, facial e, em consequência, social do paciente.

Palavras-chave: Ortodontia; Ortodontia interceptora; Extração dentária; Dente supranumerário; Estética.

Resumen

El uso de la Ortodoncia Correctiva para modificar la estética dental es cada vez más eficaz para modificar y mejorar el perfil de los pacientes. Objetivo: Revisar la literatura sobre el tratamiento de las maloclusiones CI I con apiñamiento dental severo y reportar un caso clínico realizado en la clínica dental de una institución educativa privada. Metodología: Tras la extracción dental y el tratamiento con aparatos de ortodoncia fija, la estética facial y dental de la paciente evolucionó, a pesar de la presencia de diastemas entre los elementos dentales 11 y 21 y elementos supernumerarios. El caso fue tratado en dos fases, con el objetivo de corregir el apiñamiento dental. En la primera fase se extrajeron los primeros premolares y un diente supernumerario, para iniciar la retracción aislada de los caninos y, posteriormente, el cierre del espacio mediante la retracción de los incisivos. En la segunda fase, tras el cierre de espacios, se inició la fase de intrusión y verticalización de los molares inferiores. Para la revisión del tema en cuestión, se buscaron artículos en las bases de datos Pubmed, Lilacs y Scielo y se seleccionaron 8 artículos entre los años 2010 y 2019. Resultados y Conclusiones: Se observó que la exodoncia proporcionó los espacios necesarios para la alineación y nivelación de los dientes, y la intrusión y rotación de los molares mandibulares permitió la rotación de la mandíbula en sentido contrario a las agujas del reloj, reduciendo el perfil convexo de la paciente. Al final del tratamiento se observó una respuesta facial acorde con la mecánica empleada y una mejora significativa en la estética dental, facial y, en consecuencia, social del paciente.

Palabras clave: Ortodoncia; Ortodoncia interceptiva; Extracción dental; Diente supernumerario; Estética.

1. Introduction

In addition to the correct position of teeth, alignment, leveling and ideal chewing function, achieving a harmonious facial profile of the patient during orthodontic treatment becomes one of the main goals for its completion. Angle Class I malocclusion with biprotrusion may cause pronounced inclination of the buccal incisors, leading the upper and lower lips protrusion. Likewise, increasing facial convexity as well as severe anterior teeth crowding, impairing dental eruption, and may be aggravated by other factors such as the presence of supernumerary teeth (Moreasca et al., 2014)

The first premolars extraction has been advocated to reduce facial convexity and decrease anterior dental crowding. Studies have shown improvement in the patient profiles treated with the following extraction sequences: (Moresca et al., 2014) only upper first premolars, (Allgayer et al., 2011) upper first and lower second premolars in Angle Class II malocclusion cases or (Ikoma et al., 2018) the first four premolars in cases of Class I malocclusion. Holdaway cephalometric analysis was used to quantify and compare profiles before and after treatment with aforementioned extraction protocols, and concluded that all similar facial appearances were produced. (Allgayer et al., 2011)

Usually, the orthodontic treatment is sought by young and female patients, considering the smile aesthetics due to dental agglomeration. However, facial aesthetics impairment may occur. Thereby, women with Class I occlusion and severe anterior dental crowding were observed to exhibit significantly wider skull base angles and shorter lengths, shorter sagittal maxillary bases, and hyperdivergent skeletal patterns (Ikoma et al., 2018) with a facial height (AFH) enlarged and convex profile. Regarding the supernumerary teeth, more specifically the mesiodent teeth, it is important to emphasize that early diagnosis and immediate intervention should be performed when they cause pathological medial diastemas (Michelotti et al., 2010). This is done in order to achieve satisfactory aesthetic and functional results, minimizing sequelae in the development of occlusion.

