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Crohn's disease and Trabecular Metal implants: a report of two cases and literature review

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ABSTRACT

Aim The aim of the present study was to report two cases with Crohn's disease in whom dental implants successfully osseointegrated and remained functionally stable up to 13 and 12 months of follow-up, respectively.

Case presentation In cases 1 (age 35 years) and 2 (age 36 years), tooth 24 and 14, respectively were atraumatically extracted and a particulated bone grafting material (buccal and palatal aspect of the defect) and a Trabecular Metal implant (11.5 mm length, 4.7 mm diameter) were inserted in each extraction socket. After implant placement and abutment connection with the final torque (25 Ncm), the provisional restoration was adapted in the oral cavity creating the emergence profile. The provisional crown was screw-retained and had slight occlusal contacts in the centric occlusion (ICP). A periapical radiograph was taken as a control radiograph at the baseline. Postoperatively, antibiotics were prescribed as well as analgesics and an oral rinse was recommended. In both cases, the provisional restoration was removed after 2 weeks and replaced with a full ceramic restoration. Case-1 and case-2 were followed up after 13 months and 12 months respectively. In both cases postoperative healing was uneventful and radiographs taken at follow-up showed no evidence of crestal bone loss. Implants in both cases demonstrated an excellent clinical condition at follow-up.

Conclusion Trabecular Metal implants can osseointegrate and remain functionally stable in patients with Crohn's disease.

KEYWORDS Crohn's disease; Dental implants; Systemic diseases; Trabecular Metal implants.

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INTRODUCTION

Systemic health status of the patient and implant design and surface characteristics are among the list of factors that influence implant osseointegration (1-4). It is well known that systemic conditions, such as poorly controlled diabetes, osteoporosis and oral cancer, can jeopardize osseointegration and long-term survival of dental implants (1-4). Crohn's disease (CD) is an idiopathic chronic inflammatory disease of the gastrointestinal tract that may also affect the oral cavity (5). CD is characterized by the presence of several antigen-antibody-complexes, which tend to induce an autoimmune inflammatory process in many parts of the body, including enteritis, recurrent oral ulceration, vasculitis, arthritis or keratoconjunctivitis. Results from retrospective studies (1, 5-9) have labeled CD as a significant risk factor of early dental implant failure.

In the past two decades, various implants with porous surfaces (Trabecular Metal, TM, implants; Zimmer, Carlsbad, USA) have been used to obtain fixation of bone ingrowth in medical prosthesis (10, 11). Results from histologic studies have shown that TM implants support tissue ingrowth and ongrowth and effectively supplement implant stability by biological fixation (10-13). Likewise, a multicenter prospective study, Schlee et al. (14) investigated the survival of highly porous TM dental implants placed in an uncontrolled patient population. In this study, 105 patients with 57 maxillary and 88 mandibular implants were observed over a period of 1-year. Smokers and patients with bruxism, periodontitis and osteoporosis were included. Follow-up results demonstrated that TM implants had a cumulative implant survival rate of 95.2% (14). The study concluded that TM dental implants were clinically effective under various clinical conditions in an uncontrolled patient population with and without associated health conditions. It was therefore speculated that TM implants can osseointegrate and remain functionally stable in patients with CD. However, to our knowledge from indexed literature, there are no studies that have assessed the survival of TM dental implants in patients with CD.

The aim of the present study was to present two clinical cases with CD in whom dental implants successfully osseointegrated and remained functionally stable up to 13 and 12 months of follow-up, respectively.

CASES PRESENTATION

Case 1

A 35-years old male smoker was diagnosed with CD in 2001 and had underwent ileocecal recectomy in the year 2014. From the year 2001 to 2007, the patient was prescribed the following medications for the treatment of CD: (a) Pentasa® 500 (~~Mesalamine~~), (b) Asamax® 500 (mesalazine and 5-aminosalicylic acid) 500 mg (c) Deltacortene (Prednisone 25 mg) and (d) later on his medication was only Infliximab (Remicade®, once every week). General manifestations in the patient were diarrhea, abdominal pain and weight loss (Table 1). The patient reported to smoke 10-15 cigarettes daily since 18 years.

The patient was presented in the private practice in Turin (Italy) with deep decay at tooth 24, which was diagnosed as "hopeless" and the potential implant treatment options were discussed with the patient. The patient agreed for implant treatment and immediate functional loading protocol and signed the informed consent with this recommendation.

After a thorough comprehensive clinical as well as radiographical examination, a dental impression was taken using silicone impression material to fabricate a provisional crown in the dental laboratory.

