CLINICAL ANALYSIS

http://dx.doi.org/10.5125/jkaoms.2014.40.1.17
pISSN 2234-7550 · eISSN 2234-5930

# Survival rate of Astra Tech implants with maxillary sinus lift

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**Abstract** (J Korean Assoc Oral Maxillofac Surg 2014;40:17-20)

**Objectives:** The aim of this study was to retrospectively evaluate the clinical survival rate of Astra Tech implants in the maxillary molar region performed with sinus lift and bone graft.

**Materials and Methods:** Ninety-nine Astra Tech implants (Osseospeed) placed in the maxillary molar region using sinus lift from September 2009 to February 2012 were selected with a minimum follow-up period of 1 year. The height of alveolar bone, sinus approach technique, bone material and implant survival rate were evaluated.

**Results:** Of the 99 implants, the survival rate was 90.9%; 8 implants failed within 1 year after implant placement, and 1 implant failed 1 year after implant loading. All failed implants were placed with sinus lift simultaneously. The average height of alveolar bone before implant placement was 6.9 mm, while the height of alveolar bone of failed implants was 2.1 mm, on average.

**Conclusion:** Astra Tech implants placed in the maxillary molar region had generally good survival rates, but the relationship between reduced pre-implant alveolar bone height and implant failure requires further attention.

**Key words:** Sinus floor augmentation, Dental implants

*[paper submitted 2014. 1. 13 / revised 2014. 2. 7 / accepted 2014. 2. 10]*

## I. Introduction

Implant prosthesis has become a useful and common treatment for the restoration of missing teeth. However, implant placement in the maxillary molar region requires further attention, because of potential bone quality and anatomical structure issues. In the maxillary molar area, the height of alveolar bone may be reduced due to acute or chronic periodontal disease, sinus pneumatization, or atrophy of the residual alveolar ridge after extraction. Thus, implant placement in this area can be difficult or even impossible[1,2]. Therefore, at the time of implant placement in the maxillary molar area, bone graft is performed using vertical alveolar bone graft, sinus lift, or onlay bone graft, of which sinus lift is simple and widely used[1,3]. Sinus lift is generally performed prior to or simultaneously with implant placement using the lateral window or crestal approach[4]. The survival rate of the implant is determined by the pathological or physiological condition of the existing maxillary sinus and by the height of residual alveolar bone[5].

The current study examined the clinical survival rate of Astra Tech implants in patients who underwent a maxillary sinus lift with bone graft, and stability and prognosis were evaluated retrospectively.

## II. Materials and Methods

Patients who received a maxillary sinus lift and Astra Tech implant placement in the edentulous part of the maxillary molar region at the Department of Oral and Maxillofacial Surgery at Chosun University Dental Hospital from September 2009 to February 2012 were recruited for this study. The study included 44 patients (99 implants), 34 males and 10 females, with an average age of 52.6 years (range, 23 to 86 years). Patients who required a sinus bone graft on the maxillary molar edentulous area due to lack of residual alveolar ridge, and who could maintain appropriate oral hygiene were selected. Patients were excluded due to the presence of preop-

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erative sinus lesions, as determined clinically and radiographically. Those who had systemic diseases such as uncontrolled blood pressure or diabetes, and poor oral hygiene habits were also excluded, as were patients who drank alcohol or smoked.

Sinus lift via lateral or crestal approach and implant placement were performed in the usual manner. A single oral and maxillofacial surgeon carried out operations under local anesthesia. After crestal and vertical incision, the mucoperiosteal flap was elevated. In the lateral approach, a lateral window was formed via Piezosurgery (Mectron, Carasco, Italy), and the sinus membrane was separated and elevated, then bone was grafted. In the crestal approach, the sinus membrane was elevated with the Hatch-Reamer system (Sinustech, Seoul, Korea), then bone was grafted.

All patients received amoxicillin and pain reliever for 7 days to prevent post-operative infection and pain. One prosthetic doctor performed restorative treatment after 6 months, on average. Prosthetics were porcelain-fused-to-gold, and were connected with the screw and cement-retained prosthesis method. Patients received a follow-up examination every 2 months for a year after prosthetic installation, and implant stability was evaluated using the Periotest M system (Medizintechnik Gulden Co., Mudautal, Germany).

