



Case report

Treatment of peri-implantitis with deproteinised bovine bone and tetracycline: a case report

Jun-Beom Park

Department of Pharmaceutical Sciences, College of Pharmacy, University of Michigan, Ann Arbor, MI, USA

doi: 10.1111/j.1741-2358.2011.00470.x

Treatment of peri-implantitis with deproteinised bovine bone and tetracycline: a case report

Objective: The objective of this study is to evaluate the use of tetracycline in a patient with peri-implantitis.

Background: Tetracycline is widely used in regeneration procedures owing to its positive effect with bone graft material, regeneration of extraction socket bone and its traditional antibacterial effect. However, there have been limited reports on bone graft procedures combined with tetracycline application in peri-implantitis.

Materials and methods: The detoxification procedure was performed with chlorhexidine and tetracycline, and the defect area was grafted with a 4:1 volume ratio combination of deproteinised bovine bone mixed with tetracycline.

Results: Soft tissue healing was uneventful, and the treatment yielded improved clinical results with a reduced probing depth.

Conclusions: Tetracycline was used in the treatment of peri-implantitis by burnishing the implant surface and applying tetracycline in conjunction with an osseous graft to the defect area. The treatment of peri-implantitis with tetracycline seemed to show improved clinical results up to the follow-up period.

Keywords: peri-implantitis, tetracycline, bovine bone.

Accepted 30 March 2010

Introduction

Surgical treatment procedures of peri-implantitis around titanium implants have previously been evaluated in humans¹⁻³ and animals^{4,5}, and protocols such as air-powder abrasives⁶, citric acid⁷ and antimicrobial agents⁸ have been suggested for the detoxification procedures.

Tetracyclines are primarily bacteriostatic antimicrobials, which exert their antibacterial activity by inhibiting microbial protein synthesis⁹. Tetracycline is used widely in the regeneration procedure because of its positive effect with bone graft material^{10,11}, its regeneration of extraction socket bone¹², its traditional antibacterial effect¹³ and its anticollagenase activity¹⁴. However, there have been limited reports on bone graft procedures combined with tetracycline application in peri-implantitis¹⁵.

The objective of this case report of a patient with peri-implantitis is to evaluate the use of tetracycline. We do so by burnishing the implant surface

and applying tetracycline in conjunction with an osseous graft in the defect area.

Case

A 48-year-old man presented to the Dental Clinic at the Armed Forces Capital Hospital seeking treatment for his lower left molar area. The patient had a non-contributory medical history.

Clinical examination revealed that his two lower left molars were missing. There was a ridge defect of the buccal area on the most mesial aspect and the keratinised tissue on the buccal side measured 1 mm wide. Treatment with a dental implant was planned after consultation with the patient about his condition, treatment period and complications.

Three implants (Neoplast, Neobiotech[®]; Seoul, Korea) were placed in the lower left sextant with an insertion torque of 40 Ncm (Fig. 1). The defect of 5 mm (mesio-distal) × 5 mm (apico-coronal) on the most mesial implant was grafted with



Figure 1 Buccal view at the installation of implants.



Figure 2 Graft material was placed on the defect area.

deproteinised bovine bone (Bio-Oss®; Geistlich Pharm AG, Wolhausen, Switzerland) (Fig. 2). A healing cap with 2.0 mm label bevel height was connected, and a portion of the healing cap was left exposed to avoid tension on the incision line. The patient was placed on amoxicillin 500 mg, three times a day for 5 days, mefenamic acid 500 mg initially, then mefenamic acid 250 mg four times a day for 5 days, and chlorhexidine digluconate 0.12% three times a day for 4 weeks. The patient was asked not to chew and brush the surgical area for the first 4 weeks post-operatively.

The abutments were connected, and final implant-supported crowns for the lower first and



Figure 3 A 4-month post-operative occlusal view demonstrates good soft tissue healing.



Figure 4 The patient presented with swelling and pus discharge 2 months after prosthesis connection, which was 6 months after implant installation.

second molars were inserted 4 months after implant installation (Fig. 3). Soft tissue healing was uneventful on the most mesial implant with keratinised tissue on the buccal side measuring 2–3 mm.

