Osseointegrated implant as an auxiliary of orthodontic leveling in case of asymmetric vertical skeletal discrepancy – case report

Implante osteointegrado como auxiliar do nivelamento ortodôntico em caso de discrepância esquelética vertical assimétrica – relato de caso

Gustavo Dal Bem Bernardini[*]
Dikson Claudino[**]
Jefferson Ricardo Pereira[***]

Abstract

Objective: To present a case report that used an osseointegrated implant as skeletal anchorage unit in association with fixed orthodontic appliance for the treatment of an adult patient with vertical asymmetric skeletal discrepancy. Case report: In this case, the pre-existing osseointegrated implant in the region of element 21 was used as an auxiliary of skeletal anchorage for leveling the upper occlusal plane. This was performed with the straight wire technique, Capelozza prescription pattern I, .022″ slot, using the sequence of thermal-activated nickel-titanium arches of .014″, .016″, .017″X.025″ and .019″X.025″, followed by the steel arch of .019″ X.025″. *Final considerations:* The results presented in this report showed the osseointegrated implant as a good option when used as a resource of auxiliary anchorage in orthodontics, providing better comfort and aesthetic conditions to the treatment and simplifying the technique.

Keywords: Facial asymmetry. Orthodontics. Orthodontic anchorage procedure.

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[*] MSc, Associate Professor, Postgraduate Program - EPOG, Joinville, Santa Catarina, Brazil.
[**] PhD, Postgraduate Program in Health Sciences, University of Southern Santa Catarina, Tubarão, Santa Catarina, Brazil.
[***] PhD, Associate Professor, Postgraduate Program in Health Sciences, University of Southern Santa Catarina, Tubarão, Santa Catarina, Brazil.

Introduction

Orthodontic therapy is based on the principle of transforming accumulated elastic energy into mechanical work to obtain dental movement, in which the changes that dentists impose on the appliance provide the control over the mechanism of load transference and distribution[1].

The first activated stage of orthodontic therapy is characterized by leveling, which aims to correct vertical discrepancies on teeth positioning and level the bracket slots to an equal plane, allowing the initial correction of Spee's curve[2].

However, movements such as dental intrusion during orthodontic leveling are presented as significant mechanical challenges during therapy, especially for the difficult control of undesirable load vectors on anchorage teeth. Although such adverse effects may be controlled with both extra- and intraoral auxiliary appliances, these have rarely met patient aspirations due to the discomfort and negative aesthetic aspect they cause[3].

Anchorage control is especially important in cases of skeletal discrepancies, in which more complex anchorage methods difficult to control over undesirable movements are required. They are also often more uncomfortable and provide lower aesthetic quality[4].

Then, to provide a more efficient and easy orthodontic therapy, the use of osseointegrated implants has shown great clinical applicability, providing safe and efficient intraoral anchorage mainly in treatments involving adult patients[5].

As an ankylosed tooth, osseointegrated implants do not present periodontal ligament, hence they do not allow cellular reactions to the orthodontic loads and consequent movement of this type of anchorage unit. Therefore, the use of implants supports the execution of simpler orthodontic mechanics, providing more comfort to the patient and becoming a daily reality in the orthodontic clinic[6].

This study aimed to describe a case report showing the use of dental implants as auxiliaries in orthodontic therapy.

Case report

The Research Ethics Committee of the University of Southern Santa Catarina, Brazil approved this case report, under opinion #1.916.328. A 30-year-old male patient (A.R.) showed up for orthodontic assessment with the main complaint of "crooked smile" (Figures 1 and 2).

Figure 1 – Extraoral smile view

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Figure 2 – Profile view

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The clinical assessment and complementary tests showed facial pattern II with mandibular deficiency, convex profile, obtuse nasolabial angle, and a slightly prominent chin-neck line. The intraoral analysis showed Class II relationship, division 1, right subdivision with Class II occlusal key of canines and pre molars on the right side, and class I on the left side. An upper mid-line offset of 3 mm to the left was verified, as well as accentuated overbite and overjet and severe unevenness of the occlusal plane (Figures 3 to 5). The radiographic examination revealed the presence of all teeth, except for third molars and element 21, which was replaced with an osseointegrated implant (Figures 6 and 7). Thus, clinical and complementary exams determined the skeletal involvement as the responsible for the patient's main complaint.

