

## Step-Smart Approach for Treatment of The Esthetic Areas with Cystic Lesions Using Dental Implants: A Case Report

Thales de Castro Andrade Santos<sup>1</sup>, Esteban Arroyo<sup>1</sup> and Tatiana Miranda Deliberador<sup>1</sup>

<sup>1</sup>Department of Post-Graduation, Latin American Institute of Dental Research and Education (ILAPEO), Curitiba, Paraná, Brazil

### \*Corresponding author:

Tatiana Miranda Deliberador, ( PhD, DDS),  
Department of Post-Graduation, Latin  
American Institute of Dental Research and  
Education (ILAPEO), Curitiba, Paraná,  
Brazil. Address: Rua Jacarezinho, 656  
Mercês, Curitiba-PR, 80710-150 Brazil

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## 1. Abstract

This case report presents a step-smart approach to guided bone regeneration (GBR) and implant rehabilitation in the esthetic zone affected by an extensive cystic lesion in a 19-year-old female patient. The patient had a history of dentoalveolar trauma, endodontic treatment, and orthodontic intervention. Clinical examination revealed a lack of vitality in teeth 1.1, 1.2, and 2.1, along with buccal fistulas and a large periapical lesion. The treatment plan involved three steps: tooth extraction and GBR using bovine xenografts and a resorbable membrane, followed by dental implant placement and delayed loading, and finally, the prosthetic phase with a temporary crown. During the first surgical step, tooth 1.2 was extracted, and GBR was performed using a bone substitute and a double-layered resorbable membrane. After six months, an implant was placed in the region of tooth 1.2, and a provisional crown was delivered three months later. A 9 follow-up CT scan showed bone growth at the implant site and bone regeneration around tooth 1.1. Due to the patient's high smile line, clinical crown augmentation surgery was performed, revealing bone neof ormation in the region of tooth 1.1 and adjacent areas. This case highlights the importance of a step-smart approach to GBR and implant rehabilitation in the esthetic zone, particularly in cases with extensive cystic lesions and high smile lines.

## 2. Introduction

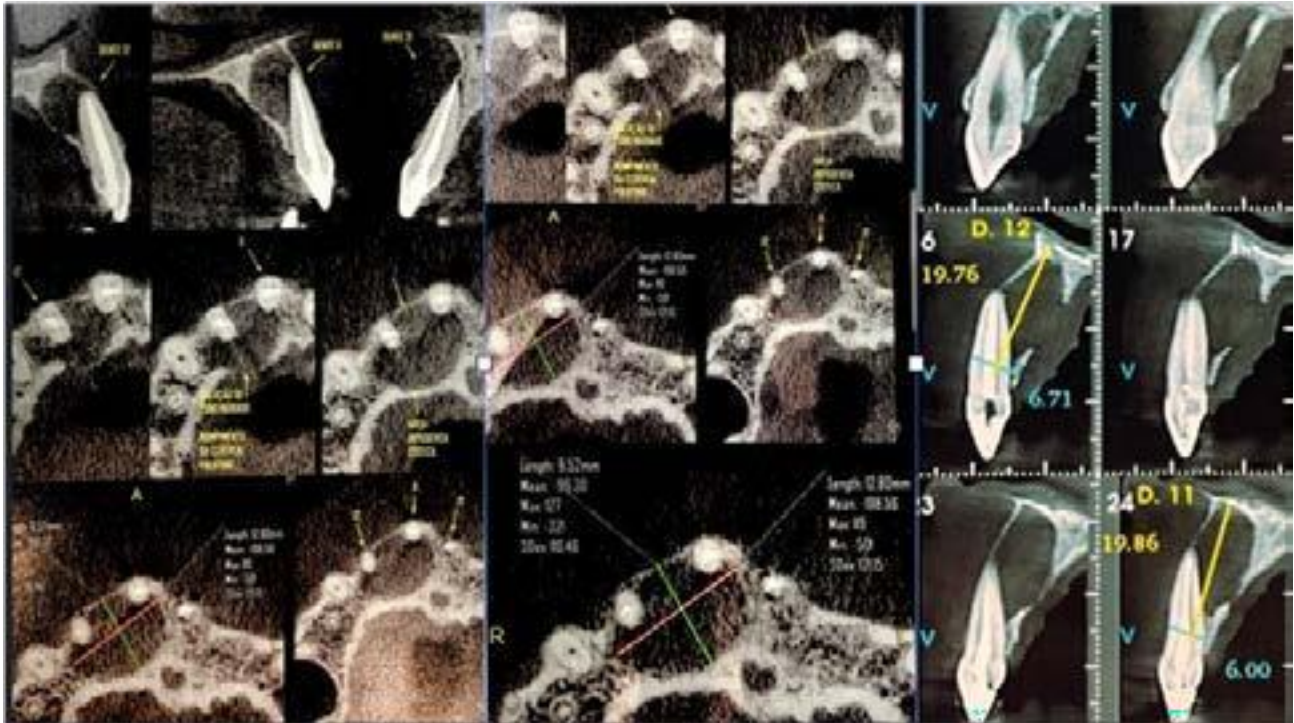
Child and teenager's dental trauma is not uncommon lesion and stays prevalent over time. Among all the lesions related to dental trauma, tooth loss is the most severe. After tooth extraction, the physiological bone remodelling of the alveolar ridge reduces bone availability, this harms further implant placement [1]. Achieving pleasing aesthetics in the anterior maxilla involves many clinical parameters and is directly related to maintaining the alveolar ridge architecture compared to the contralateral natural tooth [2]. Dimensional changes in bone and soft tissue following tooth extraction in the anterior maxilla have a significant impact on the aesthetic outcome of implant-supported restorations, as lamellar bone is a tooth-dependent structure [3]. The preservation of hard and soft tissues with immediate implant placement can be enhanced by immediate provisional restoration, which also offers psychological, functional and aesthetic advantages to the patient [4-9]. Even in high aesthetic challenges or chronically infected sites, immediate implant placement well indicated with high success rates [10]. Infectious and inflammatory processes in alveolar sites hamper bone remodelling, affecting the process of implant osseointegration [11-13]. Moreover, the infectious and inflammatory processes may result in extensive destruction of the alveolar ridge, which will require bone augmentation procedures before implant

