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IMPLANT SITE GUIDED BONE REGENERATION AND PONTIC SITE RIDGE PRESERVATION: A CASE REPORT

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ABSTRACT

Guided bone regeneration (GBR) is a therapeutic modality to achieve bone regeneration with the use of barrier membranes. The use of deproteinized bovine bone material (DBBM) for ridge preservation allows the preservation of the edentulous ridge dimensions. Here, we present a case of horizontal GBR using DBBM and a resorbable membrane, with simultaneous implant placement. Simultaneously, ridge preservation of the pontic area, using DBBM within a "socket seal" procedure was performed. Two implants were places at sites 23 and 26 to support a fixed partial denture (FPD). The mesial implant showed exposed buccal threads, which were then covered with autogenous bone particles and small size granules of DBBM. The collagen membrane was stabilized with periosteal mattress suture. Six months postoperatively, CBCT images revealed a stable buccal bone layer at the implant site, indicating a successful GBR procedure. At this point in time, tooth 24 was atraumatically extracted. A ridge preservation was done utilizing DBBM, and a soft tissue graft form the tuber. A ceramic-metal FPD with excellent "white aesthetics" and a harmonic transition zone to the soft tissue was fabricated. At 3 years follow up, the peri-implant bone levels were stable, and the clinical outcomes were excellent. It is concluded that a GBR procedure, utilizing DBBM and a collagen barrier membrane with simultaneous implant placement, as well as ridge preservation using DBBM, are predictable therapeutic methods. However, gentle manipulation of the soft tissues, and wound stability, with tension-free passive closure of the wound margins are prerequisites for a long-term clinical success.

Keywords: implants, guided bone regeneration, ridge preservation, deproteinized bovine bone materials

INTRODUCTION

Guided bone regeneration (GBR) is a therapeutic modality used to achieve regeneration of bone with the use of barrier membranes. The role of these membranes is to create a secluded anatomical space favorable for new bone formation. Bone regeneration is enhanced when the invasion of soft tissue into osseous defects is mechanically blocked, thus protecting the blood clot and enabling colonization of osteogenic cells. [1]

GBR procedures have been rapidly evolving since the introduction of the dental implants

as a method to anchor dental prostheses to bone. It is one of the most documented methods to regenerate bone in hard tissue defects, before or simultaneously with the implant placement. [2, 3]

When placed implants remain partially unexposed by bone, the literature shows GBR to be successful for predictable bone formation. [4, 5] The application of a membrane to exclude non-osteogenic tissues from interfering with bone regeneration is the basic principle of GBR. [6] Various bone substitutes have been described as adjunct or alternative to autogenous bone grafts. Bone graft substitutes must be transformed to the patient's own bone, but a slow substitution is advantageous for the maintenance of the augmented volume. [7, 8]

Tooth extraction results in a decrease of the dimensions of the alveolar ridge. In an attempt to maintain ridge volume following tooth extraction, bone grafts (autografts and allografts) and bone substitutes (xenografts and alloplastic materials) are inserted in the fresh extraction sockets. Socket grafting with the use of deproteinized bovine bone will delay the healing process but allows the preservation of the dimension of edentulous ridge. [9

CASE PRESENTATION

OThis clinical case report describes the successful use of deproteinized bovine bone material (DBBM, Bio-Oss®, Geistlich, Wolhusen, Switzerland) in conjunction with a resorbable collagen membrane (Bio-Gide®, Geistlich, Wolhusen, Switzerland) for the regeneration of a horizontal and a minor vertical bone deficiency at an implant site. Simultaneously, a ridge preservation by a "socket seal" procedure at the pontic site of the future fixed partial denture in the left posterior maxilla was reported.10

A healthy seventy-five-year-old male patient visited our clinic, looking for the replacement of a fixed partial denture (FPD) in the left posterior maxilla. This FPD has been in function for more than five years. The patient's main complaints were his inability to chew on the left side due to pain and the loosening of the bridge. The initial clinical examination as well the panoramic image revealed that the FDP of the supporting teeth showed caries, thereby making tooth 24 unrestorable. Furthermore, there was an unfavorable distal cantilever (fig. 1). After the CBCT-scan analysis, it was decided to use two implants: position 23 and position 26, serving as abutments for an implant-supported FPD.

