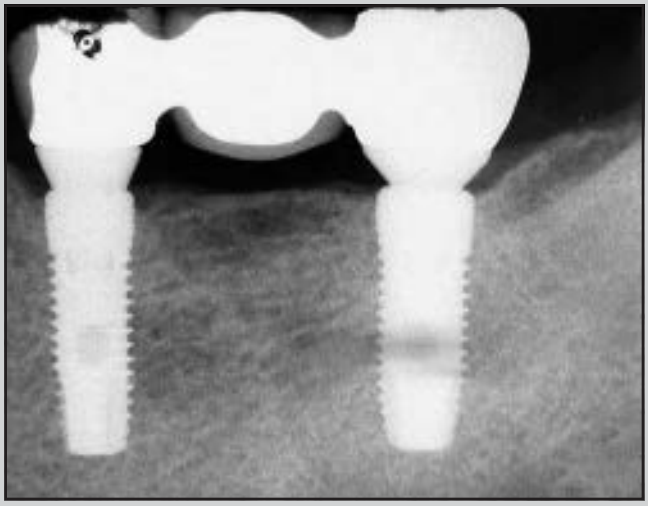

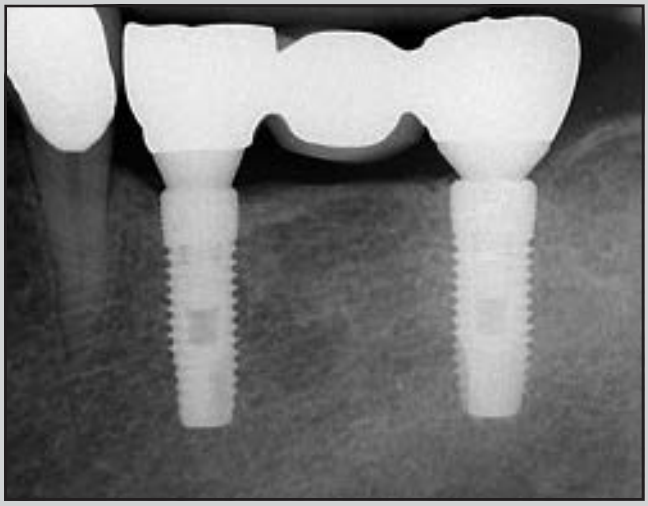

A 10-Year Retrospective Radiographic Study of Implantium Dental Implants

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A retrospective radiographic study was conducted from five private dental offices on patients requesting dental implant therapy to replace their missing teeth. All implants were placed and restored by early 2000, and patients were encouraged to continue their dental care at the same office. The records were reviewed and analyzed by the clinicians, who had more than 15 years of dental experience at the time of the initial patient treatment. A total of 74 patients with 242 implants were recalled up to 10 years (mean follow-up: 9.21 ± 1.7 years) after loading. There were five implant failures from this radiographic observation period, resulting in a 97.9% dental implant survival rate. The mean crestal bone level change on the mesial aspect was –0.36 ± 1.05 mm, while the mean crestal bone level change on the distal aspect was –0.18 ± 0.96 mm. Thus, the overall mean bone loss was –0.28 ± 0.05 mm. The dental implants, which had a sandblasted, large-grit, acid-etched surface, appeared to achieve successful osseointegration in this long-term observation period, and the implant system's unique design and surface features resulted in a stable osseous crest without bone loss to the first thread. (Int J Periodontics Restorative Dent 2015;35:49–54. doi: 10.11607/prd.prd.2289)

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Dental implant therapy has been successfully incorporated into the contemporary dental practice for the treatment of edentulous and partially dentate patients.[1–8] Despite overall survival and successful outcomes, clinicians are eager to see the latest available evidence for implant systems that have been recently introduced into the market. There continue to be changes in chemical and physical surface characteristics to promote bone-to-implant contact (BIC).

The Implantium dental implant system (Dentium), which has a surface that is sandblasted with large grit and acid etched, was introduced more than 10 years ago. The platform-switching concept, together with the optimal fixation threads, addresses the protection of the marginal cortical bone. The conical hex connection allows for distribution of the load to the fixture and also minimizes micromovement. In addition, the flat apical end reduces the risk of unintentional bone perforation.