placement. The structure of xenogenic bone substitutes is similar to the structure of human bone, which explains their osteoconductive properties, acting as a scaffold for bone regeneration enabling implant placement [14,15]. Compaction and stabilization of bone substitutes are essential to ensuring sufficient blood perfusion for the proliferation of osteogenic cells, which is a key factor in the success of guided bone regeneration (GBR). In GBR the use of resorbable membranes aims to fix the bone substitute and act as a selective barrier to exclude soft tissue cells leading the blood perfusion [16,17]. This article aims to present a case of GBR and implant rehabilitation in the esthetic zone affected by an extensive cystic lesion with step-smart approach a to achieving a high end esthetic result.

### 3. Case Report

A 19-year-old female patient attended a private clinic, which consulted for buccal infectious suppuration between teeth 1.1, 1.2 and 1.3 (Figure 1). She reported suffering a dentoalveolar trauma a few years ago, which led to the extrusion of tooth 1.1, also passing only un-dergoing composite fillers to restore the fracture of teeth 1.1 and 2.1 and had undergone orthodontic treatment. After 3 years, the patient returned for orthodontic treatment to correct tooth 1.1, which continued to suffer extrusion and movement. The clinical examination revealed a lack of vitality in teeth 1.1, 1.2 and 2.1, which had undergone endodontic treatment. After 1 year of orthodontics, the patient returned with the main complaint of mobility in tooth 1.2. Buccal fistulas and a large periapical lesion were found, despite satisfactory endodontic treatment. The patient also had a high smile line with excessive gingival display (EGD) (Figure 2). Before surgery, a prophylactic antibiotic therapy was indicated, with the use of Amoxicillin 875mgs with Clavulanate potassium 125mgs for 10 days, ibuprofen 600mgs 12x12 hours to chronify the infection and reduce the edema, but without success, the fistula points remaining, but without edema. The patient was informed that teeth 1.1 and 1.2 were indicated for extraction associated with GBR. The treatment was planned in three steps. The first would involve removing the teeth, performing a bone graft using bovine xenografts and using a resorbable membrane. The second, after 6 months of healing, would be the dental implants placement with delayed loading. The third, after 3 months, the prosthetic phase with the installation of a temporary crown.

