

Single Preoperative Dose Versus Long-term Prophylactic Antibiotic Regimens in Dental Implant Surgery

Abduaziz Binahmed, BDS, MDent¹/Andrew Stoykewych, BSC, DMD, Dip OMS²/
Larry Peterson, DDS, MD³

Purpose: The purpose of this prospective study was to compare the efficacy of prophylactic antibiotic regimens commonly used in dental implant surgery. Preoperative single-dose and long-term prophylactic antibiotic regimens were compared. **Materials and Methods:** This was a 2-center prospective study in which 215 patients underwent ambulatory endosseous implant placement. In the first group, 445 dental implants were placed in 125 patients after the administration of a single preoperative dose of prophylactic antibiotic with no postoperative antibiotics. In the second group, 302 dental implants were placed in 90 patients who received a preoperative dose of antibiotics and were instructed to take antibiotics postoperatively for 7 days. In both groups, 0.12% chlorhexidine pre- and postoperative mouth rinses were used. Patients returned for postoperative evaluation at 1 week, 2 weeks, and just prior to surgical uncovering. The surgical sites were assessed for pain, swelling, erythema, and purulence. **Results:** In the first group, 3 patients developed wound dehiscence at 5 implant sites and 1 developed a minor inflammatory response. None of the patients in this group received further antibiotics. In the second group, 3 patients developed wound dehiscence, 2 developed an inflammatory response, and 1 was diagnosed with infection, for which another course of antibiotics was required. There was no statistical difference between the 2 groups according to the Fisher 2 × 4 exact test (P = .56). **Discussion:** Indiscriminate use of antibiotics is unacceptable in clinical practice today. Surgeons must adhere to basic principles to gain the most benefit from the use of prophylactic antibiotics. **Conclusion:** Long-term prophylactic antibiotic use in implant surgery was of no advantage or benefit over a single-dose preoperative antibiotic regimen in this patient population. *INT J ORAL MAXILLOFAC IMPLANTS* 2005;20:115–117

Key words: antibiotic prophylaxis, dental implants, infection

The placement of dental implants is routine in most oral and maxillofacial surgery practices. Even though the incidence of infection following dental implant surgery is low,^{1,2} various prophylactic antibiotic regimens have been employed.

Gynther and associates³ reported in a retrospective study of 698 dental implants placed in 279

patients that there was no significant difference in the rate of infection between the group who received prophylactic antibiotics and the group that did not. However, Dent and colleagues⁴ analyzed 2,641 implants and concluded that the risk of implant failure was 2 to 3 times higher if prophylactic antibiotics were not used.

Principles of prophylactic antibiotics call into question whether long-term antibiotic prophylaxis is necessary.⁵ However, it is widely accepted that long-term prophylactic antibiotics are necessary for success,^{6,7} despite the fact that no reported studies have recommended the use of long-term prophylactic antibiotics. Two preliminary reports support the use of a single-dose prophylactic antibiotic regimen.^{1,8}

The purpose of this prospective study was to compare the efficacy of 2 commonly used prophylactic antibiotic regimens in dental implant surgery: single-dose and long-term prophylactic antibiotics.

¹Chief Resident, Oral and Maxillofacial Surgery, University of Manitoba, Winnipeg, Manitoba, Canada.

²Assistant Professor, Department of Dental Diagnostic and Surgical Sciences, University of Manitoba, Winnipeg, Manitoba, Canada.

³Department of Oral and Maxillofacial Surgery, The Ohio State University, College of Dentistry, Columbus, Ohio (deceased).

Correspondence to: Dr Andrew Stoykewych, Department of Dental Diagnostic and Surgical Sciences, University of Manitoba, Winnipeg, Manitoba R3E 0W2, Canada. Fax: + 204 489 2097. E-mail: stoyk@mts.net

MATERIALS AND METHODS

Patients were included in the study if they were at least 18 years old, edentulous in 1 or more areas of the maxilla or mandible, and willing to participate. All patients signed a form giving their informed consent. The protocol for this study was reviewed and accepted by the ethics committees of the University of Manitoba and The Ohio State University as well as the scientific advisory committee of the implant manufacturer.

Patients were excluded from the study if they had a medical condition (eg, subacute bacterial endocarditis) that required prophylactic antibiotics. Other exclusion criteria were radiation treatment at the surgical site; untreated dental disease; inadequacy of bone, requiring bone grafting or guided tissue regeneration; alcoholism or drug abuse; uncontrolled diabetes; and pregnancy.

The patients were treated in 2 different centers with identical surgical techniques according to a strict protocol. Both groups were treated by more than 1 surgeon. The only difference between the 2 groups was the prophylactic antibiotic regimen utilized.

The first group consisted of 125 patients in whom 445 dental implants were placed in a 2-stage procedure. There were 58 women and 67 men whose ages ranged from 18 to 83 years, with a mean of 52 years. This group of patients received preoperative antibiotics only.

The second group consisted of 90 patients in whom 302 dental implants were placed. There were 46 women and 44 men, ranging in age from 18 to 85 years, with a mean of 64.3 years. This group received both preoperative and long-term postoperative antibiotics.

In both groups, patients ($n = 215$) rinsed with a 0.12% chlorhexidine solution for 1 minute prior to surgery. The surgery was performed using local anesthesia and, usually, conscious intravenous sedation. If intravenous sedation was utilized, a dose of 1,000,000 units of penicillin G was given slowly intravenously prior to surgery. If the patient was allergic to penicillin, 600 mg of clindamycin was administered intravenously. Patients who did not receive intravenous sedation received equivalent oral doses of penicillin V or clindamycin orally 1 hour prior to the operation.

