

A Case of Implant Installation at Sinus Septa Using Sinus Crestal Approach: A 7-year Follow-up

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Informed Consent Statement

Informed consent was obtained from the subjects involved in the study.

Conflict of Interest

The authors declare no conflict of interest.

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Abstract

Minimal bone height for sinus crestal approach at upper molar site for implant placement was more than 5 mm. When the septum was located at implant installation site, it had a risk of membrane perforation. However, it was useful for initial fixation due to its high bone density. A 54-year-old patient had a septum at left upper 1st molar site. Implant installation was performed using sinus crestal approach using the fixing force of the septum. The 7-year follow-up revealed that the bone and implant conditions were maintained without any complications.

Keywords: Dental implants, Maxillary sinus augmentation, Nasal cavity

1. Introduction

If the vertical bone dimension is insufficient when placing an implant in the maxillary posterior area, maxillary sinus augmentation surgery is considered. However, there are cases where implant installation is difficult due to many anatomical factors, including the septum. The presence of septa increases the difficulty of surgery and the possibility of complications.¹ Septa are broadly classified into two types. Primary septa (congenital septa) exists congenitally and changes with the growth of the center of the face and Secondary septa (Incomplete septa) occurs during irregular pneumatization process after tooth loss.² According to a report by Ulm et al.³ at least one nominal dentate was observed

in 31.7%, and Kim et al.⁴ reported that in a study of Koreans, it occurred in 26.5% of the total population, and it was more common in the edentulous maxillary ridge than in the dentate maxilla.

Currently, various maxillary sinus augmentation techniques have been introduced, but it could be classified into a lateral approach and a crestal approach depending on the direction of approach to the schneiderian membrane. Maxillary sinus lift surgery can be performed through an crestal approach when there is a residual bone height of at least 5 mm or more and sufficient bone width for implant placement.⁵ If a septum exists at the implantation site, typical treatments are as follows:⁶

- 1) Antrostomy
- 2) Scaloped trap door formation after confirming the location of the septum.
- 3) Bone window formation on the mesiodistal side of the septum.
- 4) Remove the bottom of the septum with a rongeur.

In this case, we would like to look at a case in which a septum exists in the area where the implant is scheduled to be placed in the maxillary left posterior tooth, but there is residual bone of more than 5 mm, so the implant was placed immediately after bone grafting using the crestal approach rather than the lateral approach.

II . Case Report

A 54-year-old female visited Dankook University Dental Hospital in May 2016, with chief complaint of both upper molar discomfort and pain (Table 1). #17,27,37,48 were found pain when percussed and severe mobility (Fig. 1). The probing depths of these teeth were observed over 10 mm. #25 was found root caries and #25=27 bridge was 2 degrees of mobility. It was recommended full mouth root planing and #17,25,27,37,48 extraction and #25,27 alveolar ridge preservation for further implant installation (Fig. 2).

After completing periodontal treatment with extraction (Fig. 3), the patient wanted minimal implant placement due to weakened overall health due to leukemia, so only #25, 26, 36, and 46 were planned to

Table 1. Patient's information

Sex	Female	Age	54 years
Chief complaint	Upper both molar feel pain when I bite		
Present illness	#17, 27, 37, 48 : per (+), mob 2-3°, PD > 10mm, BOP (+) #25 : Root caries, per (+) Generalized calculus deposition		
PMH	Leukemia (Completed in December last year)	PDH	Full mouth periodontal treatment (2013.06)

be placed in the posterior teeth. Before maxillary implant installation, CBCT radiograph was necessary due to the sinus septum at the apex of the #26 tooth on panoramic radiograph, but the patient was reluctant to take radiography because of her radiographic therapy history for leukemia. The surgery was planned to be performed after recovering her overall health, and it was emphasized that a CBCT scan was essential after the surgery.

Despite sufficient explanation, the patient was afraid of the lateral approach, and the remaining available bone at the #26 implantation site was more than 5 mm, so implant installation was planned



Fig. 1. Panoramic radiograph of the patient at initial diagnosis.