The patient came to the clinic complaining of pus discharge and swelling 2 months after prosthesis connection. Clinical examination revealed an 8-mm pocket defect with exudates coming through the gingiva (Fig. 4). A periapical radiograph demonstrated an intrabony defect involving up to three threads of the most mesial implant (Fig. 5). The

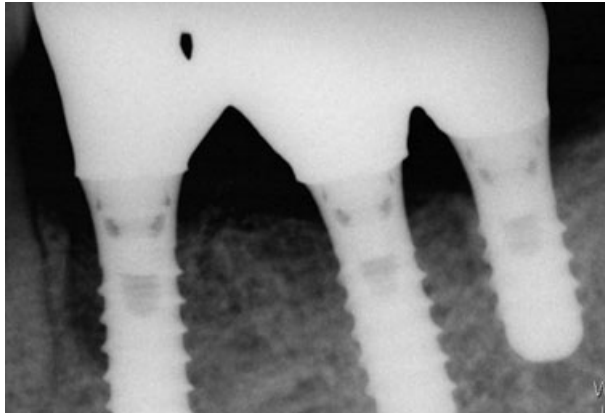


Figure 5 Radiograph demonstrating a defect area around the implant.



Figure 6 The granulation tissue is removed, revealing a 6.5 mm (mesio-distal) × 7.0 mm (apico-coronal) defect on the most mesial implant.



Figure 7 The defect area is filled with tetracycline and deproteinised bovine bone after irrigation with chlorhexidine and application of tetracycline.

granulation tissue was removed with plastic curettes to minimise damage to the fixture surface. Wound dehiscence extended apically, with a total

of three exposed threads (Fig. 6). All remaining tissue tags were carefully removed, and once the implant surface was visibly free of any debris and tissue tags, the surface was washed copiously with saline and chlorhexidine. The surface was then burnished with tetracycline solution on a cotton pledget for 2 min. The 6.5 mm (mesio-distal) × 7.0 mm (apico-coronal) defect was then packed with deproteinised bovine bone (Bio-Oss®; Geistlich Pharm AG, Wolhausen, Switzerland) and a 4:1 volume ratio of tetracycline (Evans *et al.*) (Fig. 7). Sutures were placed, and the patient was prescribed amoxicillin 500 mg three times a day for 7 days, mefenamic acid 500 mg initially, then mefenamic acid 250 mg four times a day for 7 days, and chlorhexidine digluconate 0.12% three times a day for 4 weeks. No removal of the prosthesis was intended.

Soft tissue healing was uneventful and probing depth at the final examination was 5 mm, demonstrating that the treatment produced improved



Figure 8 Clinical view 4.5 months after treatment of peri-implantitis. The soft tissue shows uneventful healing.

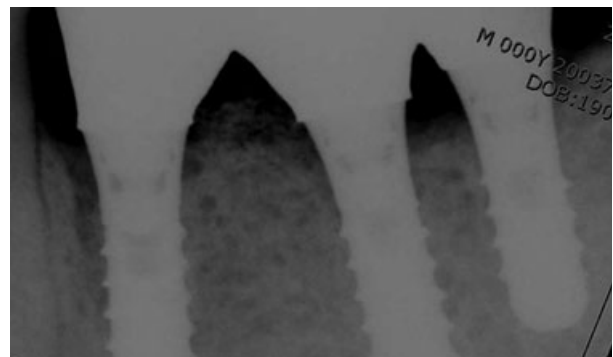


Figure 9 Radiograph taken 4.5 months after treatment of peri-implantitis. The defect area shows stable results up to the follow-up period.

clinical results (Fig. 8). A periapical radiograph taken 4.5 months after the treatment of peri-implantitis demonstrated increased radiopacity (Fig. 9), and the patient was scheduled for a follow-up visit every 6 months.

Discussion

This case report shows the successful management of peri-implantitis with tetracycline. Surface debridement of the fixture is an important step and needs to be carried out with extreme care to prevent damage to the fixture surface¹⁶. Plastic curettes were used in this report for mechanical cleaning to remove granulation tissue because they provide less implant surface alteration¹⁷. However, there are other reports of treatments that utilise titanium or graphite curettes^{16,18}.

Detoxification of the implant surface was performed using irrigation with chlorhexidine¹⁹ and burnishing of tetracycline. The concentration of burnishing was 50 mg/ml tetracycline, as used in the treatment of intrabony periodontal defects²⁰, and the tetracycline solution was applied to the implant surface using cotton pledgets for 2 min as used in the treatment of a furcation defect²¹. However, there are other reports suggesting that cotton pellets and saline may be adequate for the treatment of rough implant surfaces²².