Patients with bimaxillary protrusion or dental crowding may have an unattractive, convex profile with retracted chin contour. The chin plays an important role in the facial profile harmony. It has generally been suggested that when assessing facial aesthetics, the public primarily considers the lower third of the face (Jiang et al., 2018). Good chin morphology can be obtained by extraction of the premolars with retraction of the anterior teeth to reduce protrusion and reduce crowding, as well as causing a mandibular rotation counterclockwise, bringing the chin forward, reducing the (LAFH) and profile convexity. Results also indicated that treatment with extractions was associated with additional lower lip retraction, potentially also impacting patients' soft tissues (Konstantonis et al., 2018). Despite all these reports, it is still very controversial whether or not to indicate dental extraction, but specifically premolars, for orthodontic treatment in cases of Class I malocclusion with anterior dental crowding. Therefore, studies reporting different treatment approaches are needed, highlighting the time and difficulty of treatment, as well as the best prognosis.

Therefore, the aim of the present study is to report a clinical case of treatment of Cl I malocclusions with severe dental crowding. After extraction and treatment with fixed orthodontic appliance, there was evolution of facial and dental aesthetics of a patient with the associated problem with diastema in the upper arch.

2. Methodology

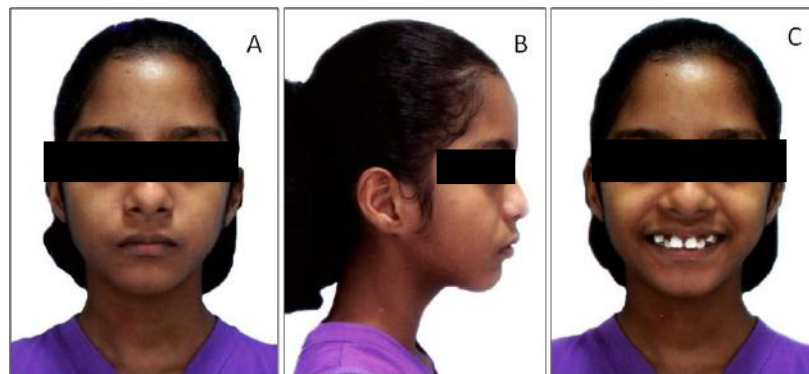
2.1 Type of study

The present study is a descriptive, qualitative, cohort and case report.

3. Case Report

Female patient, 9 years and 11 months, attended the private educational institution, complaining of her smile with severe dental crowding (Figure 1). She had a good systemic and oral condition, with all teeth present and a good periodontal condition. Clinical and radiographic examinations showed the presence of a diastema between the maxillary central incisors (11 and 21) caused by a supernumerary tooth at the height of the apical third of tooth 11; presence of pipette-like roots in teeth 11 and 21; lingualized upper lateral incisors; upper canines still in the eruption phase and crowding of the lower teeth with no room for eruption of the first left lower premolar and second right lower premolar. The patient also had a convex facial pattern, with retracted chin associated with protruded lower and upper lips and decreased nasolabial angle, however, without affecting passive lip sealing.

Figure 1 – at 9, initial photos: A) Frontal photo, B) Side photo, C) Smiling photo.



Source: Authors.

Figure 2 – pre-oral intra-treatment photographs : A) right side view B) left side view C) front view D) panoramic view.



Source: Authors.

Treatment Alternatives

Based on Class I diagnosis with severe dental crowding, the following treatment options were proposed to the patient:

- 1) correct CL I by extraction of the first four premolars (14, 24, 34 and 44) and the supernumerary;
- 2) treat CL I by placing four temporary anchorage devices and distalizing the four hemi-arches after the removal of the second molars.

Treatment Performed

The patient along with her guardian opted for the first treatment option. First premolars + supernumerary extraction was performed to obtain space for crowding correction and improvement in mandibular rotation, which was retracted due to hourly rotation.

Case difficulty factor

The patient had a very compromised intraoral aesthetic due to excessive crowding, diastema between 11 and 21 and a rotating mandibular retrusion that impaired her facial aesthetics. He needed a treatment modality that would correct intra- and extra-oral aesthetics.