Using local anesthetic infiltration (Articaine 1:100,000) the tooth was atraumatically extracted using piezosurgery (Piezosurgery, Mectron, Carasco, Italy) and periotoms. Implant placement (palatally 3-4 mm apical to the gingival margin) was performed using piezosurgical tips and according to the manufacturer protocol the osteotomy was completed with the drills. Particulated bone grafting material (Puros cancellous®, Zimmer,

General manifestations	Case 1	Case 2
Diarrhea	Yes	Yes
Abdominal Pain	Yes	Yes
Fever	No	Occasional
Fatigue	No	No
Stomatitis	No	Yes
Weight Loss	Yes	Yes
Vasculitis	No	No
Recurrent Oral Ulceration	No	No
Arthritis	No	No

TABLE 1 General characteristics of Patient 1 and Patient 2.

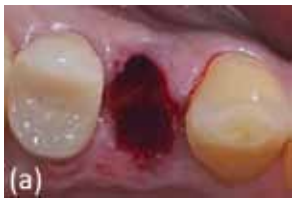


FIG. 1 A Fresh extraction socket after atraumatic tooth extraction before implant placement (A).

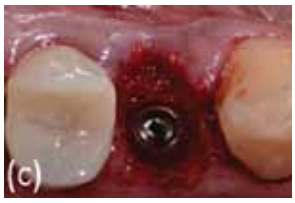


FIG. 1 B-C ATM dental implant was placed more palatally oriented (B) and the socket was grafted simultaneously (C).

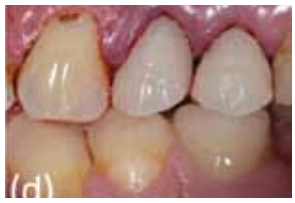


FIG. 1 D A provisional crown was made and placed in occlusion with the opposing dentition (D).

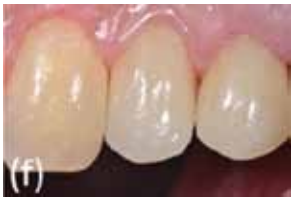
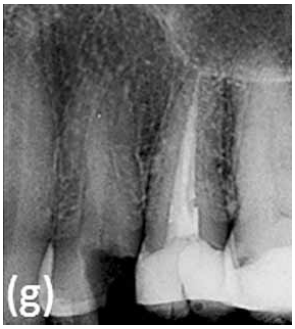


FIG. 1 E-F The final result after 13 months of loading presents an excellent tissue thickness (E) and optimal esthetic result (F).



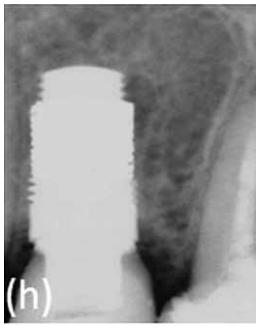


FIG. 1 G-H The radiographical evaluation before the tooth extraction (G) and after 13 months of loading demonstrates crestal bone stability around the TM immediate implant (H).

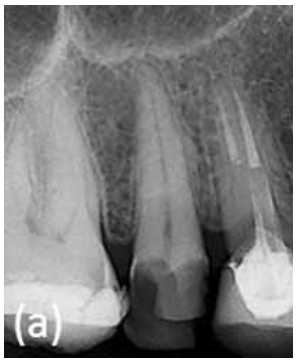


FIG. 2 A Fresh extraction socket after atraumatic tooth extraction before implant placement (A).

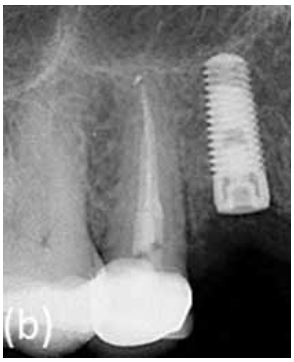


FIG. 2 B ATM dental implant was placed more palatally oriented (B) and the socket was grafted simultaneously (C).

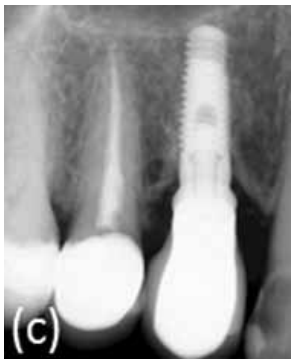


FIG. 2 C A provisional crown was made and placed in occlusion with the opposing dentition (D).

FIG. 2 D Radiographical evaluation before (a) and immediately after implant placement (b), as well as after two years of loading (delayed loading protocol) showing stable periimplant hard and soft tissue conditions (d). (D).

