The Ritter Spiral Implant

A prospective study on the survivability of 100 consecutively placed implants in healed sites with a one-stage approach. Evaluation and followup at 1 year post-final restoration. A multi-center study.

Abstract

Purpose: To assess implant success and survivability of 100 consecutively placed Ritter Spiral Implants placed between 2016 and 2019 in a private practice setting.

Materials and Methods: Over a 3.5-year period, 70 patients underwent single-tooth implant placement in post-extraction sockets or healed sites. Implants were placed in a one-stage approach with healing abutments placed at the time of surgery. Clinical and radiographic measurements of vertical bone levels were assessed on the day of surgery; at 3, 6, and 12 months after surgery; and at 24 months post-final restoration. The outcomes'measures were implant stability, survival, and success.

Results: Of the 100 implants placed, only 3 implants failed for a survival rate of 97%. No biological or technical complications were observed in the patients treated. All 3 failed implants were replaced without compromise.

Conclusion: Ritter Spiral Implants yielded a high stability, survival, and success rate and represent a convincing treatment alternative.

1. Introduction

The successful utilization of osseointegrated dental root form implants in the oral rehabilitation of partially and fully edentulous patients is well-documented.[1-3] To date, many implant designs and surfaces have been utilized to achieve a sustainable osseointegrated anchorage unit for supporting a fixed prosthesis.

The purpose of this study was to evaluate the success and survival rate of a Grade 5 titanium, internally hexed, roughened and tapered root form implant with a sand blasted (SB/LA) surface. This roughened micro-surface of the Ritter Spiral Implant is created using only biocompatible media and an approved manufacturing process.

2. Materials and Methods

2.1: Study Sample. The patients enrolled in this prospective study were treated with the insertion of dental implants over the course of 3.5 years (May 2016 through December 2019) in multiple private practice clinical centers. The inclusion criteria consisted of healthy adult patients with the need of tooth replacement in the area of a healed or intact ridge after tooth loss and/or socket grafting.

The general exclusion criteria included the presence of medical conditions that contraindicated surgery, such as (1) uncontrolled or not properly treated diabetes with high blood sugar levels, (2) the presence of immunosuppression, (3) a history of head and neck cancer with radio- and chemotherapy, (4) cigarette smoking, and (5) patients in treatment with oral/intravenous aminobisphosphonates.

2.2: Preoperative Evaluation. The pre-op evaluation included careful clinical and radiographic analysis with the use of intraoral periapical radiographs or panoramic radiographs, as well as 3D evaluation of bone anatomy by means of low-dose cone-beam computed topography (CBCT). The surgical planning was then executed through the simulation of implant