After the debridement and detoxification procedure, the remaining defect area was filled with deproteinised bovine bone and a 4:1 volume ratio of tetracycline used in the treatment of furcation defect and localised juvenile periodontitis^{21,23}. Graft material was used because bone graft to supplement surgical curettage in peri-implant infection has been reported to show adjunctive effects²⁴. Park *et al.*¹⁵ reported successful management of a rapidly developing periapical implant lesions caused by an undetected retained root tip. The apical area was filled with demineralised freeze-dried bone allograft mixed with 250-mg tetracycline; however, the ratio was not described. There is another report showing the potential of tetracycline for decontamination. Bone samples undergoing implant osteotomy procedures were collected in osseous coagulum traps and rinsed with 50 ml/ml tetracycline, and the authors reported that tetracycline treatment caused a sevenfold decrease in streptococci²⁵.

Membranes were not used in this report because they are prone to exposure, particularly around implant areas. In a study carried out by Grunder *et al.*²⁶, half of the subjects reported premature membrane exposure occurring between the second

and third post-operative week, which led to the removal of the membrane secondary to inflammation of the peri-implant tissue. A non-submerged technique was used in this case because of the difficulty covering the non-submerged implant. In addition, the results of limited studies comparing submerged vs. non-submerged techniques have failed to present any convincing evidence that a submerged technique is superior^{26,27}. There is another report evaluating the effect of local tetracycline delivery on the treatment of peri-implantitis²⁸. The authors treated 30 lesions with mechanical debridement and placement of tetracycline fibres and subsequently reported mean improvements in clinical parameters²⁸.

Conclusions

Tetracycline was used in the treatment of peri-implantitis by burnishing the implant surface and applying tetracycline in conjunction with an osseous graft to the defect area. The treatment of peri-implantitis with tetracycline seemed to show improved clinical results in the follow-up period.

Acknowledgement and disclosure

The author does not have any financial interest in the companies whose materials are included in the article.

References

1. Behneke A, Behneke N, d'Hoedt B. Treatment of peri-implantitis defect with autogenous bone grafts: six-month to 3-year results of a prospective study in 17 patients. *Int J Oral Maxillofac Implants* 2000; **15**: 125–138.
2. Haas R, Baron M, Dörtbudak O *et al.* Lethal photosensitisation, autogenous bone, and e-PTFE membrane for the treatment of peri-implantitis: preliminary results. *Int J Oral Maxillofac Implants* 2000; **15**: 374–382.
3. Khoury F, Buchmann R. Surgical therapy of peri-implant disease: a 3-year follow-up study of cases treated with 3 different techniques of bone regeneration. *J Periodontol* 2001; **72**: 1498–1508.
4. Deppe H, Horch HH, Henke J *et al.* Peri-implant care of ailing implants with the carbon dioxide laser. *Int J Oral Maxillofac Implants* 2001; **16**: 659–667.
5. Nociti FH, Machado MA, Stefani CM *et al.* Absorbable versus nonabsorbable membranes and bone grafts in the treatment of ligature-induced peri-implantitis defects in dogs: a histometric investigation. *Int J Oral Maxillofac Implants* 2001; **16**: 646–652.