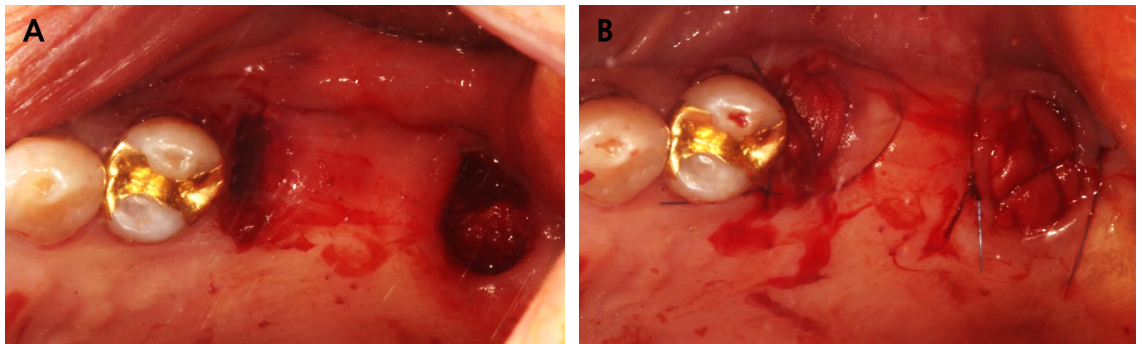


Fig. 2. Clinical photographs of alveolar ridge preservation for implant installation after #25,27 extraction. (A) Pre-operation, (B) Post-operation.



Fig. 3. Panoramic radiographs after periodontal treatment and #36i, 46i implant installation.

using the sinus crestal approach (Fig. 4). Under local anesthesia with 2% lidocaine containing 1:100,000 epinephrine (Huons, Seongnam, Korea), An implant of 4.5 mm diameter and 8.0 mm length (Superline®; Dentium. Suwon, Korea) was placed at the upper left 2nd premolar site, and the implant stability quotient (ISQ) was 77. The $\Phi 5.5 \times 5.0$ mm healing abutment was placed.

After implant installation at #25, #26 was carried out using a sinus crestal kit (SCA kit®; Neobiotech, Seoul, Korea) with hydraulic elevation. After drilling 6 mm, the septum was carefully separated from the schneiderian membrane using a reamer with augmentation of 0.25 g of deproteinized bovine bone mineral (DBBM; Bio-Oss®, Geistlich, Wolhusen, Switzerland). An implant of 5.0 mm diameter and 8.0

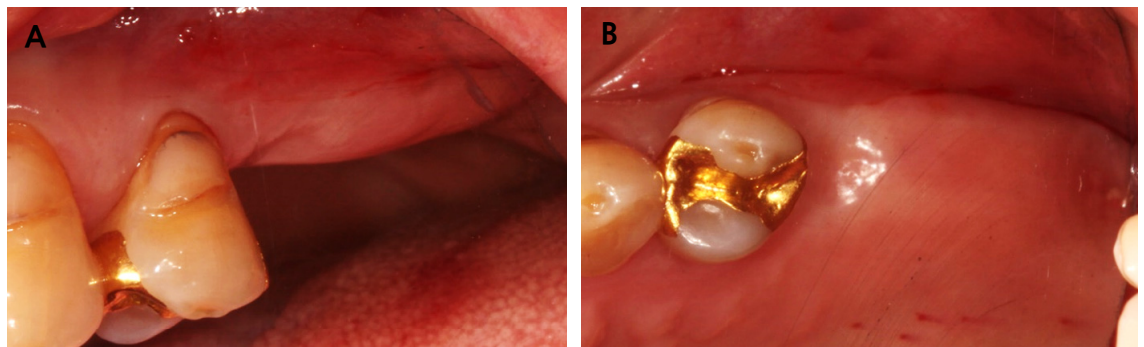


Fig. 4. Clinical photographs before surgery. (A) Buccal aspect, (B) Occlusal aspect.

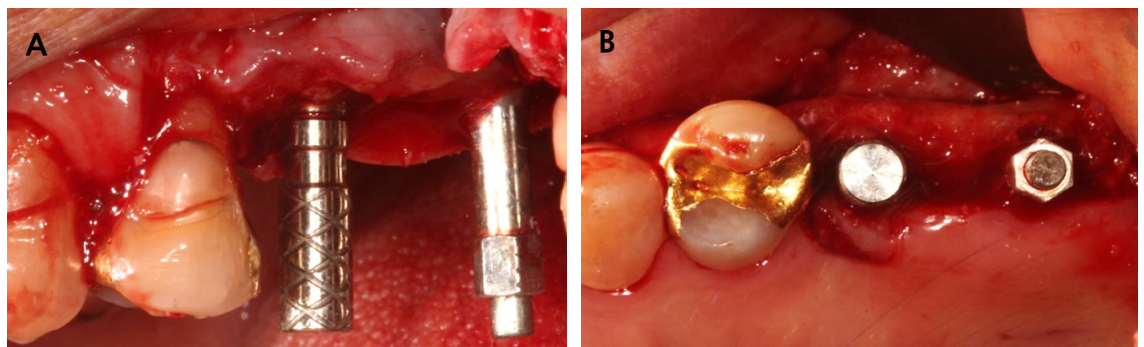


Fig. 5. Clinical photographs of implant installation. (A) Buccal aspect, (B) Occlusal aspect.