Figure 3 – Initial intraoral front view

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Figure 4 – Initial intraoral right side view

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Figure 5 – Initial intraoral left side view

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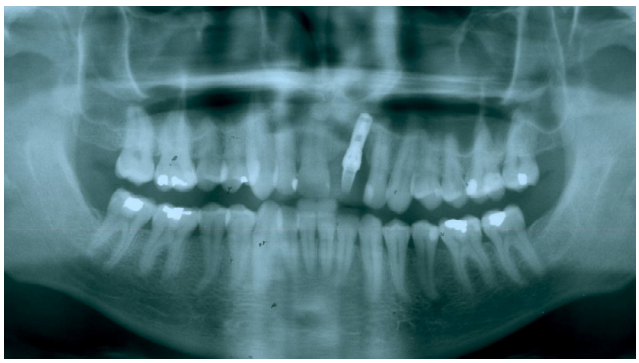

Figure 6 – Initial panoramic radiography

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Figure 7 – Initial lateral teleradiography

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Considering the present clinical case, the treatment was conducted with the installation of fixed orthodontic appliances using the straight wire technique, Capelozza prescription pattern I, .022" slot (3M/Abzil). Alignment and leveling were started using the sequence of thermal-activated NiTi arches of .014", .016", .017"X.025", and .019X.025", followed by the steel arch of .019" X.025". From the steel arches, a second fold was inserted to element 22 (intrusive), using element 21 (implant) as a skeletal anchorage unit (Figure 8).

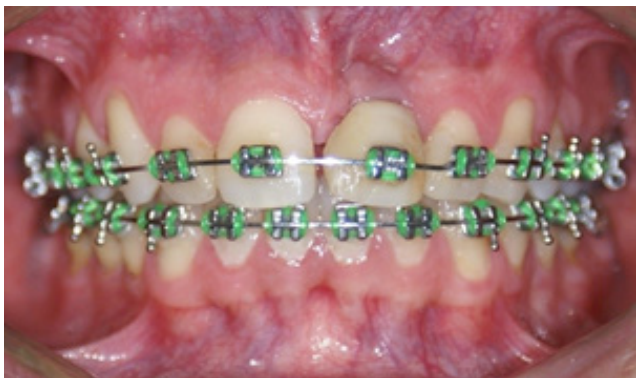

Figure 8 – Leveling phase using osseointegrated implant as anchorage

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The Class II relationship on the right side was corrected with unilateral mandibular protrusion device used for 6 months and Class II elastics used for another 6 months to maintain the result.

The results obtained during the active stage of treatment were maintained using the wrap-around Hawley retainer in the upper arch and a 3X3 fixed retention in the lower arch.

After ending the treatment, the regularization of the occlusal plane was verified with the intrusion of the upper left hemiarch (except for implant of element 21) and the stability of results, as seen after a 2-year follow-up on the case (Figures 9 to 11).

Figure 9 – Two years after the end of treatment –intraoral front view

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Figures 10 and 11 – Two years after the end of treatment – intraoral right and left views

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Discussion

This case report shows the tendency related to some factors, such as better access to preventive dental therapies, which allow reaching adult age without missing teeth[7], and the easy access to information and knowledge on treatment possibilities[8], which refine aesthetic requirements regarding oral health in the contemporary society[9].

Although assessing the sagittal relationship between bone bases is the diagnostic pillar in Orthodontics, for patients, frontal perception is essential, because the smile allows them to assess treatment evolution and results. In the present case report, such frontal smile assessment was the reason the patient was searching for orthodontic treatment[10].

Then, aspects such as tooth alignment and leveling, smile arch, buccal corridor, and appropriate dental exposure when smiling should be considered essential factors in orthodontic planning. The maxillary frontal plane inclination is a vital aspect to build the diagnosis in cases of asymmetric smile[10], as presented in this case report.

Orthodontic anchorage is one of the challenges of Orthodontics, representing a limiting aspect

of the orthodontic treatment. This is because the planned movement of a tooth or a group of teeth causes a reciprocal reaction in the teeth serving as anchorage. It has long been attempted to create a type of intraoral fixed anchorage that does not react to orthodontic forces, transferring them directly to the bone tissue[11].

Conventional orthodontic anchorage is performed mostly with symmetric devices such as transpalatal bar, extraoral arch, lip bumper, Nance button, and lingual arch, among others. Due to their symmetric natures, these devices produce unwanted movements in the anchorage units, promoting technical difficulty when treating asymmetric malocclusions[10].

Moreover, in many cases, the successful orthodontic treatment depends on controlling orthodontic anchorage, but conventional orthodontic anchorage may not always achieve such results. Some of its limitations are the patient-dependency for headgear use, the great compression on the mucosa caused by the Nance button, and the lack of sufficient strength from the transpalatal bar[12,13].

The field of action of orthodontists extends with the emergence of new diagnostic and therapeutic approaches such as implantology. This area is important for discussions about diagnosing and planning clinical cases with professionals from other specialties. Osseointegrated dental implants have completely changed the practice and scope of Dentistry, and many adult orthodontic patients have or require osseointegrated implants[14].