Two MIS Seven (MIS®, Dentsply Sirona, York, US) bone-level (3.75x10 mm) implants were installed. The implant at site 26 was placed in combination with an internal sinus membrane at an elevation of 4 mm. The implant bed preparation for the implant at position 23 was done with slow drilling (50 rpm) in order to collect bone for the planned bone regeneration procedure.11 The implant at position 23 was placed in a horizontally deficient ridge, with a width of 4 mm, leaving the coronal buccal part of the implant unexposed (fig. 2). Thus, a guided bone regeneration (GBR) procedure was performed. First, the autogenous bone chips collected whilst drilling were applied directly on the exposed implant surface. The second layer was applied with small size granules of bone replacement material (DBBM, Bio-Oss®, Geistlich, Wolhusen, Switzerland). A slight overcorrection in the horizontal direction was com-

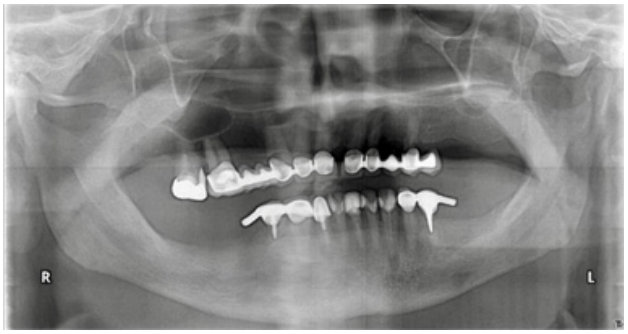


Figure 1. *Pre-operative panoramic image*

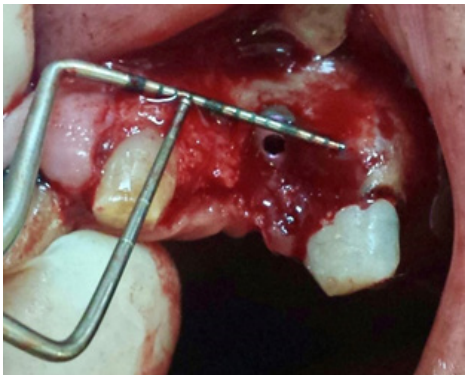
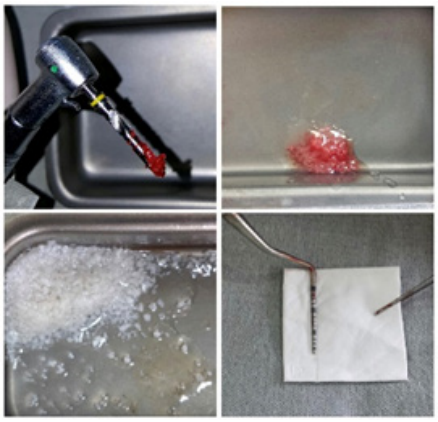
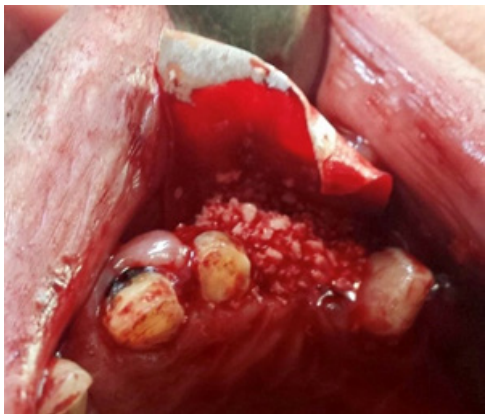


Figure 2. *Implant placed in a deficient ridge*



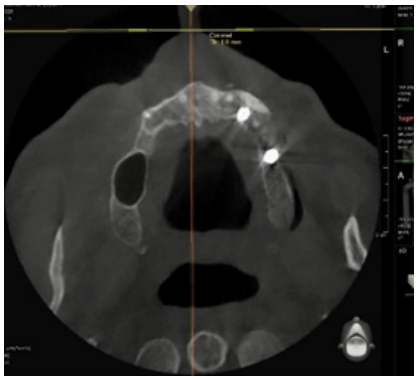


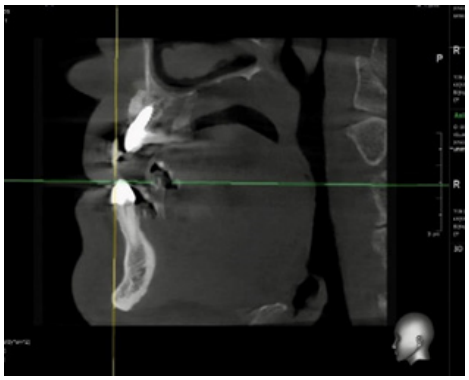
Figures 3 and 4. *The GBR procedure for horizontal ridge augmentation*