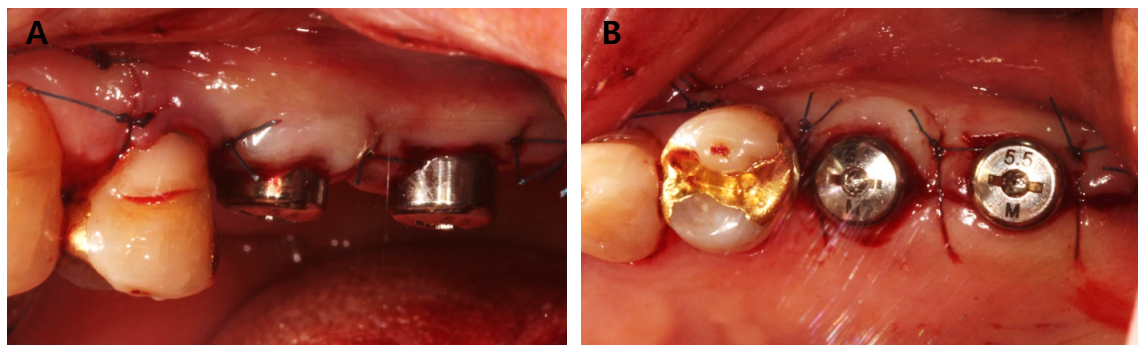


Fig. 6. Clinical photographs of suturing. (A) Buccal aspect, (B) Occlusal aspect.

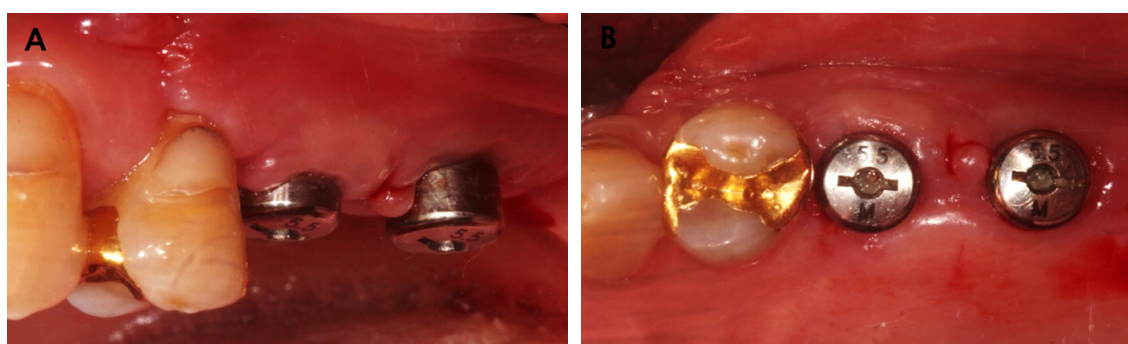


Fig. 7. Clinical photograph of stitch-out. (A) Buccal aspect, (B) Occlusal aspect.



Fig. 8. Panoramic radiograph after surgery.