For the first surgical step, anesthesia was performed by blocking the maxillary middle and anterior alveolar nerves, followed by an intrasulcular incision in teeth 2.1 to 1.5 and a vertical-releasing incision distal 1.5. After total mucoperiosteal reflection, a complete bone loss of the buccal, palatal walls and apical area of tooth 1.2 was observed. Extraction and removal of the granulation tissue were executed and irrigation with 0.12% chlorhexidine. The tooth 1.1 showed mesial, distal, palatal and apical bone loss, but the presence of a bone crest and some remaining cervical bone tissue could be seen (Figure 3). The tooth did not present any kind of mobility. At this point, it was decided not to extract tooth 1.1, in an attempt at serial extraction and implantation, so as not to generate vertical loss of the whole surgical site. Extracting elements 1.1 and 1.2 could harm aesthetics due to the patient's high smile line. Following the extraction of tooth 1.2, the GBR was performed with a bone substitute (Cerabone 1cc - Straumann) and the use of resorbable membrane (20x30mm Jason membrane - Straumann) with a double layer and fixation with titanium tags (1.3x3mm- WF Cirurgicos). The membranes were cut out and adapted according to the shape and size of the lesion. The first layer of membrane was placed horizontally, and the second layer was placed vertically to the bone defect, overlapping the first membrane and being enveloped in the palatal vestibule direction (Figure 4). After six months the implant was placed in the region of tooth 1.2 and after 3 months the provisional crown was delivered (Figure 5). After 9 months, the patient underwent a new CT scan, which showed bone growth on the site of the implant and bone regeneration on tooth 1.1 (Figure 6). The tooth had no degree of clinical mobility. Due to the high smile line, clinical crown augmentation surgery was performed on teeth 1.7 to 2.7, with osteotomy and osteoplasty, leaving the bone margin 4 mm apical to the cervical area of the clinical crown. During the surgery, bone neo-formation was observed in the region of tooth 1.1, both mesially and apically, distal to tooth 1.2 and mesial to tooth 1.3 (Figure 7). After 120 days, HT lithium disilicate ceramic laminates were prepared for teeth 1.5 to 2.5, replacing the 3.3x6x3mm GM Universal trunnion abutment by a customized zirconia trunnion abutment to neutralize the substrate and improve the emergence profile of the crown (Figure 8). The patient obtained esthetic and functional satisfaction and has been followed up for 5 years without any complication (Figure 9).



**Figure 1:** CT image showing the extension, depth, length of the cystic lesion between teeth 1.1,1.2,1.3.



**Figure 2:** Initial image, showing high smile line and good gingival exposure and active infectious site.



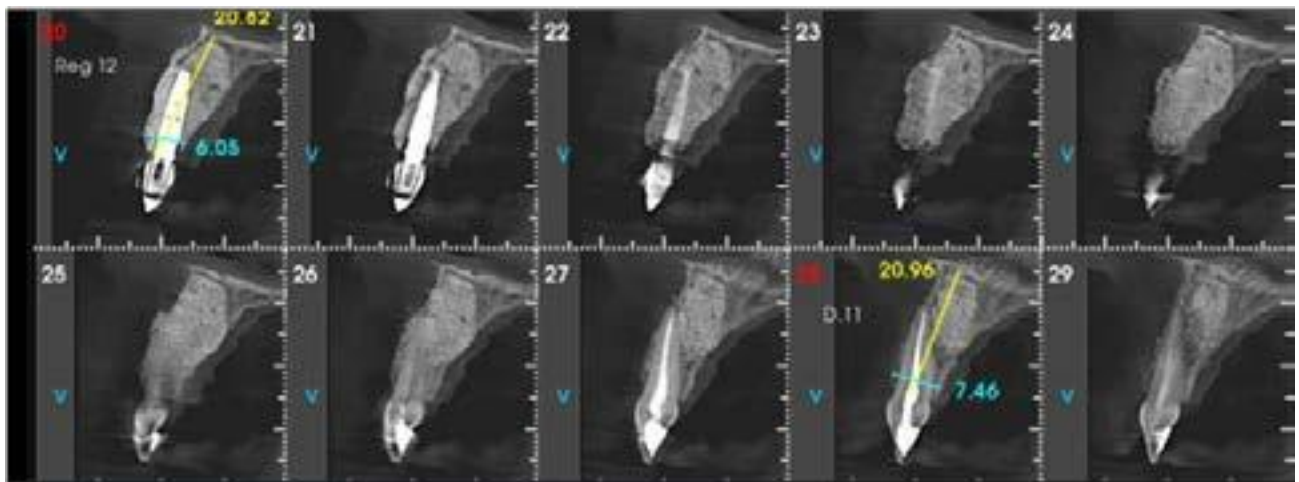
**Figure 3:** (a) incision and total reflection of the flap, (b) removal of granulation tissue and (c) extraction of tooth 1.2.



**Figure 4:** (a) Graft adapted to the bone defect, (b) positioning and fixation of the membrane for the GBR, (c) positioning and adaptation of the double-layer membrane.



**Figure 5:** (a and b) Provisional prosthesis installed in the region of tooth 1.2, 3 months after implant placement.



**Figure 6:** CT scan after 9 months of grafting, showing bone formation in the implant region of tooth 1.2, and bone regeneration of tooth 1.1.



**Figure 7:** Total reflection for clinical crown augmentation surgery, showing the effectiveness of GBR on teeth 1.1,1.2,1.3.