A number of successful studies from university- and hospital-based treatment centers have been published, but there has

been a paucity of private practice–based studies.[9–17] A retrospective radiographic study has been performed to record the efficacy of Implantium's sandblasted, large-grit, acid-etched implant surface in maintaining the crestal bone level in a variety of clinical situations that are encountered in private practice.

Method and materials

This retrospective radiographic study was conducted from five private dental offices on patients requesting dental implant therapy to replace their missing teeth. Patients had been maintained in the same office for an average time frame of 9.21 years. Their records were reviewed and analyzed by five clinicians (three periodontists and two prosthodontists) who each have practiced dentistry longer than 15 years.

All patients underwent review of their medical and dental histories as well as clinical and radiographic examinations. Informed consent was obtained for those who decided to receive implant therapy. They represented a private practice population devoid of significant medical history or medications that would preclude them from most dental surgical procedures. The patients were prepared for surgery in accordance with accepted dental practice guidelines, and implant surgeries were performed on an outpatient basis. Most patients underwent similar surgical procedures, including the elevation of full-thickness flaps with a horizontal incision to reveal the bone surface after the administration of local anesthetics (2% lidocaine with 1:100,000 epinephrine). Vertical incisions were used, as necessary, for visibility. Implant osteotomies and placement were performed according to the manufacturer's guidelines. Primary flap closure was obtained with resorbable and nonresorbable sutures.

Postoperative panoramic or parallel periapical radiographs were made to record the exact bone level at the time of the implant placement. The patients were instructed not to brush or floss the surgical site(s) until suture removal. They were also instructed to rinse with chlorhexidine mouthrinse (0.12%) daily for 1 to 2 weeks and were prescribed appropriate antibiotics and analgesics.

Routine postoperative evaluations were conducted until the time of stage-two surgery and abutment connection. Cover screws were replaced with healing abutments utilizing a punch technique if adequate keratinized gingiva was present on the facial aspect of the implant. In sites with an inadequate zone of gingiva, a full-thickness mucoperiosteal flap was elevated; healing abutments were placed; and the flap was apically repositioned to create a wider zone of gingiva. Appropriate prostheses were fabricated and delivered, and postoperative periapical or panoramic radiographs were taken until 2013.

The digital radiographs taken at different time points were imported into Adobe Photoshop CS6 with Analysis Toolkit (Adobe Systems). Three measurements were obtained for each implant: implant apicocoronal length at the middle axis and distances from the mesial and distal marginal bone levels to the coronal end of the implant, parallel to the middle axis of the implant. All measurements were then exported to Microsoft Excel 2010 (Microsoft). The measurements of mesial and distal crestal marginal bone loss were standardized with known implant length. Each implant case was serialized and coded for objective and unbiased measurements.

A frequency table was generated, and the mean and SD were calculated for all quantitative and qualitative data. The statistical analysis was performed using a commercially available software program (SPSS for Windows version 19.0, IBM). Pearson correlation analysis was conducted to examine the relationship between the two variables while controlling for the effects of one or more factors. The statistical evaluation of the difference in mesial and distal marginal bone loss was accomplished with a student *t* test. Statistical significance was set at $P < .05$ for all statistical tests.

Results

A total of 74 patients with 242 implants were recalled for a period up to 10 years (mean follow-up: 9.21 ± 1.7 years) after loading (Figs 1 to 4). Nineteen additional patients representing 37 implants were not included in the evaluation because they were lost during follow-up. The study group included 39 male patients and 35 female patients with a mean age of 50.6 years ± 11.3 receiving dental implants.