6. **Machado MA, Stefani CM, Sallum EA et al.** Treatment of ligature-induced peri-implantitis defects by regenerative procedures. Part II: a histometric study in dogs. *J Oral Sci* 2000; **42**: 163–168.
7. **Jovanovic SA, Kenney B, Carranza FA et al.** The regenerative potential of plaque-induced peri-implant bone defects treated by a submerged membrane technique: an experimental study. *Int J Oral Maxillofac Surg* 1992; **7**: 233–245.
8. **Lang NP, Mombelli A, Tonetti MS et al.** Treatment of peri-implantitis by local delivery of tetracycline. Clinical, microbiological and radiological results. *Clin Oral Implants Res* 2001; **12**: 287–294.
9. **Chopra I, Howe TG.** Bacterial resistance to the tetracyclines. *Microbiol Rev* 1978; **42**: 707–724.
10. **Pepelassi EM, Bissada NF, Greenwell H et al.** Doxycycline-tricalcium phosphate composite graft facilitates osseous healing in advanced periodontal furcation defect. *J Periodontol* 1991; **62**: 106–115.
11. **Al-Ali W, Bissada NF, Greenwell H.** The effect of local doxycycline with and without tricalcium phosphate on regenerative healing potential of periodontal osseous defects in dogs. *J Periodontol* 1989; **60**: 582–590.
12. **Hars E, Massler M.** Effects of fluorides, corticosteroids and tetracyclines on extraction wound healing in rats. *Acta Odontol Scand* 1972; **30**: 511–522.
13. **Baker PJ, Evans RT, Coburn RA et al.** Tetracycline and its derivatives strongly bind to and are released from the tooth surface in active form. *J Periodontol* 1983; **54**: 580–585.
14. **Golub LM, Ramamurthy N, McNamara TF et al.** Tetracycline inhibit tissue collagenase activity. A new mechanism in the treatment of periodontal disease. *J Periodont Res* 1984; **19**: 651–655.
15. **Park SH, Sorensen WP, Wang HL.** Management and prevention of retrograde peri-implant infection from retained root tips: two case reports. *Int J Periodontics Restorative Dent* 2004; **24**: 422–433.
16. **Atalluah K, Chee LF, Peng LL et al.** Management of retrograde peri-implantitis: a clinical case report. *J Oral Implantol* 2006; **32**: 308–312.
17. **Ramaglia L, di Lauro AE, Morgese F et al.** Profilometric and standard error of the mean analysis of rough implant surfaces treated with different instrumentations. *Implant Dent* 2006; **15**: 77–82.
18. **Matarasso S, Quaremba G, Coraggio F et al.** Maintenance of implants: an in vitro study of titanium implant surface modifications subsequent to the application of different prophylaxis procedures. *Clin Oral Implants Res* 1996; **7**: 64–72.
19. **Wetzel AC, Vlassis J, Caffesse RG et al.** Attempts to obtain reosseointegration following experimental peri-implantitis in dogs. *Clin Oral Implants Res* 1999; **10**: 111–119.
20. **Masters LB, Mellonig JT, Brunsvold MA et al.** A clinical evaluation of demineralized freeze-dried bone allograft in combination with tetracycline in the treatment of periodontal osseous defects. *J Periodontol* 1996; **67**: 770–781.
21. **Harris RJ.** Treatment of furcation defects with an allograft-alloplast-tetracycline composite bone graft combined with GTR: human histologic evaluation of a case report. *Int J Periodontics Restorative Dent* 2002; **22**: 381–387.
22. **Persson LG, Berglundh T, Sennerby L et al.** Re-osseointegration after treatment of peri-implantitis at different implant surfaces. An experimental study in the dog. *Clin Oral Implants Res* 2001; **12**: 595–603.
23. **Evans EH, Yukna RA, Sepe WW et al.** Effect of various graft materials with tetracycline in localized juvenile periodontitis. *J Periodontol* 1989; **60**: 491–497.
24. **Roos-Jansåker AM, Renvert S, Egelberg J.** Treatment of peri-implant infections: a literature review. *J Clin Periodontol* 2003; **30**: 467–485.
25. **Etcheson AW, Miley DD, Gillespie MJ.** Osseous coagulum collected in bone traps: potential for bacterial contamination and methods for decontamination. *J Oral Implantol* 2007; **33**: 109–115.
26. **Grunder U, Hürzeler MB, Schüpbach P et al.** Treatment of ligature-induced peri-implantitis using guided tissue regeneration: a clinical and histologic study in the beagle dog. *Int J Oral Maxillofac Implants* 1993; **8**: 282–293.
27. **Singh G, O'Neal RB, Brennan WA et al.** Surgical treatment of induced peri-implantitis in the micro pig: clinical and histological analysis. *J Periodontol* 1993; **64**: 984–989.
28. **Mombelli A, Feloutzis A, Brägger U et al.** Treatment of peri-implantitis by local delivery of tetracycline. Clinical, microbiological and radiological results. *Clin Oral Implants Res* 2001; **12**: 287–294.

Correspondence to:

Jun-Beom Park DDS, MSD, PhD, Department of Periodontics, Seoul St Mary's Hospital, College of Medicine, The Catholic University of Korea, 505 Banpo-dong, Seocho-gu, Seoul, 137-040, Korea
 Tel.: +82 (18) 325-2651
 Fax: +82 (2) 6287-8786
 E-mail: jbasoonis@yahoo.co.kr