continued on page 16


Marko Tadros, DDS


Richard Martin DDS, OMFS

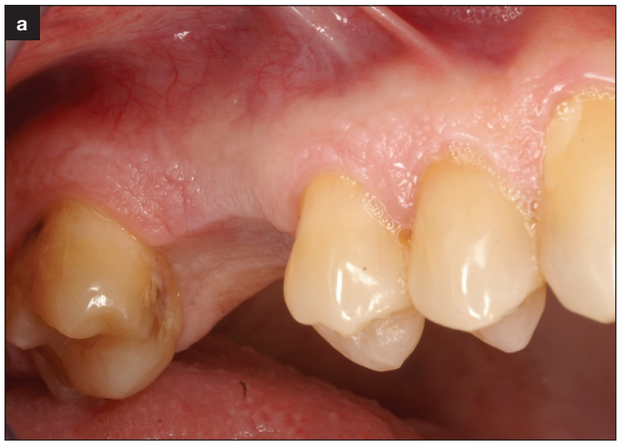

Maurice A. Salama, DMD

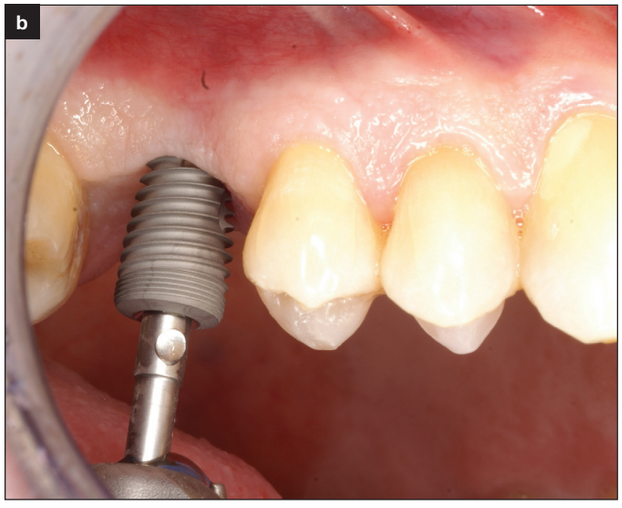

Toni Salama, DDS

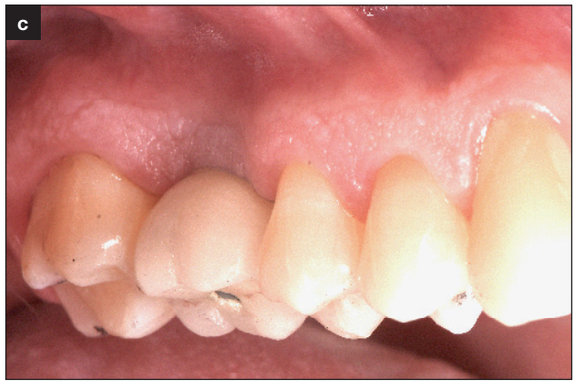

Dr. Henry Salama, DMD


Marcelo Silva, DDS


Manuel de la Rosa, DDS







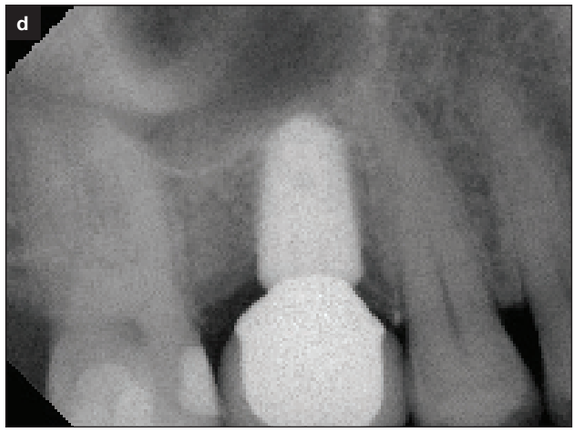


Figure 1. (a) A preoperative situation. **(b)** Ritter Spiral 5.0-mm × 10-mm implant placement beneath the sinus floor. on the day of surgery. **(c)** The final restoration. **(d)** Radiograph taken one year after the final restoration of the implant.

Ritter Spiral Implants displayed a high survival rate and success rate after one year of functional load when utilizing standard delayed loading implant protocols in intact and healed ridges throughout the oral cavity.

continued from page 14

placement as well as a diagnostic wax-up to allow for a prosthetically driven treatment plan.

2.3: The Implants. The implants used (Ritter Implants, Germany) were Grade 5 titanium, internally hexed, roughened and tapered root form implants with SB/LA, grit-blasted/large particle acid-etched macro-surfaces of 20 to 40 µm and micro-surfaces of approximately 2 µm. The roughened micro-surface of the Ritter Spiral Implant is created using only biocompatible media and an approved manufacturing process enhancing bone contact and stability.

2.4: Surgical and Prosthetic Procedures. In private clinical practice settings, 100 implants were placed utilizing standard surgical and delayed loading protocols in a one-stage approach (placement of a healing abutment and an open wound healing environment). The implants were placed in healed or previously grafted extraction sockets and residual ridges. No additional grafting of any kind was required at the time of implant placement.