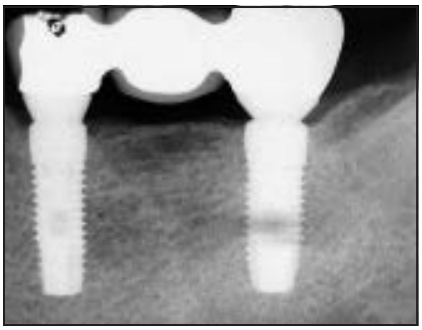

Fig 1a (left) *A 43-year-old male patient presented with a partially edentulous mandibular ridge. His medical history was significant for hypertension and smoking. Two dental implants (3.8 × 12 mm and 4.4 × 12 mm) were placed in the mandibular left second premolar and second molar sites and were restored with a three-unit, screw-retained partial denture.*

Fig 1b (right) *An 8-year follow-up radiograph shows excellent maintenance of the crestal bone around both implants.*

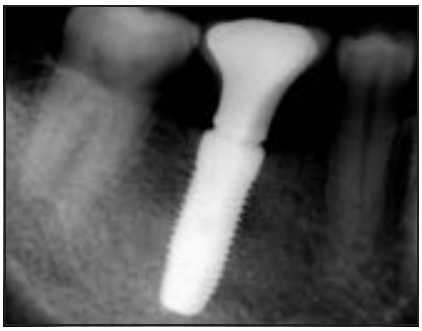

Fig 2a (left) *A 25-year-old female patient presented with a nonrestorable mandibular right first molar with a periapical lesion. Medical history was unremarkable. An immediate implant (4.8 × 14 mm) was placed, and the socket was grafted with a mixture of autograft, allograft, and xenograft. The implant was restored with a screw-retained crown in 2003.*

Fig 2b (right) *A radiograph taken 10 years after restoration (2013) demonstrating maintenance of the crestal bone level around the implant.*

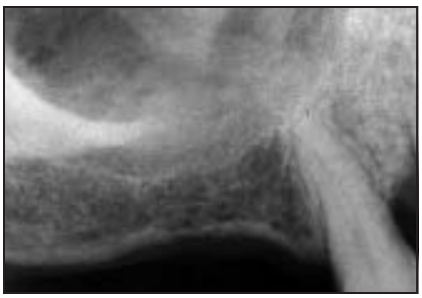

Fig 3a (left) *A 56-year-old male patient presented with a partially edentulous ridge (maxillary right first and second molar sites) in 2003. He was a smoker and reported both hypertension and diabetes.*

Fig 3b (right) *Two dental implants (4.3 × 10 mm) were placed with an osteotome sinus elevation procedure using a xenograft.*

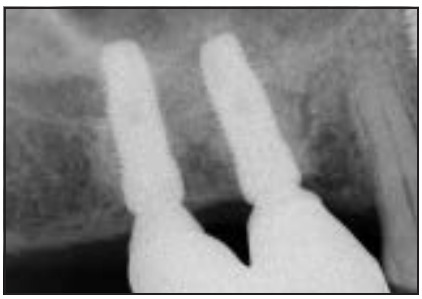

Fig 3c (left) *A splinted, cement-retained restoration was placed in 2004.*

Fig 3d (right) *A 9-year follow-up radiograph demonstrating excellent radiographic evidence of osseointegrated dental implants.*

A current or past history of smoking was reported in 32.4% of the patients during the evaluation period. A history of osteoporosis was reported in 14%, diabetes in 18%, and hypertension in 42%.

A total of 107 implants were placed in the maxilla, and 135 implants were placed in the mandible.

Figs 4a and 4b *A 66-year-old male patient presented with hopeless mandibular first molars. He was a smoker and reported both hypertension and hyperlipidemia. Immediate dental implants were placed for the mandibular right and left first molar sites, and the sockets were grafted with an allograft. The mandibular second molar sites had been edentulous for a while and received two implants at the same time. All implants were restored with screw-retained restorations in 2003.*

Fig 4c and 4d *This patient was followed for 10 years (2013), and the latest radiographs demonstrated minimal remodeling of the crestal bone level.*

Of the 242 implants, 19 were placed in the anterior region (7.9%), and the remaining 223 implants were placed in the posterior region (92.1%). The implants were provided in the variety of clinical situations normally encountered in private dental offices. There were 139 implants placed in edentulous sites; 33 were placed in previously bone-grafted sites, and 70 were placed in extraction sites. There were 93 implants that either were placed in grafted sites or received simultaneous grafting at the time of the implant placement. The average length of the implant used was 11.5 mm, and the average diameter was 4.1 mm.