In the present case report, the option used was a dental implant previously installed as anchorage to meet the needs of the orthodontic therapy. According to Buj et al.[5], osseointegrated implants are considered excellent means of anchorage in Orthodontics. Additionally, the high level of integration to the bone tissue allows applying orthodontic loads without undesirable movements in the anchorage unit, as well as several tooth movements like torque, translation, inclination, extrusion, and intrusion; the latter being specially required in this case report.

Although temporary orthodontic implants have been used with high success rates, osseointegrated implants may also be used for this purpose, providing treatment efficacy. A crown supported on an osseointegrated implant may be used as anchorage for intrusion, extrusion, rotation, or inclination of the adjacent tooth without affecting the natural dentition. As the location of osseointegrated implants should provide for posterior prosthetic rehabilitation, their position may not be ideal to serve as orthodontic anchorage and this problem is solved by applying orthodontic mechanics appropriate to the case[15].

Imaging and histological assessments allow verifying that even when high orthodontic forces are used on bone implant, they remain viable to serve as posts for rehabilitation treatments after orthodontic therapy[16]. The implants prevent the use of extraoral and intermaxillary elastic anchorages that, besides causing deleterious effects on dental elements, also require patient collaboration. Osseointegrated implants may be used as orthodontic anchorage in posterior edentulous patients and their structure must comply with a cautious surgical and prosthetic planning so they may support the fixed partial prosthesis at the end of treatment[11].

Disadvantages regarding the use of osseointegrated implants for orthodontic anchorage purposes are reported in the literature as presenting higher cost, waiting time for osseointegration, need for surgical procedure, risk of infection and damage to roots and nerves adjacent to the implantation site, and the need for a second surgical moment for removal when used only for anchorage purposes[5].

The advantages of using osseointegrated implants include better comfort and aesthetics of orthodontic anchorage when compared to conventional methods such as extraoral anchorage, reduced treatment time, high stability, and the possibility to apply different force vectors, among others[5]. A pre-existing osseointegrated dental implant provides effective anchorage to perform various movements such as rotation, correction, intrusion, and extrusion, among others. Careful planning along with dental prosthesis is essential in cases of mutilated occlusion or absence of several teeth. In these cases, when orthodontic planning is not involved, the implants are restored with excessive spaces, reduced emergency profiles, and occlusal impairment, causing hygiene challenges and potential rehabilitation treatment failure[15].

Therefore, the orthodontic indication of osseointegrated implants with anchorage presents specific advantages. When extending the anchorage purpose, the implant is also designed to be a prosthetic support after orthodontic therapy. For this reason, planning should be multidisciplinary, involving orthodontists and prosthetists, as reported in this case.

Final considerations

In the case reported, using osseointegrated implant previously installed was effective to help leveling the occlusal plane during orthodontic therapy with fixed orthodontic appliance. This therapeutic alternative allows achieving the treatment objectives faster, comfortably, and with better aesthetics and lower need for patient collaboration, when compared to other conventional anchorage alternatives in Orthodontics. The osseointegrated implant in this case report has been indicated not only with the purpose of skeletal anchorage for orthodontic therapy, but also as a post for the prosthetic crown in an edentulous region after the end of orthodontic treatment.

Resumo

Objetivo: apresentar um relato de caso em que se utilizou um implante osteointegrado como unidade de ancoragem esquelética em associação com aparelho ortodôntico fixo, no tratamento de um paciente adulto com discrepância esquelética vertical assimétrica. Relato do caso: neste caso, foi utilizado o implante osteointegrado pré-existente na região do elemento 21 como auxílio de ancoragem esquelética para o nivelamento do plano oclusal superior, por meio da técnica *straight-wire,* prescrição Capelozza padrão I, *slot* .022", utilizando a sequência de arcos de níquel-titânio termoativado .014", .016", .017"X.025" e .019X.025", seguido por arco de aço .019" X.025". Considerações finais: os resultados apresentados neste relato demonstraram ser o implante osteointegrado uma boa opção, quando utilizado como recurso de ancoragem auxiliar em ortodontia, conferindo melhores condições de conforto e estética ao tratamento, bem como simplificação técnica.

Palavras-chave: Assimetria facial. Ortodontia. Procedimento de ancoragem ortodôntica.

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Corresponding author:

Dikson Claudino
Av. Marcolino Martins Cabral, 1788, sala 20
ZIP Code 88701-000 – Tubarão, SC, Brasil
Telephone: (+55) 48 999067203
E-mail: diksonc@hotmail.com

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