The implants utilized included 3.3-mm, 3.75-mm, 4.2-mm, 5.0-mm, and 6.0-mm diameters and ranged from 8 mm to 13 mm in length. The surgeons prepared the implant sites using drills of increasing diameter, strictly following the manufacturer's recommendations. Forty-one of the implants were placed in the anterior region, 35 were placed in the premolar region, and 24 were placed in the molar regions. In all cases, the implants were all placed with a one-stage approach (healing abutment

continued on page 18

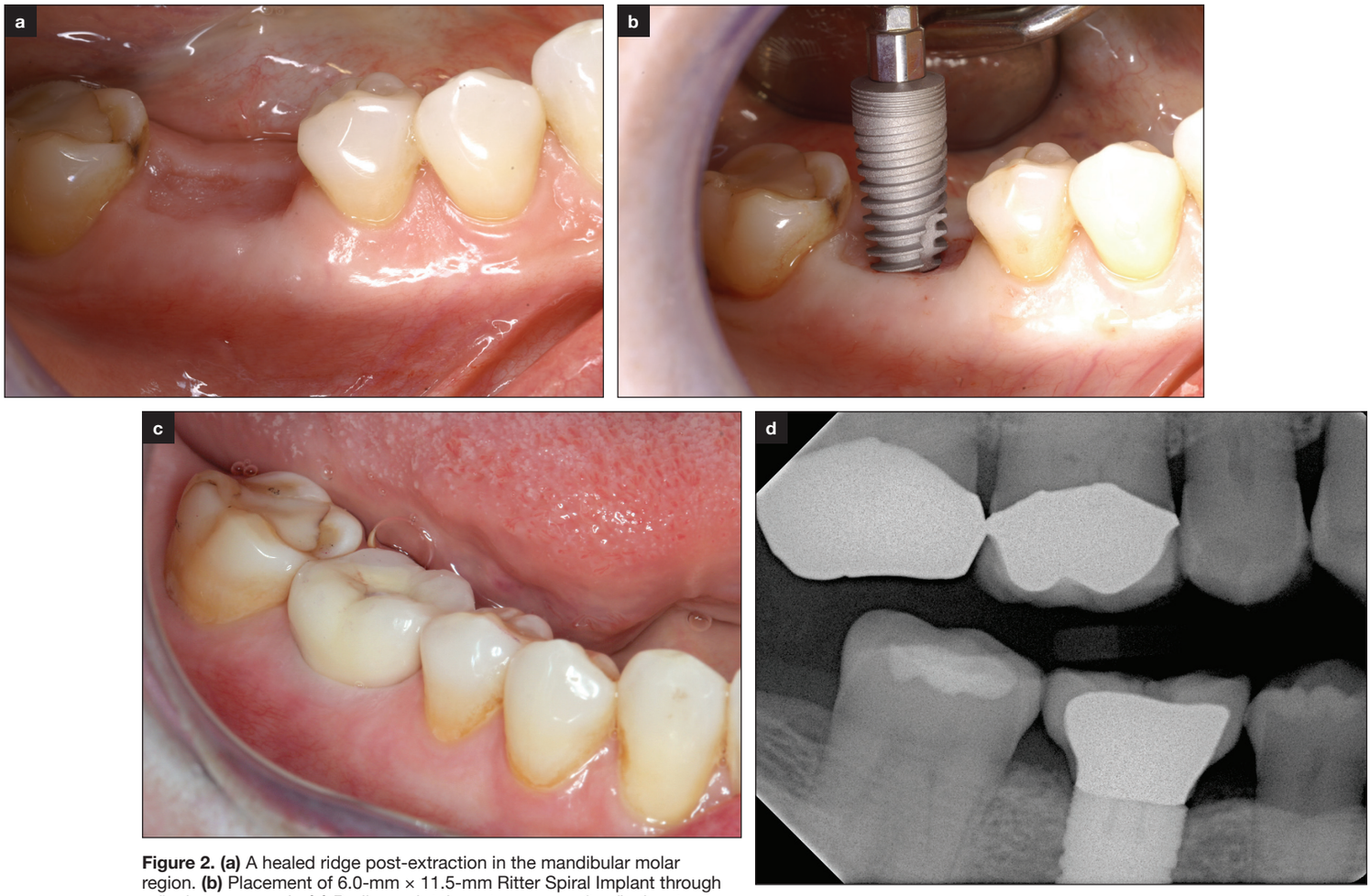


Figure 2. (a) A healed ridge post-extraction in the mandibular molar region. **(b)** Placement of 6.0-mm × 11.5-mm Ritter Spiral Implant through a flapless approach. **(c)** Radiograph taken at one year after final restoration. **(d)** One year following final restoration of the implant.

continued from page 16

placed at the time of surgery).