Treatment evolution

After extraction of the first premolars and the supernumerary tooth, the Edgewise slot 018 fixed appliance was installed on the patient. Then, treatment with isolated canine retraction was started to later align, level, close the diastema between the central incisors and Canine fitting in Cl I. After space closure, the intrusion and vertical phase of the molars began, which enabled the mandibular rotation counterclockwise, improving the profile. And at 13 years and 02 months of the patient, after 03 years of treatment, the device was removed and new tests were performed. The panoramic radiograph showed the formation of a new supernumerary in the region of element 33, which was also sent for removal.

Figure 3 – at 13 years, after treatment A) Frontal Photo B) Side Photo C) Smiling Photo.



Source: Authors.

Figure 4 – pos-treatment images. A) right side B) left side C) Front D) Panoramic.



Source: Authors.

3. Results and Discussion

Comparing the before and after treatment photos shows the improvement in the patient's dental and facial aesthetics.

Figure 5 – Before and after treatment A) Front view pre-treatment B) Right side view pre-treatment C) Left side view pre-treatment D) front view pos-treatment E) right view pos-treatment F) left view pos-treatment.



Source: Authors.

Evaluating the table with the results of some cephalometric analysis values obtained after treatment, it is also possible to observe an improvement of the case. After 2 years the examinations were repeated and the results remained stable during the preservation period.

Table 1 - cephalometric values before and after treatment and references values.

α	beforeα	obtainedα	Referencesα
AFHα	61,5mmα	65,34mmα	65,6±4,9α
Nasolabial·Angleα	84,76°α	111,38°α	109,2°±9,2α
FMAα	53,19°α	57,76°α	68°±6α
FMAα	36,74°α	37,58°α	25°±6α
IMPAα	90,08°α	84,66°α	87°±6α
DCα	-9,45α	-5,79α	-α
1 .NAα	35,86°α	22,01°α	22°α
1 .NBα	29,38°α	22,37°α	25°α

Source: Authors.

Figure 6 – pre- treatment Cephalometric analysis.



Source: Authors.

Figure 7 – proservation after 2 years A) Front view B) Lateral view C) Smiling View.



Source: Authors.

Figure 8 – proservation after 2 years A) right side view B) left side view C) front view D) panoramic view.



Source: Authors.

During dental development, the interaction of different factors may cause some malocclusion. In the case described, we observed the presence of a large central diastema in the upper arch along with a severe dental crowding, which prevented the correct alignment, positioning and relationship of the teeth, and drastically compromise the facial and smile aesthetics. After examination for correct diagnosis and treatment planning, a supernumerary tooth responsible for the central diastema was found; As well as the value of the high total discrepancy (cephalometric discrepancy + model discrepancy), opting for the extraction of the first premolars and supernumerary. With the evolution of the treatment, besides the correct occlusion, the patient's facial modification was noticed, leaving her with a more harmonious and pleasant profile. There is no definitive time to to the appearance of supernumerary teeth, they may development before birth, or later in the permanent dentition phase, especially in the premolar region (Same et al.,2016). The number of supernumerary teeth in a patient is not limited, they may be single or multiple, unilateral or bilateral, may rupture or impact, and may appear in the jaw, maxilla, or both (Rajob et al.,2002).

According with Michelotti et al, 2010, to ensure good results in midline pathological diastema correction, the treatment should be performed as soon as possible. For Primoch et al, 1981 (Primosch et al.,1981) is also commonly agreed that the supernumerary tooth included should be removed as soon as a detected. Therefore, diastemas larger than 2 millimeters should be investigated as soon as possible due its relation to some dental eruption disorder. The main causes of midline diastemas are not just the mesiodentes, but also genetically missing teeth, conoid incisors lateral, lip break, racial and ethical characterists, certain pathological conditional is thumb sucking habit (Teitelbaum et al.,2002). It's common sense among most professionals, that the patients tend to judge the success of orthodontics treatment primarily by aligning the upper anterior teeth (Naraghi et al., 2006). However this judgment should go further considering the effect of treatment on soft tissue and facial profile. It's a fact that beauty concept can be subjective, but aesthetic concept is not, therefore personnal opnion cannot conduce orthodontics decisions, since this is speacialty is a science. The most used facial analysis is the profile analysis which we take into account the harmonic positioning between nose, lips and chin (Picanço et al.,2013). Orthodontic approaches after case diagnosis are often questioned as to whether or not premolar extractions are performed. It is still widespread that tooth extractions can cause a "flat face" (James et al, 1998) due to excessive tooth retraction, which has discouraged this type of treatment protocol. However, extractions can benefit the profile when properly indicated (Kames et al.,1996).

