Clinical and Radiographic Performance of Rough Surfaced Implants Placed in the Atrophic Posterior Maxilla With Sinus Membrane Elevation Without Bone Grafting: A Prospective and Preliminary Study

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Purpose: The aim of the present prospective and preliminary study was to compare the clinical and radiographic outcomes of 2 types of rough surfaced implants after implant placement in the atrophic posterior maxilla with sinus membrane elevation without bone grafting using the crestal approach.

Patients and Methods: All clinical and radiographic records for 28 patients who had received 40 implants were included in the present study. The patients returned for radiographic and clinical examinations at 1, 3, and 6 months and every 6 months thereafter after implantation. Cone-beam computed tomography images were taken to evaluate the amount of bone gain in the maxillary sinus. Standardized periapical digital radiographs were taken to evaluate the changes in the crestal peri-implant bone level and peri-implant fixture radiolucency.

Results: The Kaplan-Meier survival estimates demonstrated a 100% probability of survival to 24 months. No significant differences were found in cervical bone loss (CBL) or residual bone height (RBH) between the TS III CA group and the TS III SA group during the 2-year follow-up period after implant placement. The CBL values according to gender, implant placement region, prosthesis type, and the time of implantation were not significantly different between the 2 groups.

Conclusions: The results of the present preliminary study demonstrate that 2 types of rough surfaced implants placed in the atrophic posterior maxilla with sinus membrane elevation without a bone graft have good clinical and radiographic outcomes.

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The introduction of implant-supported dental prosthesis has contributed to the significant improvement in restoring the masticatory function of partially or completely edentulous patients. Many studies have demonstrated that treatment using titanium dental implants is a safe method for oral rehabilitation with high success rates.[1-3]

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Insufficient bone volume due to factors such as pneumatized maxillary sinus, rapid resorption of the alveolar bone, and lower bone density are common problems encountered in the rehabilitation of the edentulous posterior maxilla with implant-supported prostheses.[4,5] Boyne and James[6] in 1980 and Tatum[7] in 1986 introduced the lateral window approach to provide adequate bone volume and bone room for safe implant placement. Since then, bone regeneration in the posterior maxilla for implant placement has been achieved using various maxillary sinus floor augmentation techniques, such as sinus elevation with the use of bone grafts and bone substitutes to ensure sufficient bone volumes.

However, in recent years, the sinus floor elevation technique has also been performed using a modified approach that is different from other procedures, in which no graft material is placed in the newly created space underneath the Schneiderian membrane.[8] Despite the controversies regarding the height of new bone formation at the apices of implants after sinus membrane elevation without bone grafting, many investigators have agreed that graft material is not necessary to promote osseointegration and maintain optimal bone volume around the implant. This approach has some advantages, including *1)* the decreased possibility of infection, *2)* an overall reduction in the cost of treatment, and *3)* more rapid and denser bone development in the maxillary sinus.[9-12] Despite these advantages, little is known about the outcome and comparison of rough surfaced implants in this approach.

The objective of the present prospective and preliminary study was to compare the clinical and radiographic outcomes of 2 types of rough surfaced implants after implant placement in the atrophic posterior maxilla with sinus membrane elevation without bone grafting using the crestal approach.

Patients and Methods

The institutional review board of the Catholic University of Korea approved the present study (approval no. SC14RISI0175). All clinical and radiographic records for 28 patients who had received implants in the posterior maxilla with sinus membrane elevation without bone grafting from March 2014 through August 2016 at the oral and maxillofacial surgery department (Yeouido and Bucheon St. Mary's Hospital, Catholic University of Korea, Bucheon, Republic of Korea) were included in the present prospective study. A total of 40 implants (21 TS-III SA and 19 TS-III CA; Osstem Implant Co, Busan, Republic of Korea) were placed by 1 experienced implant surgeon.

The inclusion criteria were as follows: *1)* implant treatment with sinus elevation in the posterior maxilla to replace missing teeth to support a fixed prosthesis; *2)* sinus lifting procedure performed without grafting materials; *3)* achievement of implant primary stability; *4)* no use of a removable partial denture during the healing period; and *5)* no sinusitis was present.

Medically compromised patients and smoking patients (5 of 28 patients) were not excluded but were informed that smoking is a risk factor for implant failure.

PATIENTS' GENERAL HEALTH STATUS

Of the 25 patients, 14 were in good health and 11 patients were receiving routine medication for cardiovascular problems. Four patients were receiving controlled treatment for diabetes and 2 patients were receiving medication for osteoporosis.

Preoperative Preparation

Before sinus elevation and implant installation, all patients received an oral examination that included the intermaxillary relationship, dental caries, and periodontal and soft tissue diseases. They then received the appropriate treatment. Before sinus elevation and implant installation, panoramic radiographs, periapical radiographs, and cone-beam computed tomography (CBCT) scans were taken to evaluate bone quantity, proximity from vital structures, and adjacent tooth angulation.

SINUS ELEVATION AND IMPLANT INSERTION SURGERY

To reduce the risk of infection, a prophylactic antibiotic (Moxicle; Daewoong, Seoul, Republic of Korea) was given 1 hour before surgery and for 5 days after surgery (625 mg, 3 times daily). The surgical procedures were performed with the patient under local anesthesia.

For maxillary sinus membrane elevation, the crestal approach was performed using the crestal approach sinus kit and sinus membrane lifter drill (CAS kit, SMLD; Osstem Implant Co, Busan, Republic of Korea).

After sinus elevation was completed, drilling was performed according to the manufacturer's written surgical protocol and the internal and 2-piece implants (TS-III SA and TS-III CA; Osstem Implant Co, Busan, Republic of Korea) were positioned without bone grafting. The final tightening of the fixture into the bone was performed using a torque wrench with a primary stability of more than 35 Ncm. All implants were left to heal unsubmerged (ie, 1-stage approach) during the healing period after implant installation surgery. Healing abutments were installed after inserting the implant. Flaps were adjusted to the implant and

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