2.5: Outcomes of the Study. During each follow-up visit (2-weeks post-implant placement and approximately every 4 months thereafter) and until the conclusion of the study (one year following placement of the final restoration), a clinical and radiographic assessment of the implants, peri-implant tissues, and prostheses were carried out by multiple blinded reviewers. The main outcomes of the study showed high implant stability, survivability, and success.

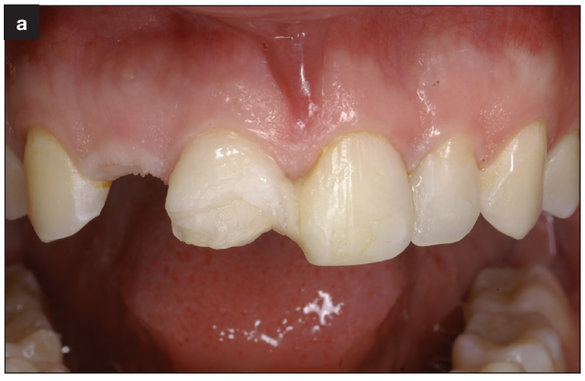
Implant stability was evaluated using resonance frequency analysis at the time of implant placement and again at the time of final impression.

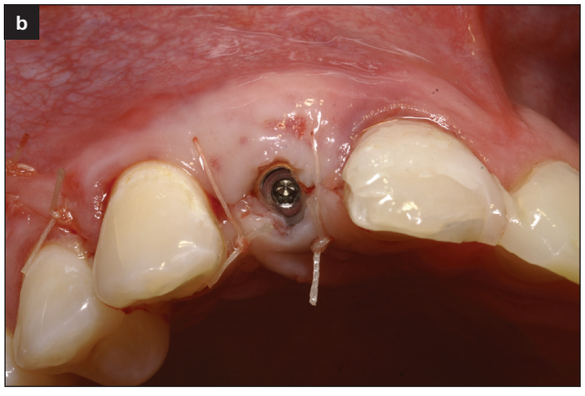
Implant success was determined according to the criteria created by Albrektsson et al[4] and Buser et al,[5] which included:

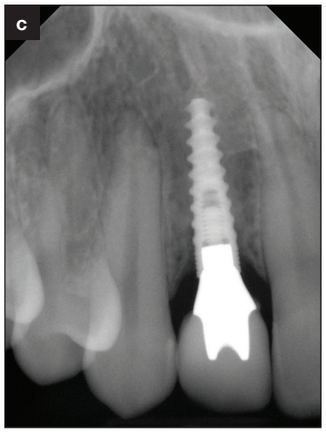
1. The absence of biological or prosthetic complications, such as persistent subjective complaints—for example, pain, foreign body sensation, and/or dysesthesia
2. The absence of peri-implant infection with suppuration
3. The absence of mobility
4. The absence of continuous radiolucency around the implant

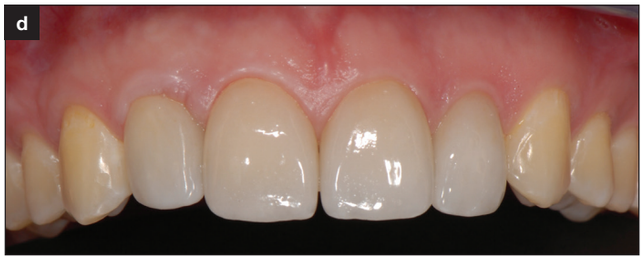
2.6: Statistical Evaluation. Multiple blinded reviewers collected and evaluated all data. The evaluation of each patient's demographics, as well as implant characteristics (site, position, length and diameter, minor bone augmentation, and soft tissue augmentation), was performed. Observations and clinical measurements were made to determine if any significant changes occurred to the soft tissue margin of the implant restorations over a one-year timeframe. Radiographic assessments of marginal bone stability