A case report described by Jiang et al, 2018 shows the orthodontic treatment of a severe case of bimaxillary protrusion and moderate open bite, which yielded excellent chin morphology and facial appearance with extraction of 4 first premolars and 4 third molars, and anterior retraction with absolute mini-implant anchorage in both arches. In another study (Allgayer et al.,2011) the effect of three different premolar extraction protocols on the facial profile was compared taking Holdaway's analysis into account: extraction of the upper first premolars only, extraction of the first four premolars and first premolars and second premolars extraction and an improvement in profile was found in all groups. When compared to each other, the protocols produced similar facial appearances.

After a systematic review by Iared et al, 2016 in which the authors evaluated cephalometric parameters and aesthetic results in orthodontic treatments performed with and without premolar extraction, taking into account mainly the biological retraction response of the lip after extraction, they concluded whereas in patients who initially had higher lip protrusion and a more convex facial profile, premolar extractions tend to benefit the profile with respect to soft tissue structure. In patients treated with extractions, the perception of smile was rated higher than in individuals treated without extraction by dental professionals, due to a higher exposure of the upper incisor, and a greater relationship between the teeth and the oral aisle making the smile more aesthetic (Cheng et al.,2018). However, in another systematic review made by Konstatonia et al, 2018 that also assessed the effect of extraction during orthodontic treatment on soft tissue profiles concluded that although extractions appear to affect the patient profile, existing studies are heterogeneous and no consistent predictions can be made profile answers. It is also important to consider the stability of the post-treatment outcome. A study (Quaglio et al.,2011) aimed to compare the stability of anterior dental

maxillary alignment in Class I and Class II Division 1 malocclusion after treatment, consisting of 70 patients who were treated with extractions and evaluated at pre and post treatment for at least 5 years. The sample was divided into 03 groups: group 01, Class I malocclusion with crowding treated with extractions of the first four premolars; group 02, Class II malocclusion also treated with extractions of the first four premolars; and group 03, Class II treated with premolar extractions only. It was concluded that the stability of the alignment between the 03 groups was similar and that there was high long-term alignment, but a high percentage of teeth tended to return to their original positions.

Finally, according to Ho Kim J et al, 2018, it is important to highlight that Dentistry, in its already established and routine techniques, already has a great impact on facial composition and harmony. Examples are teeth augmentation and reanatomization, promoted by restorative techniques, alteration of the facial profile by orthodontic movements or buccomaxillofacial surgeries (Bitalus et al.,2022), such as orthognathic ones. However, this movement happened almost exclusively from the inside out. The intraoral modifying the extraoral. Today, the perspective of the profession has been expanded, integrating with other areas of health and extending the action of dentistry. Thus, new viewing angles are available and are able to provide even more tools in valuing facial aesthetics. We will increasingly learn to look the face, giving prominence to the smile, as it deserves, as one of the most dynamic and striking expressions that the human being has.

4. Final Considerations

The patient in the present report had a well-compromised intraoral aesthetic due to excessive crowding, diastema between teeth 11 and 21 caused by a supernumerary tooth, and a rotating mandibular retrusion that impaired her facial aesthetics. She was treated with first premolar and supernumerary extraction to provide room for crowding correction and improved mandibular positioning, leaving her with a straighter and more pleasing profile prior to treatment with fixed Edgewise orthodontic appliance. Such treatment promotes a facial response according to the mechanics employed and significant improvement in its dental and facial aesthetic. More studies are needed to better understand complex cases of class 1 malocclusions associated with the presence of supernumerary teeth and/or mandibular protrusion, evaluating not only intra-oral results, but also the improvements that can bring to facial aesthetics.

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