pleted. The bone replacement material was covered with a single layer of a resorbable membrane (Bio-Gide®, Geistlich, Wolhusen, Switzerland). This membrane was positioned before the application of the bone graft materials and it was stabilized with a horizontal mattress suture using an absorbable 5.0 PGA suture (Assut Medical, Lausanne, Switzerland). The sutures were passed through the periosteum at the apical part of the flap and tied to the palatal mucosa. A superficial submucosal incision (periosteum splitting) was done in order to enable flap mobility for primary closure (fig. 3 & 4). The soft tissues were closed utilizing double sling 5.0 polypropylene sutures (Assut Medical, Lausanne, Switzerland) to ensure a passive closure of the wound. An antibiotic (amoxicillin + clavulanic acid) was prescribed post-operative and instructions for oral hygiene were given to the patient.

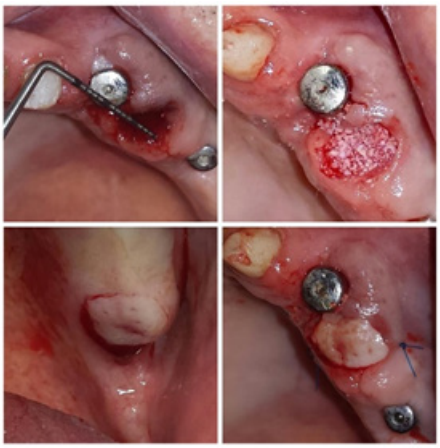
Two weeks post operation the sutures were removed. Tooth 24 was temporarily used as abutment for the provisional PMMA bridge. Element 24 was meant to be extracted at a later stage, after the osseointegration of both implants. The patient was scheduled for regular monthly follow ups, during the following months.

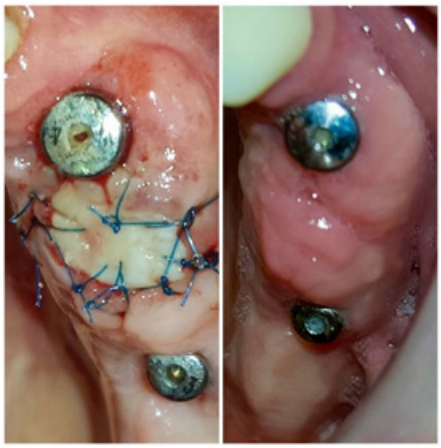
Six months post operation, a CBCT-scan was made. The axial and sagittal scan images revealed a stable layer of bone at the GBR site and prosthetically correct implant positioning (fig. 5 & 6). At this point of time, the provisional bridge was removed. Upon determining the sufficient stability of both implants (ISQ values above 65 – Penguin® RFA, IDS, Goteborg, Sweden), the healing abutments (4 mm height) were placed. No soft tissue manipulation was done due to the adequate width and vertical thickness of the attached mucosa. Tooth 24 was atraumatically





Figures 5 and 6. *CBCT images at 6 months post-operative*





Figures 7 and 8. *The "socket seal" procedure for ridge preservation*

extracted and a ridge preservation, utilizing the "socket seal" technique, was done. [10]

The alveolar socket was thoroughly cleaned and gently filled with small granule size (0.25-1mm) deproteinized bovine bone material (Bio-Oss®, Geistlich, Wolhusen, Switzerland). The diameter of the alveolus was measured using a graduated periodontal probe (UNC15, Hu-Friedy, Chicago, US). After the de-epithelization of the wound margins with a round diamond bur, a soft tissue graft from tuberosity was harvested. The graft margins were also de-epithelized using a 15C blade (Swann-Morton, Sheffield, UK). The graft was placed and sutured to the surrounding tissue using 6.0 polyproplylene sutures (Assut Medical, Lausanne, Switzerland), which were finally removed two weeks later (fig. 7 & 8).

The prosthetic phase of the treatment was completed with the fabrication of a ceramo-metal fixed partial denture (FPD). Two straight abutments were tightened to the implants with the recommended torque of 30 Ncm and the bridge was cemented utilizing long-term temporary cement (DentoTemp, Itena Clinical, Villepinte, France) for better retrievability.