continued on page 20









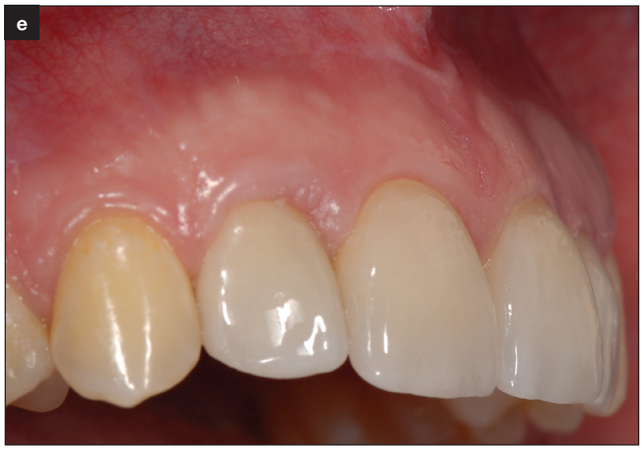


Figure 3. (a) Initial clinical image of edentulous healed site No. 7. **(b)** One-stage implant placement of a Ritter Spiral Narrow line 3.3-mm × 13-mm implant with a healing abutment. **(c)** Final restoration. **(d)** Two years following final restoration of No. 7. **(e)** Five years postoperative.

continued from page 18

at one year were also analyzed. Any noticeable color changes of the soft tissue were assessed via photographic and clinical inspection.

Results

In total, 70 patients were enrolled in the present study. The mean age of these patients was 53 years. A total of 100 implants were inserted in this study. All were placed in previously grafted sites in multiple private practice clinical settings. With regard to the position of the implants, 41 were placed in the anterior region, 35 were placed in the premolar region, and 24 were placed in molar sites. No statistically significant differences were found in the distribution of implants by length and diameter.

Of the 100 implants included in this clinical study, only 3 implants failed and had to be removed (ie, a survival rate of 97%). The implants that failed were clinically stable at the time of insertion (> 30 Ncm) and radiographically sound. Of the 3 failed implants, one was removed 4 months after placement of the final restoration due to a significant infection originating from an adjacent endodontically compromised tooth. The other 2 implants failed at the time of impression and were later successfully replaced with new implants. The mean radiographic marginal bone loss, measured between the time of placement of the final restoration and the 1-year followup, was 0.5 mm. At the end of the study, one year after the placement of the definitive crowns, no implant failure was noted, for an overall survival rate of 100%.

No statistical difference was found among the studied variables. These measurements included pre-op photos, digital scans, PA films, and CBCT, as well as the maintenance and stability of peri-implant marginal bone and soft-tissue levels measured through probing depths and serial PA radiographs.

Discussion

This prospective clinical study presented detailed clinical and radiographic data of 100 implants placed in previously grafted sites. Overall, the clinical and radiographic results obtained confirmed favorable results with high survival and success. The survival and success rates compared very favorably with implants evaluated over an equivalent time period. The implants utilized in this study displayed excellent initial stability, high torque insertion measurements, stable soft-tissue response, and minimal radiographic bone resorption noted at 1-year post-final restorative loading.

Conclusion

Ritter Spiral implants displayed a high survival rate and success rate after one year of functional