Carlsbad, CA) was placed in the socket (buccal and palatal aspect of the defect) and a TM implant (11.5 mm length, 4.7 mm diameter) (Zimmer, Carlsbad, USA) was inserted. After implant placement and abutment connection with the final torque (25 Ncm), the provisional restoration was adapted in the oral cavity creating the emergence profile. The provisional crown was screw-retained and had slight occlusal contacts in the centric occlusion (ICP). A periapical radiograph was taken as a control radiograph at the baseline. Postoperatively, antibiotics (Amoxicillin 500 mg/day for 7 days) were prescribed as well as analgesics (Ibuprofen 600 mm/ 3 times a day) and an oral rinse (Listerine, Johnson & Johnson, New Brunswick, NJ, USA) was recommended. The patient was advised to consume soft/liquid diet for 6-8 weeks after surgery.

After 2 weeks of healing, the provisional restoration was removed and an impression coping was used for final impression for a definitive restoration. The impression coping was modified (within the sulcus) using light cure resin to capture the soft tissue profile. The definitive restoration was full ceramic restoration in lithium di-silicate basis (E-MAX Press, Ivoclar, Armhest, NY), screwed onto the implant.

A final radiographic examination was performed after delivery of the final prosthesis. The patient was examined clinically and radiographically once every six months in the conventional recall program. The latest radiograph shows no crestal bone loss and an excellent clinical condition after 13 months of loading (Fig. 1).

This patient had another implant (Tapered Screw Vent, Zimmer Carlsbad, USA) (11.5 mm length, 3.75 mm diameter) in the oral cavity for a period of two years loaded with conventional loading protocol (delayed loading). The clinical and radiographic findings of this implant presented no signs of periimplant infection (Fig. 2).

Case 2

A 36-year old female non-smoker diagnosed with CD since 2004 reported for the restoration of a deep carious lesion at tooth 14. General manifestations were diarrhea, abdominal pain, stomatitis and weight loss as well as occasional episodes of fever (Table 1).

In the first year of the disease, the following medications for the treatment of CD were prescribed: (a) Pentasa® 500 and (b) Corticosteroids, and (c) Infliximab (Remicade®, 1x every week) ADD THE COMPANY CITY AND STATE. Following clinical and radiographic examination, the tooth 14 was considered hopeless and ~~an immediate~~ implant placement with immediate restoration was recommended. The surgical and prosthetic protocol was similar with the first case. The implant was loaded for one year without complications (Fig. 3).

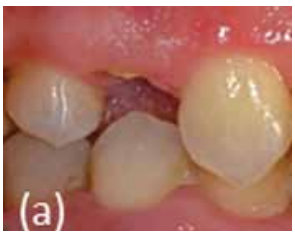
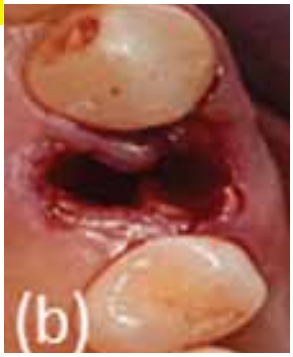


FIG. 3 A Inter-occlusal distance immediately before tooth extraction (a) of the root remnant (#5).



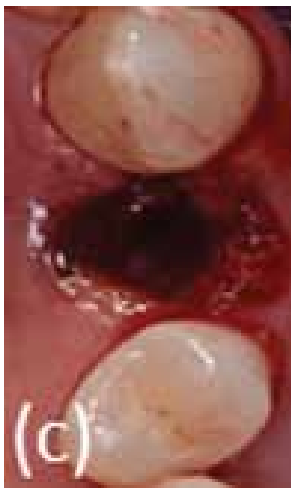
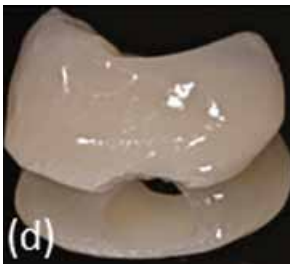
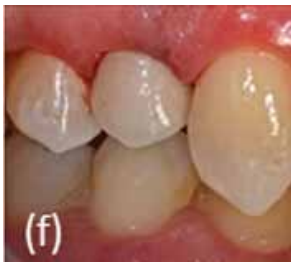


FIG. 3 C Simultaneous socket grafting was performed using particulated bone allograft (C).

FIG. 3 B Fresh extraction socket after atraumatic tooth extraction before implant placement (B).