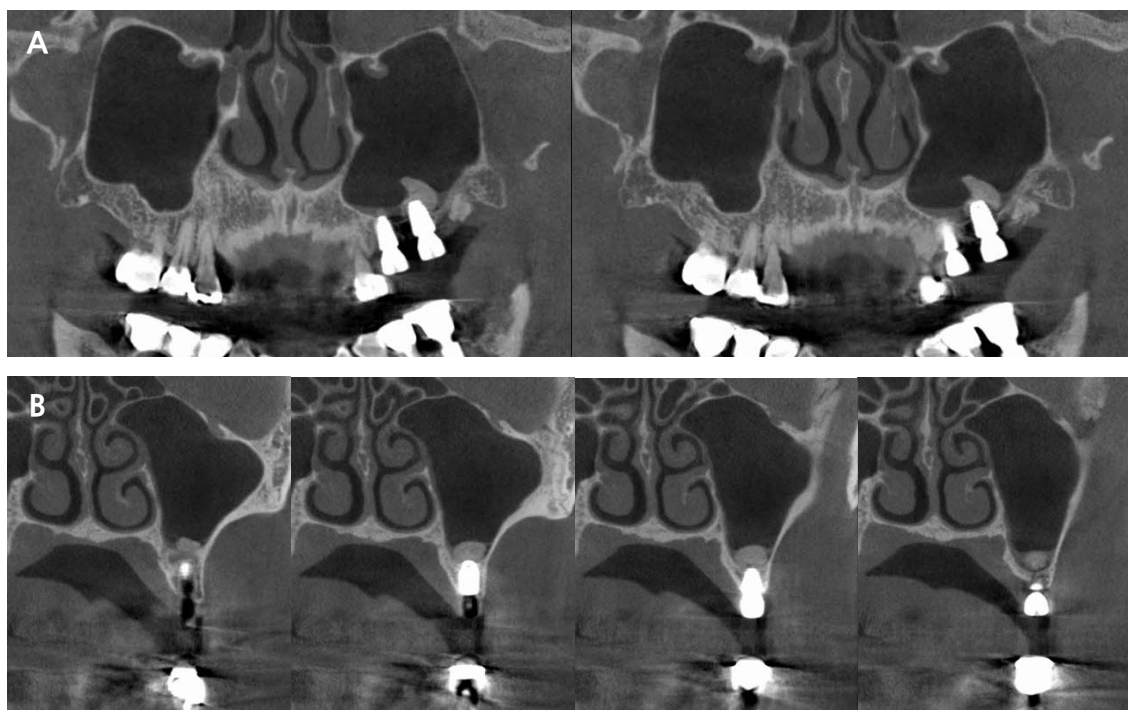


Fig. 9. CBCT radiographs after surgery. (A) panoramic view, (B) Paraxial view.

mm length (Superline[®]; Dentium) was placed and the initial fixation values were good at ISQ 69, so a healing abutment $\Phi 5.5 \times 5.0$ mm was installed (Fig. 5). For primary intention closure of the inter-implant mucosa, the Palacci technique⁷ was sutured with 4-0 non-resorbable silk (Supramid[®]; Assut Medical Sarl, Pully-Lausanne, Switzerland) (Fig. 6). When the sutures were removed after 2 weeks, interproximal gingiva was healed without any unfavorable signs (Fig. 7).

It showed stability on the post-operative panoramic radiograph (Fig. 8) and the graft material is located on the left and right sides of the implant based on the septa on the post-operative CBCT radiograph (Fig. 9). After 6 months, the final prosthesis was completed (Fig. 10) and augmented bone was also stable at CBCT radiograph (Fig. 11).

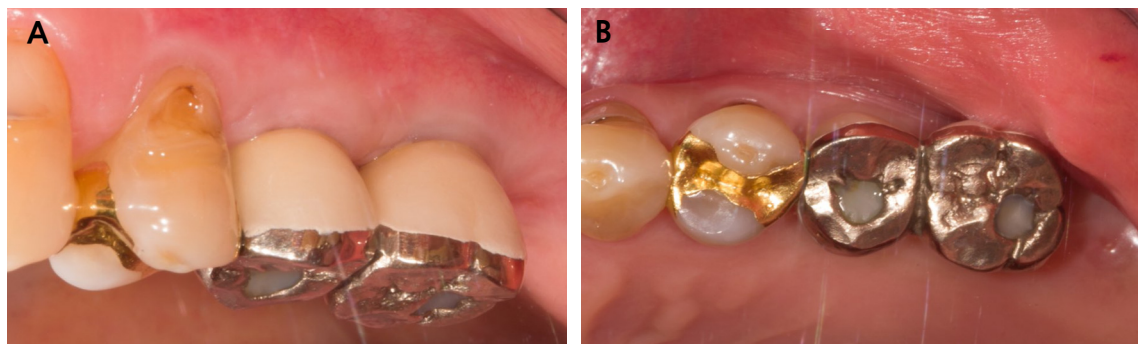


Fig. 10. Clinical photographs of crown delivery after 6 months. (A) buccal aspect, (B) Occlusal aspect.