continued on page 22

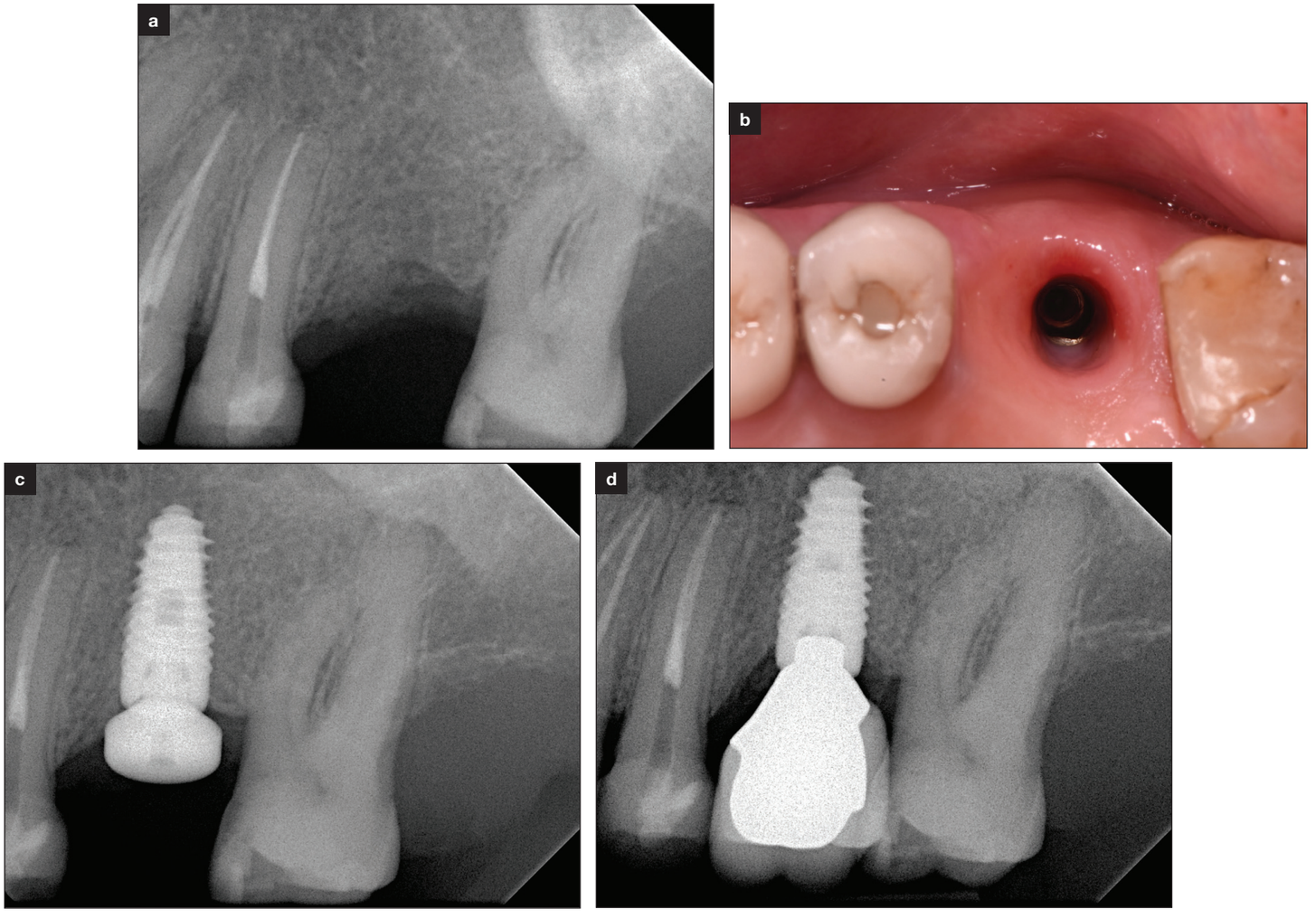


Figure 4. (a) PA radiograph of the healed ridge in a maxillary molar site. **(b)** Placement of a 4.2-mm × 11.5-mm Ritter Spiral Implant through tissue in an incisionless approach. **(c)** PA radiograph after a one-stage placement with a healing abutment. **(d)** Three-years post-op PA radiograph.

continued from page 20

load when utilizing standard delayed loading implant protocols in intact and healed ridges throughout the oral cavity. This success was achieved in all areas and under various clinical conditions, such as healed extraction sites and grafted sites, including previously grafted sinuses and narrow ridges in combination with osseous augmentation and ridge splitting. In these private practice settings, a 97% overall success rate was reported after one year of clinical loading, soft-tissue changes were minimal or clinically insignificant, and the bone resorption was within normal limits when compared to similar longitudinal studies performed in other reported implant studies.[6-8]

