EBD

www.nature.com/ebd

COMMENT

Dental implants

Antibiotic prophylaxis may effectively reduce early failures after beginner-conducted dental implant surgery

Omer Waleed Majid[1] ✉

A COMMENTARY ON
Mascarenhas L S, Pedreira K L, Cosme F D et al.
Effect of Antibiotic Prophylaxis on Early Loss of Implants Installed by Unexperienced Operators. *J Oral Implantol* 2023; **49**: 537–543.

PRACTICE POINTS

- Early implant failures represent complex and multi-factorial problems that are related to different aspects of dental implant surgery. One of the surgeon-related factors influencing the occurrence of early implant failures is the experience and skill level of the operator.
- Being mostly associated with bacterial contamination, early implant failures can often be prevented by appropriate antibiotic prophylaxis.
- Compared to placebo, preoperative administration of 1 g amoxicillin one hour prior to surgery resulted in significantly fewer early implant losses in healthy patients who underwent placement of 2 to 4 implants by inexperienced practitioners. Antibiotic prophylaxis may be warranted during the training phase of professionals learning dental implant placement techniques.

STUDY DESIGN: A randomized, double-blind, placebo-controlled clinical trial.
OBJECTIVE: To assess the impact of antibiotic prophylaxis on postoperative recovery and implant short-term survival in clinically healthy patients who underwent placement of 2–4 dental implants by inexperienced operators.
METHODS: The study adhered to the ethical guidelines of the Helsinki declaration, and followed the CONSORT protocol for randomized controlled trials (RCTs). Signed consent forms were provided by all patients. Included were healthy individuals aged over 18 years, with sufficient and fully healed alveolar ridge (undergone extraction at least 3 months prior), requiring placement of 2–4 dental implants, and were classified as ASA I or II. Exclusion criteria were: systemic diseases, hypersensitivity to penicillin, pregnancy or lactation, smoking, recent antibiotic usage, and history of periodontitis. Patients were randomly allocated into 2 groups: the antibiotic group received 1 g of amoxicillin one hour before surgery, while the placebo group was given starch-filled capsules that looked identical to the antibiotic. All implants were installed through 2-stage procedures by students of a specialization course in implant surgery, employing a standardized procedure and armamentarium. Each patient was evaluated preoperatively, and at 2 days and 7 days postoperatively, for the following parameters: mouth opening, experienced pain (using a visual analog scale), and signs of infection (fistula, wound ulceration, tissue necrosis, flap dehiscence, and purulent exudates). Implant survival was monitored for up to 90 days after implant surgery.
RESULTS: A total of 90 patients (224 implants) were included: 43 patients (108 implants) in the antibiotic group, and 47 patients (116 implants) in the placebo group. Overall, there were 58 women and 32 men, aged from 23 to 70 years old. In terms of mouth opening, pain, and infection parameters, no statistically significant differences were observed between the groups at any of the time points evaluated. Similarly, there was no statistically significant difference regarding antibiotic usage and implant loss at the patient level ($p = 0.06$). However, at the implant level, significantly higher implant loss rate was noted in the placebo group (14.9%) compared to the antibiotic group (2.3%) [$p < 0.05$].
CONCLUSION: Prophylactic antibiotic administration effectively reduced the occurrence of implant loss after implant surgery performed by inexperienced practitioners.

Evidence-Based Dentistry; https://doi.org/10.1038/s41432-024-01011-9

[1]Professor, Department of Oral and Maxillofacial Surgery, College of Dentistry, Mosul University, Mosul, Iraq. ✉email: omerwaleedmajid@uomosul.edu.iq

Received: 20 April 2024 Accepted: 23 April 2024
Published online: 08 May 2024

GRADE Rating: ●●●○

COMMENTARY

Every year, millions of dental implants are placed globally, showcasing the growing favor for this efficient tooth replacement choice. Thanks to their lifelike appearance and lasting durability, dental implants have transformed dentistry, offering a reliable method to rejuvenate smiles and enhance oral health. However, implant failures, defined by loss of osseointegration, may arise and can be classified as either early (before the placement of final prosthesis) or late (1–3 years after implantation) failures[1]. Early implant failures occur in approximately 2% of cases, typically result from biological problems, and involve in their etiology different implant-, patient-, and surgeon-related factors. Early implant loss has considerable consequences for the patient involved, often hindering advancement to the restorative phase and necessitating either implant reinstallation or adjustments to the treatment plan.

Surgical experience is one of the surgeon-related factors that may influence early implant failure rates. The differences observed among surgeons may stem from variation in the levels of competence and/or performance, compounded by their overall professional attitude[2]. Some studies have acknowledged a learning curve for dental implant surgery similar to that noted in other oral surgery disciplines[3,4]. Nevertheless, controversy exists, and a definitive link between surgeon experience and implant failure remains unverified, potentially skewed by the selection of challenging patients for experienced clinicians.

Due to the strong correlation between bacterial contamination during or after surgery and early implant failures, antibiotic prophylaxis is widely considered as an effective measure for minimizing their occurrence. Various antimicrobial prophylaxis protocols are utilized for dental implant surgery, with key variables including the selected drug, dosage, and timing of administration[5]. However, the lack of clear guidelines on appropriate antibiotic prophylaxis regimens for dental implant surgery may lead to unjustifiable antibiotic use, potentially fostering resistant bacterial strains, resulting in adverse effects and unnecessary economic burdens[6]. Therefore, the decision to prescribe antibiotic prophylaxis should be tailored to the patient's specific circumstances and the clinician's judgment. Knowing how prophylactic antibiotics impact particular variables influencing implant survival in the early postoperative phase is crucial for determining the optimal prescription strategy.