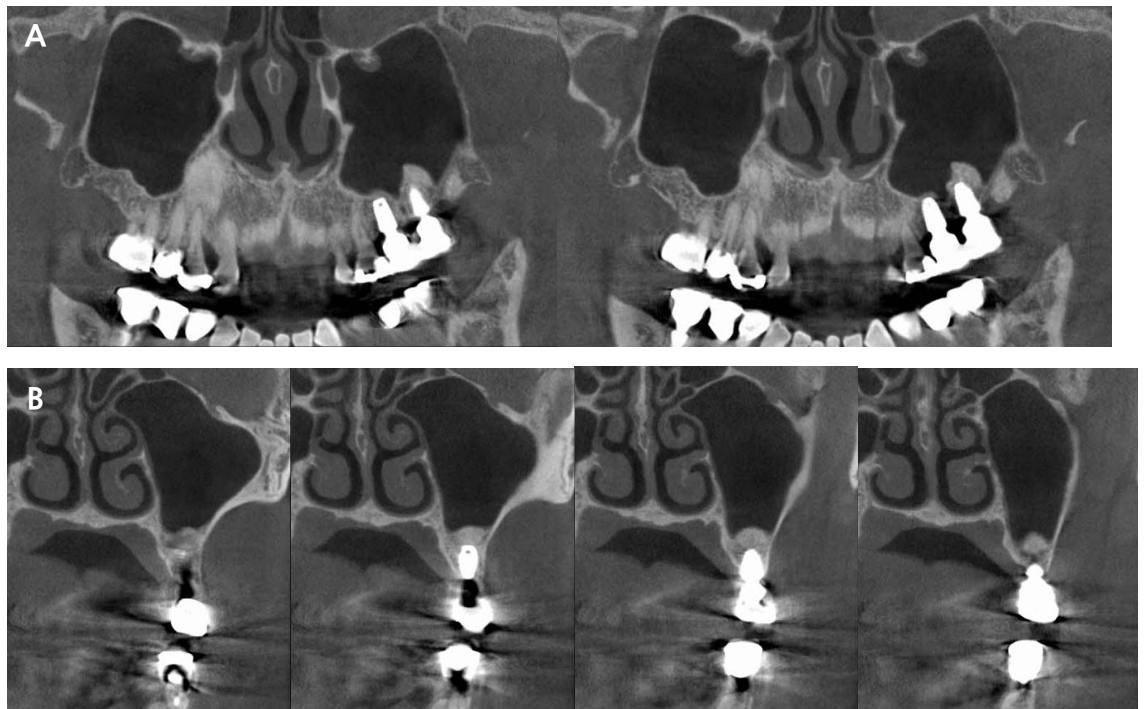


Fig. 11. CBCT radiographs of crown delivery after 6 months. (A) panoramic view, (B) Paraxial view.



Fig. 12. Panoramic radiographs after 7 years.

At 7 years follow-up, the implant showed stable alveolar bone without any signs of peri-implantitis but decreased volume of augmented bone (Fig. 12). However, implants showed favorable conditions at the gingival margin and alveolar bone, without bleeding on probing.

III. Discussion

The average length of the septum is 7.9 mm, and in the edentulous area, it occurs about 70% in the anterior part between the second premolar and the first molar.⁸ When classified by the running direction of the septum, bucco-palatal was the most common at 87.6%, mesio-distal at 11.1%, and horizontal at 1.3%.⁹

The crestal approach has a high possibility of perforating the maxillary sinus membrane because of the limit of the sight.¹⁰ The possibility increases, especially if septa are present. However, according to Velasquez et al.,¹¹ the sinus septa is a D1 cortical bone and has high bone density, and Ella B et al.¹² reported that excellent initial fixation could be obtained in the maxilla with low bone density when placed in the septa. Also, Angle between the septum plane and the horizontal maxillary plane is nearly right angle, so It was favorable for implant installation.¹³

In this case, a septum existed directly above the site where #26i was scheduled to be installed. When performing maxillary sinus elevation using lateral approach, the patient's morbidity and operation time were longer than crestal approach, so patients with poor overall health condition showed resistance. There was more than 5 mm of residual bone in the #26 area, and considering the patient's overall health, the crestal approach was performed. It was reported that the SCA kit was less perforated and more vertically elevated than the osteotome.¹⁴ The SCA kit was able to easily separate the membrane on both sides from the septum after drilling along the vertical axis of the septum. The patient recovered without

any significant discomfort or pain after the surgery and is currently using the prosthesis without any discomfort even 7 years after the prosthesis was completed. After 7 years, augmented bone was appeared decrease of volume in the panoramic radiograph. It could be seen as a limitation that the graft material seems to be disappeared, but Riachi et al.¹⁵ was reported that the particle size of used xenograft was small, large amount of calcium release due to dissolution of material in water make high volumetric loss after sinus augmentation.