References:
1. Hjalmarsson L, Gheisarifar M, Jemt T. A systematic review of survival of single implants as presented in longitudinal studies with a follow-up of at least 10 years. *Eur J Oral Implantol*. 2016;9(Suppl 1):S155–62.
2. Buser D, Sennerby L, De Bruyn H. Modern implant dentistry based on osseointegration: 50 years of progress, current trends and open questions. *Periodontology 2000*. 2017;73(1), 7-21.
3. Pjetursson BE, Thoma D, Jung R, et al. A systematic review of the survival and complication rates of implant-supported fixed dental prostheses (FDPs) after a mean observation period of at least 5 years. *Clin Oral Implants Res*. 2012;23(Suppl 6):22–38.
4. Albrektsson T, Zarb G, Worthington P, et al. The long-term efficacy of currently used dental implants: a review and proposed criteria of success. *Int J Oral Maxillofac Implants*. 1986;1:11–25.
5. Buser D, Ingimarsson S, Dula K, et al. Long-term stability of osseointegrated implants in augmented bone: a 5-year prospective study in partially edentulous patients. *Int J Periodontics Restorative Dent*. 2002;22:109–17.
6. Buser D, Janner SF, Wittneben JG, et al. 10-year survival and success rates of 511 titanium implants with a sandblasted and acid-etched surface: a retrospective study in 303 partially edentulous patients. *Clin Implant Dent Relat Res*. 2012;14(6), 839-851.
7. Bain CA, Weng D, Meltzer A, et al. A meta-analysis evaluating the risk for implant failure in patients who smoke. *Compend Contin Educ Dent*. 2002;23(8):695-708.
8. Buser D, Weber HP, Lang NP. Tissue integration of non-submerged implants. 1-year results of a prospective study with 100 ITI hollow-cylinder and hollow-screw implants. *Clin Oral Implants Res*. 1990;1: 33–40.

continued on page 24

continued from page 22

Dr. Tadros started his dental journey at Georgia Regents University in August of 2010 and had obtained his DMD degree by May 2014. Upon graduation, he received "Best of the Best in Prosthodontics" award. Dr. Tadros was also awarded first place in the aesthetic contest at the "Digital Smile Design Miami Super Week" held by Dr. Christian Coachman in September 2014. His attention to detail and eagerness to treat challenging cases led him to pursue a 3-year residency program that specializes in prosthodontics at Augusta University. Alongside the residency, he is also involved in the Ronald Goldstein Center for Esthetic and Implant Dentistry, directed by the world-renowned father of modern aesthetic dentistry, Dr. Gerard Chiche. Dr. Tadros has special interest in comprehensive full-mouth rehabilitations, aesthetic and implant dentistry, computerized implant guided surgery, 3D printing, and digital dentistry. He has been published several times, including for his latest article, "A Blended, Novel Team Approach in Academic Esthetic Dentistry," in the *Journal of Cosmetic Dentistry*. Furthermore, he has lectured about aesthetic dentistry, digital smile design, computer-guided surgery, and 3D printed implant surgical guides both nationally and internationally. In addition, he has also lectured at the 2015 Georgia Implant Maxicourse about integrating digital smile design with computer-guided surgery. Dr. Tadros also demonstrates exemplary skills in navigating Blue Sky Bio implant planning software, 3Shape, and the 3D printing of implant surgical guides in-office. He is a co-founder of the Blue Sky Bio Academy where he and others teach about guided surgery.

Dr. Martin is an oral and maxillofacial surgeon in Lewisville-North Dallas, Texas. He is a graduate of the NYU College of Dentistry where he was elected Omicron Kappa Upsilon. He completed his oral and maxillofacial surgery training at Harlem Hospital-Columbia University College of Physicians and Surgeons. He is a diplomate of the American Board of Oral and Maxillofacial Surgery. Dr. Martin has a special interest in instrument design and has invented more than 20 instruments and facial splints. He has a keen interest in soft tissue and bone management in the anterior jaw. Dr. Martin has published several articles in maxillofacial and plastic and reconstructive literature and has co-authored 2 book chapters.