The Astra Tech implants with TiO-blast surface used in this study were the Osseospeed (Astra Tech AB, Mölndal, Sweden) variety, which contain characteristic microthreads in the upper area to facilitate even distribution of stress. The bone graft materials used were autogenous bone and allogenic bone (Tutoplast, Tutogen Medical GmbH, Neunkirchen, Germany; Allo-oss, CG-Bio, Seongnam, Korea), xenogenic bone (Bio-Oss; Geistlich Pharma AG, Wolhusen, Switzerland), alloplastic bone (Osteon; Genoss, Suwon, Korea), and autogenous tooth bone graft materials. The height of residual alveolar bone was measured using periapical view (Radicon imaging Corp., Santa Clara, CA, USA) with keeping the same angle after implant placement. The mesial and distal alveolar bone height of implants were averaged.(Fig. 1) Patients were followed for a minimum of 1 year. This study was approved by the Institutional Review Board of Chosun University Dental Hospital (No. CDMDIRB-1322-115).

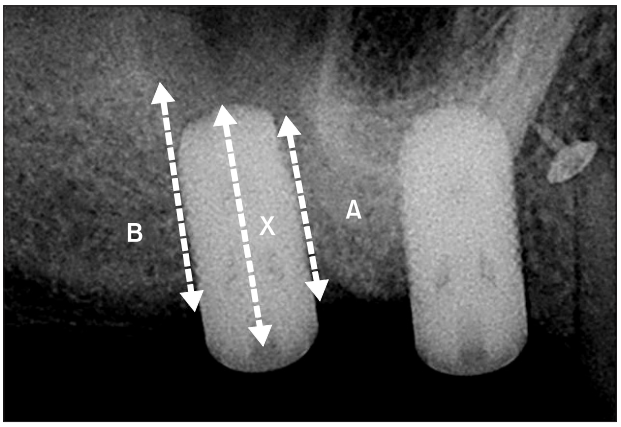


**Fig. 1.** Radiographic measurement of residual bone height (A: mesial residual bone height, B: distal residual bone height). A : X or B : X=actual residual alveolar bone height : actual implant height.
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## III. Results

Of 99 implants, those 11 mm in length were used most frequently (75 implants, 75.8%), followed by 13 and 9 mm lengths, with diameters of 3.5, 4.0, 4.5, or 5.0 mm. Implants 5.0 mm in diameter were used most frequently. The height of alveolar bone varied from 1.2 mm to 10.5 mm and the average height was 6.9 mm.

Sinus lift with bone graft was performed via the crestal or lateral approach. The lateral approach was used in 68 implants (68.7%), the crestal approach in 31 (31.3%). Of the various graft materials, Tutoplast was the most often used (67 implants, 67.7%), followed by a Bio-oss/Tutoplast mixture (19 implants, 19.2%). Synthetic bone such as Osteon, autogenous tooth bone graft material, and autogenous bone were also used.

With the exception of 11 implants, implants were placed simultaneously with sinus lift (88.9%). Delays in implant placement averaged 7.5 months after maxillary sinus lift with bone graft. Submerged placement was used in 88 implants. The second surgery was performed 6.6 months after implant placement on average.

The survival rate of implants was also investigated. One implant was removed due to failure of osseointegration six months after placement. Seven implants failed within 12 months after placement, and one implant was removed a year after loading due to peri-implantitis and severe alveolar bone loss. All failed implants were performed with simultaneous sinus lift. The survival rate of Astra Tech implants with sinus lift was 90.9%.(Table 1)

Implant failure occurred in a total of 9 implants in four patients; 4 implants were removed due to failure of osseointegration, and another 4 failed due to uncontrolled infection. One implant failed 24 months after installation on account of severe bone loss followed by functional loading.(Table 2)

The first molar was the most common site of implant fail-

**Table 1.** Cumulative implant survival rate

| Expiration of period following placement (mo) | Total implants (n) | Failed implants (n) | Cumulative survival rate (%) |
|---|---|---|---|
| 0-6 | 99 | 1 | 99.0 |
| 6-12 | 98 | 7 | 91.9 |
| 12-18 | 91 | 0 | 91.9 |
| 18-24 | 91 | 0 | 91.9 |
| 24-30 | 91 | 1 | 90.9 |