A strict surgical protocol was followed. Sequential internally irrigated burs were used. Implants were placed, and the mucosa was closed primarily. Postoperatively, all patients were instructed to continue to use the chlorhexidine rinse twice daily for 1 week.

No postoperative antibiotics were given to the first group of patients. Analgesics were prescribed as

necessary. Patients returned for postoperative evaluation at 1 week, 2 weeks, and just prior to surgical uncovering. The surgical sites were assessed for pain, swelling, erythema, and purulence.

In the second group, all patients were given a prescription for 300 mg penicillin V orally 4 times a day, or in the case of penicillin allergy, 150 mg clindamycin orally 3 times a day for 7 days. Analgesics were prescribed as necessary. The second group of patients was also evaluated 1 week postoperatively, 2 weeks postoperatively, and just prior to surgical uncovering. All wounds were assessed for pain, swelling, erythema, and purulence.

RESULTS

In the first group of patients, who received only preoperative antibiotics, 445 implants were placed in 125 patients. Wound dehiscence developed in 3 patients involving 5 implant sites. In these dehiscences there was no evidence of inflammation or infection. One patient developed a minor inflammatory response in the region of a vertical releasing incision. This, however, was not associated with swelling or discharge. No patients were diagnosed with postoperative infection, and no patients received further antibiotics in addition to their original preoperative dose. At stage 2 surgery, based on clinical and radiographic examination, all 445 implants were found to be osseointegrated and were subsequently restored.

In the second group of patients, who received both pre- and postoperative antibiotics, 302 implants were placed in 90 patients. Three patients developed wound dehiscence involving 3 implant sites. There was neither inflammation nor infection in the dehisced areas. Two patients developed an inflammatory response at the surgical site but did not require any further antibiotics. One patient was diagnosed with an infection; for that patient, a second course of antibiotics was prescribed. At stage 2 surgery, all 302 implants were found to be osseointegrated. However, 1 implant had to be removed shortly after uncovering because of severe bone loss and mobility.

Postoperative infection was defined as the presence of purulent drainage or fistula in an operative region associated with pain, tenderness, localized swelling, erythema, or pyrexia.

An analysis of the 747 implants was performed. There was no statistical difference between the 2 regimens utilized according to the Fisher 2×4 exact test ($P = .56$). Therefore, the use of long-term prophylactic antibiotics did not reduce the incidence of postoperative infections and implant failure.

DISCUSSION

The use of prophylactic antibiotics in dental implant surgery remains controversial. Gynther and colleagues³ reported success without the use of prophylactic antibiotics. However, many implant surgeons agree that prophylactic antibiotics are necessary for implant success.^{1,2,4} This study compared 2 commonly employed regimens of prophylaxis. However, determining whether prophylactic antibiotics are necessary for implant placement was not the objective of the study.

The 2 groups of patients were treated identically; the only difference between them was the prophylactic antibiotic regimen. Chlorhexidine 0.12%, a commonly used topical antimicrobial agent, was a constant for both groups.⁹

Indiscriminate use of antibiotics is unacceptable in clinical practice today. Surgeons must adhere to basic principles to gain the most benefit from the use of prophylactic antibiotics. The surgical procedure must have a significant risk of infection before prophylactic antibiotics are employed. In addition, the appropriate antibiotic should be selected for the given surgical procedure, and antibiotic levels in the plasma must be high at the time of surgery. The risks of antibiotic side effects, including allergic reactions and the development of resistant bacteria, can be reduced by using a single preoperative application as compared to multiple applications.

CONCLUSION

Long-term prophylactic antibiotic use in implant surgery was of no advantage or benefit over a single-dose preoperative antibiotic regimen in this patient population.

REFERENCES

1. Larsen P. Antibiotic prophylaxis for placement of dental implants [abstract]. *J Oral Maxillofac Surg* 1993;51(suppl 3):194.
2. Adell R, Lekholm U, Brånemark P-I. Surgical procedures. In: Brånemark P-I, Zarb GA, Albrektsson T (eds). *Tissue-Integrated Prostheses: Osseointegration in Clinical Dentistry*. Chicago: Quintessence, 1985:211–232.
3. Gynther GW, Kondell PA, Moberg LE, Heimdahl A. Dental implant installation without antibiotic prophylaxis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;85:509–511.
4. Dent CD, Olson JW, Farish SE, Bellome J, Casino AJ, Morris F. The influence of preoperative antibiotics on success of endosseous implants up to and including stage II surgery: A study of 2,641 implants. *J Oral Maxillofac Surg* 1994;55(suppl 5):19–24.
5. Peterson LJ. Antibiotic prophylaxis against wound infections in oral and maxillofacial surgery. *J Oral Maxillofac Surg* 1990;48:617–620.
6. Gatell JM, Garcia S, Lozano L, Soriano E, Ramon R, SanMiguel JG. Perioperative cefamandole prophylaxis against infections. *J Bone Joint Surg Am* 1987;69:1189–1193.
7. Hall JC, Christiansen KJ, Goodman M, et al. Duration of antimicrobial prophylaxis in vascular surgery. *Am J Surg* 1998;175:87–90.
8. Peterson LJ. Long-term antibiotic prophylaxis is not necessary for placement of dental implants [abstract]. *J Oral Maxillofac Surg* 1996; (suppl 3):54.
9. Lambert P, Morris HF, Ochi S. The influence of 0.12% chlorhexidine digluconate rinses on incidence of infectious complications and implant success. *J Oral Maxillofac Surg* 1997;55(suppl 5):25–30.