Dr. Maurice A. Salama completed his undergraduate studies at the State University of New York at Binghamton in 1985 where he was a member of the university basketball team and nominated to the State of New York All-Scholastic Team. He received his BS in Biology upon graduation. He then went on to graduate school to receive his DMD degree from the Penn School of Dental Medicine (Penn Dental Medicine). Dr. Salama completed a one-year general practice and surgical residency at Maimonides Medical Center in Brooklyn, NY, in 1989 to 1990 where he was named chief resident. Dr. Salama later returned to Penn Dental Medicine and received his dual-specialty certification in orthodontics and periodontics, as well as his implant training at the Brånemark Center at Penn. Dr. Salama is currently on the faculty at Penn and the Dental College of Georgia as clinical assistant professor of periodontics. Dr. Salama remains a founder and a permanent member of the Scientific Committee of DentalXP. He is also a legacy member of the Team Atlanta Dental Practice, which is a multidisciplinary practice world-renowned for its clinical research in implants and reconstructive and aesthetic dentistry. Dr. Salama and his team have published numerous scientific papers, book chapters, and periodicals in peer-reviewed journals and is often an invited keynote and featured speaker at dental conferences around the world.

Dr. Toni Salama was born and raised on Long Island in New York. She earned her bachelor's degree in Biological Sciences at Binghamton University and received her DDS degree at the Stony Brook University School of Dental Medicine. She then went on to complete a 3-year residency at New York University (NYU) where she specialized in periodontics and implant dentistry. During her residency, she received world-class training in treating complex cases, implant placement, and full-mouth rehabilitation. Dr. Salama has a true passion for dentistry and is committed to providing exceptional dental care, making patient comfort a priority. Her approach to dental treatment is thorough and conscientious. She is dedicated to lifelong learning and attends continuing education courses regularly. During her free time, Dr. Salama enjoys spending time with her family and friends, playing tennis, hiking, and traveling with her husband.

Dr. Henry Salama received his postdoctoral specialty certificates in both periodontics and periodontal-prosthesis, fixed prosthodontics from the University of Pennsylvania (Penn). He is the former director of the Implant Research Center at Penn, where he continues to be a clinical assistant professor in the department of periodontics. Dr. Salama is currently in private practice in Atlanta limited to advanced restorative and implant therapy. His clinical research activities focus on long-term stability of aesthetic soft-tissue enhancement techniques as well as the immediate and early loading of root form implants. Dr. Salama is a partner in the Atlanta Esthetic Dental Practice known as "Team Atlanta." His partners include Dr. David Garber; Dr. Ronald Goldstein; and his brother, Dr. Maurice Salama. This group has an international reputation for interdisciplinary care and dental education and has published hundreds of articles and several textbooks. Dr. Salama is a featured Xpert content provider and member of the Scientific Committee of the leading web-based dental education site DentalXP (dentalxp.com).

Dr. Silva was born in Sao Paulo, Brazil, and was raised in the small city of Mogi das Cruzes, Brazil, where he attended dental school. He focused his career on the surgical aspect of implant dentistry after having completed intense postdoctoral training in that field. Dr. Silva came to the United States to pursue his dream to become a dentist. He spent several years as an intern in one of the most important multidisciplinary practices in the world, "Team Atlanta," where he had the chance to follow Drs. Maurice Salama and David Garber chair side. He decided to validate his Brazilian dental license in the United States and went back to dental school for 2 years and earned his second DDS degree at the University of Southern California. After dental school, Dr. Silva decided to enhance his restorability skills and knowledge by pursuing postdoctoral training in prosthodontics at Augusta University. Following his residency, Dr. Silva started a fellowship at the Ronald Goldstein Center for Esthetic and Implant Dentistry.

Dr. de la Rosa graduated from the University of Nuevo León Dental School in Monterrey, Mexico, in 1992 and received his Masters' degree in periodontics from the University of Texas (UT) in Houston in 1996. He completed a fellowship in implant dentistry from UT in Houston in 1997 and is a fellow of the International College of Dentists. He has been published in *JOMI*, *Journal of Clinical Periodontology*, *Journal of Dental Research*, and *Brazilian Dental Journal*, among others, and lectures internationally. Dr. de la Rosa is a member of DentalXP and serves on the Scientific Board of Ritter Implants. He is a keynote speaker for Devemed, Novabone, Ritter Implants, and Zeyco. He is in private practice limited to periodontics and implant dentistry in Monterrey and Cancun, Mexico.