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**Table 2.** Analysis of failed implants

| Cause of implant failure | Failed implants (n) |
|---|---|
| Failure of osseointegration | 4 |
| Uncontrolled infection | 4 |
| Severe bone loss after loading | 1 |

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ure and occurred in three patients. In addition, the pre-surgical height of alveolar bone in the 9 failed implants averaged 2.1 mm, which was less than half of the overall average (6.9 mm). All failed implants were placed simultaneously with maxillary sinus lift via a lateral or crestal approach. Fixtures that failed or became mobile were removed and replaced.

## IV. Discussion

In comparison with the anterior tooth area, the rate of tooth loss in the molar area is high due to its important role in mastication and caries or periodontal diseases caused by inferior oral hygiene practices. Thus, this area is the most likely to require implant placement. Also, because bone quality of the maxilla is poorer than that of the mandible, atrophy of the alveolar ridge can be more severe in cases maxillary tooth loss. In addition, maxillary pneumatization may hinder implant placement[6,7]. To overcome these problems, maxillary sinus lift with an accompanying bone graft serves as a simple, widely used procedure[1].

The aim of the study was to evaluate the short-term predictability of Astra Tech implants one year after placement and loading in the maxillary molar area with simultaneous maxillary sinus lift. Of 99 implants, 90 survived, a 90.9% survival rate. Numerous studies have been conducted on the survival rate of implants accompanied by sinus lift. Factors such as bone graft material, approach method, pre-surgical condition of the maxillary sinus, and patient oral hygiene habits all influence the survival rate, which has varied among studies, ranging from 92%-96.9%[4,8,9].

In this study, implant failure occurred in three patients who underwent the crestal approach and in one who underwent the lateral approach; this difference was not significant. Jurisic et al.[10] conducted a study in which 61 patients were divided into three groups: a group undergoing the transcrestal approach and immediate placement, one undergoing the lateral window approach with immediate placement, and one undergoing delayed placement. The survival rates were similar among the three groups. Bruschi et al.[4] reported that use of the transcrestal approach yielded a survival rate of 95.5% after a follow-up period of 16 years. Rapani and Rapani[9] also reported that, in cases involving the lateral window approach, the survival rate was 96.9% after 2 years.

In addition, bone graft materials may affect implant survival rate. In our study, xenogenic bone was used in many cases, precluding determination of significance. Nevertheless, Hürzeler et al.[5] reported that implant survival rates did not differ significantly among allograft, xenograft, synthetic graft, and demineralized freeze-dried bone allograft. Addition of growth factors (e.g., platelet-rich plasma) to bone graft materials may also increase the rate of bone-implant contact[6].

The condition of the maxillary sinus is also associated with post-operative complications. In particular, to accurately assess the condition of the maxillary sinus membrane and the presence of chronic maxillary sinusitis, the precise condition of the residual alveolar bone should be evaluated by cross-sectional computed tomography imaging as well as general radiography. Moreover, the presence or absence of pathological factors should be assessed carefully during pre-surgical planning because antral pseudocysts, mucoceles, etc., may be present[11]. Nonetheless, these may not be absolute contraindications for maxillary sinus lift[12]. Similarly, one case in this study had chronic maxillary sinusitis prior to surgery, and implants were placed after removal of granulation tissue. In addition, the habits of patients may affect the success or failure rate; Cha et al.[13] reported that the rate of implant failure in smokers was more than five times that of non-smokers.

In conclusion, Astra Tech implants that were placed in the maxillary molar region had a good survival rate. Implant failure primarily occurred within the first year when placement and sinus lift were performed simultaneously in patients with low residual alveolar bone height. There was no correlation between approach method to the maxillary sinus or bone graft material used and implant failure.

## V. Conclusion

Implant placement in the maxillary molar region is more difficult than it is in other sites, and Astra Tech implant placement with maxillary sinus lift demonstrated a good survival rate. Failure of implants is likely to occur when placement and sinus lift are performed simultaneously in patients with low residual alveolar bone height and implant placement on reduced height of alveolar bone is needed for attention.

## Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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