Use of orthodontic extrusion as aid for restoring extensively destroyed teeth: a case series

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Abstract

Forced orthodontic extrusion may represent a valid option for clinicians in different clinical situations. Extrusive movements lead to an improvement in the vertical amount of both hard and soft tissues. Major advantages of this procedure are related to the quality of the regenerated tissues, since they determine the vertical apposition of new endogenous bone. In this paper, we report a case series in which forced orthodontic extrusion in combination with other, surgical- or nonsurgical-techniques, led to recovery of “hopeless” teeth and avoided implant-supported restorations. In some cases a surgical fiberotomy was performed in order to improve the amount of healthy tissues available for the subsequent restoration. A long term follow up revealed that a multidisciplinary approach including: endodontic therapy, surgical crown lengthening or/and orthodontic extrusion followed by rehabilitation with fixed partial prosthesis (FPP) could lead to long survival rate even for “hopeless” teeth. These procedures have the aim to expose a sufficient amount of circumferential healthy tooth tissues that is fundamental to obtain a ferrule effect for the subsequent prosthetic restoration. Forced orthodontic extrusion represents an important technique in the hands of clinicians for the resolution of difficult situations. Although it is a safety and predictive technique, collaboration by the patient is necessary, in order to achieve desired results at the end of the extrusion period.

Introduction

The recovery of extensive destroyed teeth represents one of the most important challenges for dentists. In the last years, the frequent use of dental implants led a reduction in the execution of recovery procedures of widely destroyed teeth [1,2]. However, whenever possible, the conservative procedures should be preferred to the implant therapies because of the absence of periodontal ligament in implants compared to teeth restorations. Furthermore, the implant positioning may be subsequently performed in the event of failure of conservative therapies [3]. The periodontal ligament works as a shock absorber, absorbs the occlusal loads and determines a better discharge of the forces at the root interface level. Prosthetic and periodontal factors should be taken into account in order to obtain long-term success in this type of treatments. For a correct restore of the "biologic width", different kinds of therapies may be performed such as: surgical crown lengthening combined, or not, with orthodontic extrusion [4]. The final aim of these procedures is to expose a sufficient amount of circumferential healthy tooth tissues. In fact, an amount of 1.5-2.0 mm in height and 1.0 mm in width is required in order to obtain the "ferrule effect" which strongly decreases the rate of vertical fractures [5]. To improve the longevity of restorations, another factor to take into account is the crown-root ratio. In fact, failure to comply with this parameter is one of the major source of failure [6]. Surgical crown lengthening procedure provides for an apical flap repositioning after osteotomy procedures, which permit the reestablishment of a new "biologic width". However, this approach leads to a decrease of the amount of root portion in the bone (worsening of the crown/root ratio) and a gingival repositioning. In the anterior sector, this could lead to an incorrect gingival alignment and determines esthetic problems [7]. Orthodontic tooth extrusion is a less invasive approach, in which there is no interference with the periodontium of neighboring teeth; nevertheless this technique requires a better patient compliance [8]. The coronal migration of periodontal tissues during and after dental extrusion seems to be induced by the tension provoked by gingival fibers; in fact, performing a supracrestal fiberotomy during the period of extrusion may prevent the coronal migration of bone and gingival tissues. In this way, at the end of extrusion and retention periods a greater amount of healthy tooth structure could have been moved coronally and be available for the subsequent prosthetic rehabilitation [9]. This procedure is indicated for the recovery of teeth with partial subgingival fracture, since it exposes the healthy tissues in the oral cavity allowing a subsequent rehabilitation [10]. Extrusive movements also determine enhanced amount of soft tissues by increasing the width of attached gingiva [11]. It has been demonstrated that during the extrusion movements the gingival margins migrates coronally but the level of the mucogingival junction remains at the same level [12]. As above mentioned, this technique leads to increment of both soft and hard tissues, the gain is significant because it happens on the vertical plane and, as it is known, such success is difficult to achieve with the current surgical regenerative procedures [13]. Another advantage is related to the quality of the regenerated tissues, because the extrusive...
procedures lead to apposition of new "endogenous" bone that is the best possible result to be obtained [14]. In addition, it seems that orthodontic extrusion could be an option in periodontal therapy aiming to reduce angular periodontal bony defects [15,16]. In this paper, we report a case series of teeth restored with a multidisciplinary approach, involving the use of orthodontic extrusion in different clinical situations.