In the present RCT[7], the authors tried to assess the effectiveness of preoperative 1 g amoxicillin in minimizing early failures after novice-conducted implant surgery. The objectives were clearly stated, and the null hypothesis was well formulated. The use of randomization, placebo, and double-blind design enhanced the study's quality. Furthermore, strict inclusion criteria enforced the internal validity by mitigating the influence of numerous confounding variables - such as smoking, complexity of surgery, history of periodontitis, systemic diseases, and prosthetic considerations - that possibly impact the rates of dental implant failure[8–10]. The minimum number of patients per group was determined by appropriate sample size calculation based on insights from prior research, ensuring sufficient statistical power. All patients participating in this study sought dental implant therapy voluntarily, indicating a convenient sampling method, which might induce selection bias due to the likelihood of motivated individuals with better health outcomes being overrepresented, a common characteristic in the dental field where treatments are usually elective. Employing an independent evaluator maintained the blinding procedure; however, the absence of evaluator calibration might compromise data consistency. Similarly, enlisting graduates in a specialized implant course resulted in a homogeneous operator pool, yet incomplete data regarding student numbers and individual operator implant counts (both prior to and during study) were notable omissions.

The main finding of this study was that antibiotic prophylaxis effectively decreased early failures of dental implants placed by relatively inexperienced practitioners, suggesting a potential role of bacterial contamination in these failures. Various human mistakes, such as failure to adhere to aseptic surgical technique, inadequate osteotomy site preparation, and improper instrument handling, may contribute to bacterial contamination. The efficacy of amoxicillin may be attributed to its effectiveness against the typical bacteria found in oral infections, which are generally susceptible to penicillins. Conversely, the amoxicillin group showed no significant improvements in postoperative healing and infection parameters, a finding which is compatible with the relatively short duration of surgeries performed, often linked to decreased postoperative morbidity. Therefore, antibiotic prophylaxis is advised for trainees during the learning stage of dental implant placement procedures, yet it should not be assumed that antibiotics can compensate for suboptimal surgical techniques.

It is worth acknowledging that significant reduction of early implant failures in the treatment group was observed at the implant level but not at the patient level, indicating a "clustering effect" due to multiple implants being placed within the same patient. Data presentation at the patient level is clinically preferable and aligns with the contemporary patient-centered approach to healthcare[1]. Hence, when interpreting study findings, it is essential to consider outcomes at both implant and patient levels for an accurate evaluation of treatment efficacy and patient advantages. Accounting for clustering through cluster-adjusted sample sizes is one approach to address this issue and should be considered in future research endeavors.

In conclusion, there is moderate evidence suggesting that preoperative administration of 1 g amoxicillin effectively reduces early implant failures after dental implant surgery performed by inexperienced operators. Further confirmatory evidence from well-designed RCTs with larger samples is needed before integrating this conclusion into the prescription protocol of prophylactic antibiotics for dental implant patients.

REFERENCES

1. Tomasi C, Derks J. Etiology, occurrence, and consequences of implant loss. Periodontology. 2022;88:13–35.
2. Jemt T, Olsson M, Renouard F, Stenport V, Friberg B. Early Implant Failures Related to Individual Surgeons: An Analysis Covering 11,074 Operations Performed during 28 Years. Clin Implant Dent Relat Res. 2016;18:861–72.
3. Chrcanovic BR, Kisch J, Albrektsson T, Wennerberg A. Impact of Different Surgeons on Dental Implant Failure. Int J Prosthodont. 2017;30:445–54.
4. Majid OW. Assessment of clinical ability in the removal of teeth among undergraduate dental students: a longitudinal comparative study. Br J Oral Maxillofac Surg. 2018;56:870–6.
5. Nolan R, Kemmoona M, Polyzois I, Claffey N. The influence of prophylactic antibiotic administration on post-operative morbidity in dental implant surgery. A prospective double blind randomized controlled clinical trial. Clin Oral Implants Res. 2014;25:252–9.
6. Bernabeu-Mira JC, Peñarrocha-Diago M, Peñarrocha-Oltra D. Prescription of Antibiotic Prophylaxis for Dental Implant Surgery in Healthy Patients: A Systematic Review of Survey-Based Studies. Front Pharmacol. 2021;11:588333.
7. Mascarenhas LS, Pedreira KL, Cosme FD, Oliveira AS, de Oliveira GJPL, Azoubel MCF, et al. Effect of Antibiotic Prophylaxis on Early Loss of Implants Installed by Unexperienced Operators. J Oral Implantol. 2023;49:537–43.
8. Majid OW. Dose- and time-dependent association of smoking and its cessation with risk of peri-implant diseases. Evid Based Dent. 2024;25:15–16.
9. Majid OW. Does flapless immediate implant placement lead to significant preservation of buccal bone compared to flap surgical protocol? Evid Based Dent. 2024;25:9–10.
10. Majid OW. Cemented and screw-retained implant-supported restorations may have a comparable risk for peri-implant mucositis and peri-implantitis. J Evid Based Dent Pract. 2024;24:101964.

COMPETING INTERESTS

The author declares no competing interests.

ADDITIONAL INFORMATION

Correspondence and requests for materials should be addressed to Omer Waleed Majid.