Because panoramic radiographs cannot clearly detect septa,¹⁶ preoperative tomography (CBCT) is essential, but the patient was unable to take any CBCT before implant surgery due to the fear because of her systemic problems. Fortunately, the implant was placed in the septum as planned, and a CBCT radiograph taken 6 months after prosthesis confirmed that the graft material and implant were well maintained, with stable results at 7 years follow-up.

IV. Conclusion

In patients with insufficient vertical bone due to maxillary sinus pneumatization, more precise surgical techniques are required during implant installation. Implant installation at a sinus septum using the sinus crestal approach had advantages of initial fixation and less pain for patients. It requires accurate analysis through pre- and post-operative CBCT, but if it is difficult to plan CBCT according to the patient's health status or preferences, a cautious approach with a panoramic view might be an alternative.

References

1. Maestre-Ferrín L, Galán-Gil S, Rubio-Serrano M, Peñarrocha-Diago M, Peñarrocha-Oltra D. Maxillary sinus septa: a systematic review. *Med Oral Patol Oral Cir Bucal* 2010;15:e383-6.
2. Krennmair G, Ulm CW, Lugmayr H, Solar P. The incidence, location, and height of maxillary sinus septa in the edentulous and dentate maxilla. *J Oral Maxillofac Surg* 1999;57:667-71.
3. Ulm CW, Solar P, Krennmair G, Matejka M, Watzek G. Incidence and suggested surgical management of septa in sinus-lift procedures. *Int J Oral Maxillofac Implants* 1995;10:462-5.
4. Kim MJ, Jung UW, Kim CS, Kim KD, Choi SH, Kim CK, et al. Maxillary sinus septa: prevalence, height, location, and morphology. A reformatted computed tomography scan analysis. *J Periodontol* 2006;77:903-8.
5. Geurs NC, Wang IC, Shulman LB, Jeffcoat MK. Retrospective radiographic analysis of sinus graft and implant placement procedures from the Academy of Osseointegration Consensus Conference on Sinus Grafts. *Int J Periodontics Restorative Dent* 2001;21:517-23.
6. Smiler DG. The sinus lift graft: basic technique and variations. *Pract Periodontics Aesthet Dent*

- 199;9:885-93.
7. Palacci P, Nowzari H. Soft tissue enhancement around dental implants. *Periodontol 2000* 2008;47: 113-32.
 8. Bornstein MM, Seiffert C, Maestre-Ferrín L, Fodich I, Jacobs R, Buser D, et al. An analysis of frequency, morphology, and locations of maxillary sinus septa using cone beam computed tomography. *Int J Oral Maxillofac Implants* 2016;31:280-7.
 9. Yang HM, Kyong Bae HE, Won SY, Hu KS, Song WC, Paik DJ, et al. The buccofacial wall of maxillary sinus: an anatomical consideration for sinus augmentation. *Clin Implant Dent Relat Res* 2009;1:e2-6.
 10. Zitzmann NU, Schärer P. Sinus elevation procedures in the resorbed posterior maxilla: Comparison of the crestal and lateral approaches. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998; 85:8-17.
 11. Velásquez-Plata D, Hovey LR, Peach CC, Alder ME. Maxillary sinus septa: a 3-dimensional computerized tomographic scan analysis. *Int J Oral Maxillofac Implants* 2002;17:854-60.
 12. Ella B, Noble RDC, Lauverjat Y, Sédarat C, Zwetyenga N, Siberchicot F, et al. Septa within the sinus: effect on elevation of the sinus floor. *Br J Oral Maxillofac Surg* 2008;46:464-7.
 13. Dragan E, Odri GA, Melian G, Haba D, Olszewski R. Three-dimensional evaluation of maxillary sinus septa for implant placement. *Med Sci Monit* 2017;23:1394-400.
 14. Gargallo-Albiol J, Tattan M, Sinjab KH, Chan HL, Wang HL. Schneiderian membrane perforation via transcresal sinus floor elevation: a randomized ex vivo study with endoscopic validation. *Clin Oral Implants Res* 2019;30:11-19.
 15. Riachi F, Naaman N, Tabarani C, Aboelsaad N, Aboushelib MN, Berberi A, et al. Influence of material properties on rate of resorption of two bone graft materials after sinus lift using radiographic assessment. *Int J Dent* 2012;2012:737262.
 16. Kasabah S, Slezák R, Simunek A, Krug J, Lecaro MC. Evaluation of the accuracy of panoramic radiograph in the definition of maxillary sinus septa. *Acta Medica (Hradec Kralove)* 2002;45: 173-5.