Patients and methods

Case 1

A 36-years-old female patient referred to our observation, complained a fracture of the lingual surface of the element 4.5. At the clinical examination, the tooth presented a destructive decay with a fracture of the lingual wall up to cervical line. The radiographic examination revealed the presence of a radiolucent periapical lesion. To start, a composite provisional restoration was built without the insert of a fiber post. Subsequently, the patient mounted a fixed orthodontic appliance in order to have an extrusion of the root and expose the cervical margin of the tooth. The orthodontic therapy was carried out for two months in combination with a coronal odontoplasty to allow the extrusion of the tooth in the arch. After removing the orthodontic, a surgical crown lengthening was performed in order to improve the amount of healthy tissues exposed to the oral cavity, increase the retention of the later restoration and maintain the biological width. After the healing period, a custom post was built and cemented to the root canal. The final restoration was built after a second provisional restoration that was used to improve soft tissues conditioning. A polyether base impression (Impregum; 3M ESPE®) was carried out after the placement of two retraction cords. Finally, a ceramic-metal crown was cemented using GC Luting and Lining cement (GC Corporation). After a ten years follow-up, the restoration and soft tissues appear to still be in good health conditions (Figure 1).

Case 2

A 44-years-old male reported to our department for a general dental examination, the patient wanted restore the element 1.5 who fractured itself 3 months before. At the clinical examination, this tooth appeared destroyed and decayed, with the dental margin positioned at subgingival level. Radiographic examination with an intraoral periapical radiograph revealed the presence of a radiolucent periapical lesion. The patient refused the implant therapy, so we decided to perform a multidisciplinary therapy including: endodontic treatment, orthodontic extrusion and prosthetic rehabilitation. In addition, the patient asked us the utmost respect for its aesthetics during orthodontic procedures. For this reason, after the endodontic therapy, we built a custom device with two orthodontic bands, which served as anchorage for the extrusion forces. To transmit forces to the root, a prefabricated post was leaning against the canal walls and was put on traction with an elastic thread. The orthodontic extrusion was carried out for a period of 6 weeks, and a supracrestal fibromyoblast with concurrent root planning was performed once a week during the extrusion period. After another three months of stabilization, a restoration with a fiber post was carried out and a provisional crown was cemented. Subsequently, a polyvinyl siloxane rubber base impression was taken (Exa’lence®, GC Corporation) on the final crown preparation for the crown construction. Radiographic evaluation at 8 years follow-up revealed a healthy condition for both endodontic and periodontal tissues (Figure 2).
alignment of the gingival paraboles [31]. In this paper, we report three cases of multidisciplinary approach, containing orthodontic extrusion, for the recovery of strongly destroyed teeth in the posterior region. In the clinical practice, this is the most frequent and comfortable situation to perform orthodontic extrusion. In fact, the majority of patients refuse to perform these procedures in the anterior region for aesthetic reasons, while, in the posterior region, this technique may be performed without aesthetic sequelae. For posterior teeth, the exposure of the margin to 360 degrees is one of the most important prerequisites for a long-lasting prosthetic rehabilitation [32]. The three cases reported in this paper have a mean follow up of 10 years and the patient satisfaction is very high. In our experience, one of the most important problems following the orthodontic extrusion is the amount of root remaining in the bone. In fact, this could lead to a disadvantageous root/crown ratio and increase the risk of fracture. In these situations the risk of fracture could be decreased scribing the crown of the tooth with the crown of the neighbor element as reported in the case 2.

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