There were five implant failures from this radiographic observation period, resulting in a 97.9% dental implant survival rate. One implant failed because of a recurring screw-loosening issue; two implants were lost as a result of peri-implantitis in a smoker with a history of bruxism; one implant fractured; and one implant was lost just 1 month after surgery.

The radiographic crestal bone levels were expressed in millimeters from the top of the implant platform to the first BIC. The mean crestal bone level change on the mesial aspect was –0.36 ± 1.05 mm, while the mean crestal bone level change on the distal aspect was –0.18 ± 0.96 mm. Thus, the overall mean bone loss was 0.28 ± 0.05 mm. There was no statistically significant difference in the mean crestal bone level change between the mesial and distal aspects (P = .44).

Discussion

The practice of dentistry can be driven by data derived from randomized, controlled clinical trials; however, it is important to bridge the gap between results obtained from clinical trials and their application in the clinical practice. The majority of patient care is delivered in private practice, where clinicians see a large variety of dental problems.

For the current study, the data were generated from an unrestricted general population from five private practices. The advantage of this study design was inclusion of a broad spectrum of patients who have been treated and maintained by private practitioners. The downside is the retrospective nature of

the observation, as well as the use of nonstandardized radiographs. There were no standardized treatment protocols for the patients, who have attended the same practice on a regular basis. In addition, no specific success criteria have been applied to this observation.

Nonetheless, the data that have been generated are very strong and supportive of the safety and efficacy of this dental implant system for replacing missing teeth. In this retrospective radiographic analysis, 242 Implantium implants with sandblasted, large-grit, acid-etched surfaces were radiographically evaluated up to 10 years after restoration to determine the change in crestal bone levels relative to the top of the implant platform. For the long-term success of implants, stable peri-implant bone crest levels are a valuable indicator.[5] In the present study, a mean loss of 0.28 ± 0.05 mm of crestal bone height from the initial surgery to up to 10 years after restoration was reported. This is an improvement from what Lee et al reported when they examined 249 Implantium implants with sandblasted, large-grit, acid-etched surfaces placed in 95 patients.[13] Mean crestal bone height losses of 0.41 ± 0.48 mm (mesial) and 0.58 ± 0.65 mm (distal) were reported in the first year of loading; in the fifth year of loading these data were 1.13 ± 2.23 mm (mesial) and 1.20 ± 2.61 mm (distal). Annual average bone loss of 0.18 mm (mesial) and 0.19 mm (distal) was reported in the study. However, the 5-year cumulative implant survival rate was 97.37%, which is very similar to the current study results (97.9%).

The sandblasted, large-grit, acid-etched surface has been proven to be effective in both preclinical and clinical studies conducted by other investigators.[18–22] For example, Buser et al[5] reported a 10-year implant survival rate of 98.8% and a success rate of 97.0% for dental implants with sandblasted, large-grit, acid-etched surfaces. In addition, the prevalence of peri-implantitis was low (1.8% during the 10-year period). Another 10-year study by Roccuzzo and colleagues reported survival rates of 90% to 96.6% for 101 periodontally compromised and periodontally healthy patients.[23] Patients with a history of periodontitis presented a lower survival rate and a statistically significantly higher number of sites with peri-implant bone loss.

Two-piece dental implants with matching abutment and platform configurations undergo a typical 1.5- to 2.0-mm peri-implant crestal bone loss apical to the implant-abutment junction, exposing one or two implant threads after 1 year of loading.[24–26] The introduction of the platform-switching concept has resulted in improved maintenance of the crestal bone level.[27–32] The Implantium implant features a built-in platform-switching concept, which may very well have contributed to the outstanding results observed in this study.

Conclusions

The Implantium dental implants with a sandblasted, large-grit, acid-etched surface appeared to achieve successful osseointegration during this long-term observation period, and this implant system's unique design and surface features resulted in a more stable osseous crest without bone loss to the first thread.

Acknowledgments

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