Case presentation

Minimally invasive staged approach for aesthetic dental implant therapy – a case report

Abstract

This case report presents a staged approach for minimally invasive immediate implant placement for a maxillary central incisor. A preliminary procedure to enhance soft tissue thickness and volume was provided with a connective tissue graft via a tunnelling technique. A secondary procedure utilised piezo-surgery for atraumatic extraction, guided surgery for implant placement, and recombinant human platelet-derived growth factor-BB (rhPDGF-BB) with bone allograft to graft the peri-implant extraction socket. The staged combined treatment resulted in ideal biologic health and aesthetics for the implant supported restoration.

Introduction

Maintaining aesthetics for anterior dental implant rehabilitation remains a challenge due to the complexities of maintaining an adequate framework of hard and soft tissue architecture, which is ultimately required for the restorative phase of treatment. There are significant changes to the ridge form, bone, and soft tissue volume that begin almost immediately post-extraction (1). Thus, careful sequencing for surgical treatment planning and decision-making is essential to obtain optimal and predictable results.

One treatment option that has been previously recommended is to provide a simple dental extraction and delay regenerative therapy until the soft tissue has healed (2). This delay may result in significant bone and tissue loss that could otherwise be intercepted via preservation procedures performed at the time of extraction (3). Maintaining bone dimension is not only crucial for a prosthetic driven implant placement but also aids in maintaining the soft tissue level (1).

The aim of this clinical report is to describe a sequence of minimally invasive treatment procedures for replacement of a maxillary central incisor with a dental implant. This report presents the transition from a maxillary right central incisor with soft tissue recession to a healthy dental implant with an aesthetic restoration and normal gingival contours.

Case report

A 47 year-old patient presented with mild discomfort and was concerned with the aesthetics of his maxillary right central incisor. He reported a history of endodontic treatment, crown lengthening, and a crown placement performed 15 years ago. During the
past year, the crown had been re-cemented several
times and the patient had constant mild discomfort.
Clinical examination revealed soft tissue recession
at the maxillary right central incisor (Figure 1A, B).
Cone beam CT scan (CBCT) did not demonstrate
any significant findings. It was determined that the
tooth had a guarded prognosis and a treatment plan
for implant placement was established. To address the
patient's chief complaint and request for minimally
invasive procedures, a subepithelial connective tissue
graft using a tunnel technique was planned followed by
atraumatic extraction of the maxillary right central
incisor and a guided immediate implant placement.

A soft tissue tunnel was prepared using
microsurgical instrumentation extending from the
maxillary right lateral incisor to the left central
incisor. The tooth was scaled and root planed
using curettes. The root surface was then treated
using neutral pH 24% EDTA (PrefGel, Straumann
USA, Andover, MA). The subepithelial connective
tissue graft was harvested from the palate. The
graft was soaked in recombinant human platelet
derived growth factor-BB, rhPDGF-BB, (Gem 21S,
Osteohealth, Shirley, NY) for 10 minutes. The graft
was stabilised using suture (6-0 Premilene, Braun, Melsungen,
Germany) (Figure 2).

A 3D software (Materialise Dental, Glen Burnie, MD,
USA) was utilised to plan for the immediate implant
placement at the maxillary right central incisor with
a guided surgical flapless approach (Figure 3). This
approach was chosen to aid in maintaining the hard
and soft tissue anatomy. The tooth was extracted
atraumatically using Piezo-surgical instrumentation
(Mectron Columbus, OH). A horizontal root
fracture was noted (Figure 4A-B) and the tooth
was sectioned and removed atraumatically. Implant
preparation and placement was performed utilising
the Navigator surgical kit (Biomet 3i, Palm Beach
Gardens, Florida, USA) (Figure 4C). This allowed
for an accurate placement of a 4 by 15mm fixture
(Figure 4D). The surrounding extraction socket was
grafted with rhPDGF-BB and freeze dried allograft
(RegenerOss Biomet 3i, Palm Beach Gardens, Florida,
USA) protected by a collagen membrane (Bio-Gide,
Geistlich, Princeton, NJ ) placed over the socket
(Figure 4E). The membrane was stabilized using
PeriAcryl (GluStitch, Ace Surgical, Brockton, MA)
(Figure 4F). A periapical radiograph was taken post-
operatively (Figure 4G). Patient was provisionalised
using an Essex retainer (Figure 4H).

The site was allowed to heal for 5 months prior to
second stage surgery. The implant was then restored
using a Lithium Disilicate pressed titanium abutment
and Lithium Disilicate crown (Figure 5A-C).
Periapical radiograph was taken (Figure 5D).
Discussion

Aesthetic dental implants should meet the biological and functional needs to be sustainable over time. Establishing adequate bone and soft tissue is a necessity for the longevity and success of implants (4, 5). In an effort to achieve a minimally invasive treatment, a flapless approach may be desirable. However, this should not limit the overall surgical restorative and aesthetics goals.

A natural tooth with recession that will be transitioned to an implant supported restoration has additional considerations. This case report presents an alternative approach with staged treatment beginning with improving the soft tissue thickness and height via a minimally invasive tunnel approach connective tissue graft prior to extraction and implant placement. This will provide increased soft tissue to support the grafting in the extraction socket and around the immediate implant.

A minimally invasive implant placement should not limit the accuracy of a restorative driven treatment, nor the safety regarding anatomic limitations. The use of a guided surgical approach through a computerised simulation allows for the implant placement to be provided with around 98% accuracy (6,7). Guided surgery is advantageous for conventional implant placement, immediate implant placement, and for potential immediate provisionalisation. The case presented utilised immediate implant placement, with 5 months healing prior to second stage surgery.

Growth factor technology, such as PDGF, enhances regenerative potential for bone and soft tissue grafting procedures (8-11). The use of allograft and PDGF growth factor enhanced matrix increases the quality and volume of bone regeneration for a flapless extraction socket grafting (12).

The predictability and success of aesthetic implant treatment is dependable on an accurate diagnosis and development of a restorative driven surgical treatment plan. The use of technology such as CBCT guided surgery, growth factors, and combined with careful sequencing of treatment may enhance the results.

Figure 4E. Socket filled with freeze dried bone allograft and PDGF.

Figure 4F. Bone graft is secured by membrane and tissue adhesive.

Figure 4G. Periapical radiograph of the implant.

Figure 4H. Provisionalisation using Essex retainer.
References