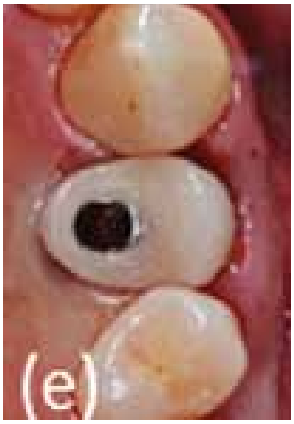
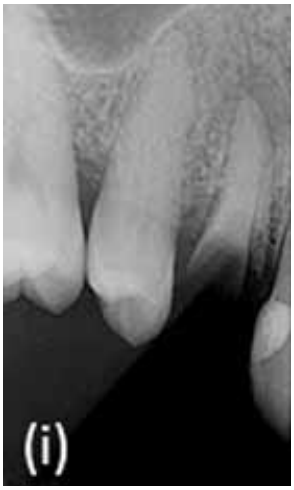


FIG. 3 D-F Definitive full ceramic restoration in lithium di-silicate basis was fabricated (d) and a provisional screw-retained crown (e) with slight occlusal contacts was inserted (f).

FIG. 3 G-H The final result presents an excellent tissue thickness (G) and optimal esthetic result after 12 months of loading (H).



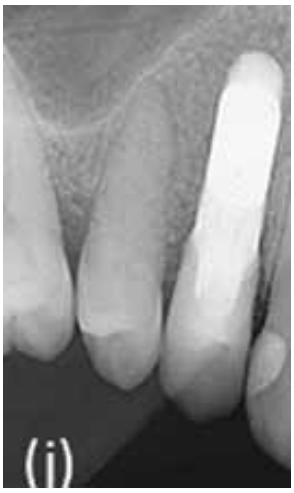


FIG. 3 I-J The radiographical evaluation before the tooth extraction (I) and after 12 months of loading demonstrates crestal bone stability around the TM immediate implant (J).

narrowed from fibrosis, patients may complain of constipation and obstipation (15). These symptoms generally do not improve with anti-inflammatory agents (16). Corticosteroids and immunosuppressant drugs, when used correctly, are a highly effective, well tolerated, cheap and generally safe treatment for active CD (16,17). However, it has also been reported that nearly 50% of recipients either fail to respond (steroid-resistant) or will be steroid dependent at 1 year (17). To our knowledge newer alternatives to corticosteroids are not yet available.

In both cases, successful osseointegration of TM dental implants was achieved and the TM implants remained aesthetically and functionally stable for up to 12-months of follow-up. The present results are in accordance with an experimental study (10) in which, TM implants obtained promising bone ingrowth and mechanical fixation. The TM implants represent a novel implant material (tantalum) and were initially developed for potential applications in reconstructive orthopedics and other surgical disciplines (18). It has been reported that tantalum enhances the process of osteoblastic differentiation (19). In addition, implant surface characteristics and the coatings' pore size are also essential parameters that influence the overall percentage of bone attachment and ingrowth (20-22). A pore size of 100 µm is normally suitable to facilitate bone ingrowth (23). Therefore, replacement of threads in the midsection of a conventional titanium-based implant body with a tantalum material has been proposed to enhance the interconnected porosity of TM implants thereby augmenting secondary stability through a high volume of bone ingrowth (24).

Results from the present case studies showed that there was no significant difference in crestal bone heights between baseline and following one-year of follow-up. This is most likely associated with the microgrooved collar design of TM implants. It has been reported that microgrooved implant collars provide more promising conditions for the attachment of hard and soft tissues and reduce the level of marginal bone resorption as well as soft tissue recession (25). In an *in vitro* study, Fillies et al. (26) investigated osteoblastic behavior on different sandblasted an acid-etched (SLA) and microgrooved implant surfaces under standardized conditions. The results showed that proliferation rate of osteoblasts and the synthesis of bone-specific proteins were significantly higher on microgrooved surfaces than on SLA surfaces (26).

Javed and Romanos (3), in a systematic review concluded that an immunocompromised state (poorly-controlled diabetes mellitus) is a significant risk factor for early implant failure. However, results from the present study showed that implants can remain functionally stable in immunosuppressed individuals (such as those with CD). An explanation in this regard may be derived from the fact that amongst the studies included in the systematic review by Javed and Romanos (3), conventional titanium were used. It is therefore tempting to speculate, on at least a local level, TM implant design exhibits the

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potential to attract osteoblasts and sustain crestal bone heights regardless of an immunocompromised ~~medical~~ status.

The present results support the study by Schlee et al. (14) that reported a cumulative implant survival of 95.2% for TM implants. However, the present results as well as those reported by Schlee et al. (14) were based on rather short-term (12 months) follow-up periods. A limitation of the present study is that the conclusion was based on results from two clinical cases. Moreover, the follow-up durations of both cases investigated in the present study were relatively short-term (12 and 13 months). It is yet to be determined whether or not TM dental implants can sustain crestal bone heights and demonstrate high survival and success rates over long-term periods (for example 5 years or longer). Further long-term prospective randomized controlled based clinical trials based on a large sample size are needed to test this hypothesis.

Within the limits of the present investigation, it is concluded that TM implants can osseointegrate and be functionally stable in patients with CD.

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