The final restoration was very aesthetically acceptable, with a harmonious transition zone between the margins of the bridge and the soft tissue (fig. 9). The patient was scheduled for regular annual follow up exams. The panoramic image at the 3-year follow-up showed stable bone levels without any sign of peri-implant disease. Patient satisfaction was excellent (fig. 10).

CONCLUSION

The key elements that make this type of cases successful are: (1) correct 3D implant planning and positioning, (2) the choice of re-

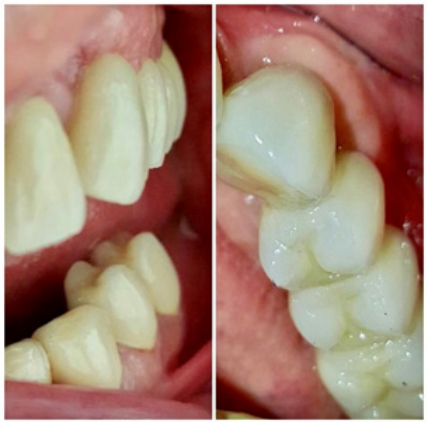


Figure 9. *The final restoration in place*

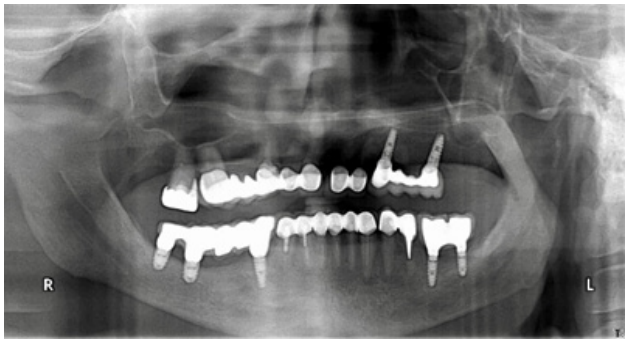


Figure 10. *Panoramic image at three year follow-up*

liable bone replacement material for regeneration, (3) the gentle manipulation of the soft tissue, (4) wound stability with enough available space and finally (5) a tension-free suturing for passive closure of the wound margins. A GBR procedure utilizing DBBM and collagen barrier membranes in conjunction with simultaneous implant placement, as well as ridge preservation using DBBM, are both predictable therapeutic methods providing excellent long-term results.

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Резиме

ВОДЕНА КОСКЕНА РЕГЕНЕРАЦИЈА НА МЕСТОТО НА ИМПЛАНТОТ И ПРЕЗЕРВАЦИЈА НА ГРЕБЕНОТ НА МЕСТОТО НА ТЕЛОТО: ПРИКАЗ НА СЛУЧАЈ

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Воденатa коскена регенерација подразбира регенерција на коскеното ткиво со употреба на мембрани. Употребата на депротеинизиран говедски коскен материјал овозможува зачувување на димензиите на беззабиот алвеоларен гребен. Презентиран е случај на поставување на имплант во тесен алвеоларен гребен со истовремена хоризонтална водена коскена регенерација, како и презервација на гребенот на местото на телото од идната фиксна протеза со употреба на депротеинизиран говедски коскен материјал. Поставени се два импланта на позиција 23 и 26. Кај имплантот на позиција 23, врз експонираните букални навои е поставено автологно коскено ткиво и депротеинизиран говедски коскен материјал. Колагената мембрана е стабилизирана со периостеална душек-сутура. Шест месеци подоцна, на CBCT-снимките се детектира стабилно букално коскено ткиво – знак за успех на процедурата. Забот 24 е атрауматски екстрахиран и е направено зачувување на алвеоларниот гребен со депротеинизиран говедски коскен материјал и мекоткивен трансплантат од областа на туберот. Направен е металкерамички мост со одлична естетика и хармоничен преод кон мекото ткиво. Три години подоцна, коскеното периимплантно ниво е стабилно, додека успехот на интервенцијата од аспект на пациентот е одличен. Заклучокот е дека воденатa коскена регенерација со употреба на депротеинизиран говедски коскен материјал и колагена мембрана, како и зачувувањето на гребенот со депротеинизиран говедски коскен материјал, се предвидливи тераписки методи. Но, нежната манипулација со меките ткива, стабилноста на хируршката рана за да се обезбеди простор за регенерација, како и сутурите без тензија, се предуслов за клинички успех.

Клучни зборови: импланти, водена коскена регенерација, зачувување на алвеоларен гребен, депротеинизиран говедски коскен материјал