**Figure 8:**(a) After 120 days to clinical crown augmentation surgery, (b) dental preparation of teeth to receive prosthetic rehabilitation and replacing the 3.3x6x3mm GM Universal trunnion abutment, (c) Finalized case using 10 HT BL2 lithium disilicate laminates.



**Figure 9:** 5-year follow-up.

#### 4. Discussion

In cases of tooth extraction in esthetic areas, the clinician is often faced with a challenge regarding the optimal decision-making process to provide a solution using dental implants. This decision is aligned with the: time chosen for implant placement, the ability to place an immediate dental implant; the quality and quantity of soft tissue in the region of the extraction socket; the remaining height of the buccal bone; and the expected survival and success rates of the implant [18]. Favorable results from procedures for the immediate placement and provisionalization of implants performed in intact sockets are less predictable when a buccal bone defect is present [19]. In regions affected by cystic lesions, there is often a loss of structural and morphological anatomy of the covering hard and soft tissues. Controlling contamination at extraction sites may be the key to the success of immediate implantation in infected sites [20]. Immediate implant placement in infected sites in the esthetic zone has been shown to have an equally favorable survival rate to healthy sites, with similar changes in soft and hard tissues, and GTR and GBR techniques using bone substitutes gap fillers, membrane placement and soft tissue closure are crucial for such success [21-24]. This was verified in this clinical case report. Especially in the esthetic area, such as this clinical case, there are differences in success rates rather than survival rates. Achieving aesthetic success is related to several factors such as proper three-dimensional positioning of the implant, maintenance of the ridge anatomy on the buccal side, tissue biotype, also the poor aesthetics of the restoration against its contralateral and should be considered a failure [25-27]. This case highlights the importance of a precise diagnosis and the need to identify cases where there is no possibility of immediate implant placement, requiring a multiple-stage GBR technique, thus implementing a serial approach, especially when there is a loss of two or more teeth in the same segment. The membrane used for the GBR was a Jason membrane (Botiss), based on native collagen obtained from porcine pericardium, which causes less severe material-induced inflammation and is therefore absorbed more slowly and retains its barrier functionality for longer, forming a barrier between the soft tissue and the bone defect area. It thus prevents the non-osteogenic cell population from migrating to the bone defect area and allows the osteogenic cell population of the original bone to grow [22]. Another key factor in GBR's success is the use of a double-layer membrane [5]. The reason is the reduction of micro-movements and better stabilization of the graft, improving the action of the xenogenic material with its osteoconductive role. In this case, the use of a double-layer membrane and its fixation with tags favoured stabilization of the graft, leading to the clinical success observed. Urban et al. 2016 compared different GBR treatment groups, including procedures with or without membrane fixation [23], the study showed that any form of stabilization for unilateral horizontal bone augmentation

resulted in better graft stability. In this patient's case, if tooth 1.1, 1.2 and possibly 1.3 had been removed, due to the size and extension of the lesion, functional and aesthetic success would not have been achieved, as there would have been a significant loss of bone crest height (vertical) and bone volume (horizontal). Other studies have described that it is more difficult to maintain or create a papilla between two adjacent implants than an implant and a natural tooth [26]. During the clinical crown augmentation surgery, to reduce gingival exposure when smiling, we saw total bone regeneration of 1.2, 1.1 and 1.3 teeth, and the extraction of tooth 1.1 was no longer necessary (Figure 6). In fact, bone regeneration and successful healing of tooth. 1.1 would not be possible, since there were no palatal, apical or mesial bone walls, and the plan proposed for the patient would be to extract and install the implant in the region of tooth 1.1 after the provisional crown of tooth 1.2 had been fitted. The remaining cervical bone maintained the height of the mesial and distal bone crest, and this was important for maintaining the periodontal architecture and stability of the tooth, which played a preponderant role in the healing process after the GBR in the region of teeth 1.2 and 1.1, as we saw in this case report. Three months after the clinical crown augmentation surgery, a customized zirconia trunnion abutment was made for tooth 1.2, and ceramic laminates in HT BL2 lithium disilicate were made for teeth 1.5 to 2.5, to balance for the color due to the alteration caused by the endodontic treatments and correct the volume, since tooth. 1.1 was buccally projected and there was extrusion due to its bone loss [24-27]. Even though the treatment was carried out in several stages, the patient felt fulfilled because she had only lost one of her teeth. She was satisfied with the proposed treatment, with aesthetics very similar to the contra-lateral tooth, no surgical sequelae and the elimination of a gummy smile that had bothered her a lot. As we can see from this case report, GBR followed by delayed implant placement and provisionalization in an esthetic area is well indicated even when there are active infections, and the decision to reach clinical success must be made cautiously considering both functional and esthetic results.

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