Accidental Migration of a Dental Implant into the Ethmoid Sinus following a Transalveolar Sinus Elevation Procedure

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ABSTRACT

Background: Migration of a dental implant into the paranasal sinuses may be the result of sinus membrane perforation, loss of osseointegration, and lack of initial stability. The majority of displaced implants migrate into the maxillary sinus, which may cause sinusitis.

Purpose: The purpose of this study is to report an extremely rare ethmoid sinus migration of a dental implant after crestal approach in a resorbed posterior maxilla.

Materials and Methods: A 60-year old Korean male with a noncontributory medical history was referred from a local clinic to remove the migrated dental implant in the right ethmoid sinus. The patient had symptoms of mild sinusitis. The implant had been placed 6 months earlier through the bone-added transalveolar approach in a severely resorbed maxilla.

Results: The displaced implant was removed through the intraoral approach. A lateral window was made and an endoscopic surgery was performed to remove the implant. Healing was uneventful, and sinusitis symptom had ceased.

Conclusion: The crestal approach for severely resorbed posterior maxillae should be performed when there is a potential for primary stability. If bone quality is poor and initial stability cannot be achieved, lateral window sinus elevation procedure is a better option for successful implant placement. Migrated implant may be removed with antrostomy and endoscopic surgery.

KEY WORDS: crestal sinus elevation, endoscope, ethmoid sinus, implant, migration, osteotome

INTRODUCTION

Osseointegrated implant therapy for partial or complete edentulous patients has become a standard procedure and is regarded as one of the most sought-after advancements in the dental field. In particular, in a severely resorbed maxilla, bone graft procedures and sinus floor elevation make it possible to place implants and implant-supported prostheses. During the last 3 decades, sinus floor elevation through the lateral window technique and crestal (osteotome) approach has become predictable procedures for resorbed maxillae.[1–3] Recently, several surgical methods have been developed to elevate the sinus membrane through the crestal approach in order to minimize surgical trauma and facilitate the procedure. However, these methods are not free of complications, for example, undetected membrane perforation, inadequate elevation of the membrane resulting in limitations in the length of the implant, benign paroxysmal positional vertigo, and implant migration into the sinus.[1,4]

There are several reports of implant migration into the maxillary sinus;[5–17] however, there is only one

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reported case of migration of a dental implant into the ethmoid sinus.[18] This manuscript presents another case for this rare complication. The patient has been described in a way that identification is not possible directly or through identifiers, and therefore, Institutional Review Board (IRB) of Seoul Asan Medical Center exempted this manuscript for IRB approval.

CASE DESCRIPTION AND RESULTS

A 60-year-old Korean male with a noncontributory medical history was referred from a local clinic to Seoul Asan Medical Center to remove a migrated dental implant in March 2010. In the initial examination, no purulent discharge from the oral or nasal cavities was detected; however, the patient did complain of symptoms of chronic sinusitis such as nasal congestion and mild headache. Of note, the patient reported a history of smoking (20 cigarettes per day) and alcohol consumption (three times per week).

Initially, the patient had been fully edentulous for 10 years and underwent implant surgery in the anterior maxilla. The patient reported that several implants were placed and then removed because of mobility, and therefore, he was wearing a partial denture (Figure 1).

In September 2009, the patient presented to a local clinic with a resorbed maxillary ridge (less than 3 mm of residual bone on the right side) and bilateral pneumatized maxillary sinuses. The original treatment plan was bilateral sinus elevations via the lateral window technique and bone grafting. However, after completion of the left sinus elevation, the patient complained of fatigue and discomfort, and therefore, the clinician opted to perform the osteotome technique on the right side in an effort to shorten procedure length. Eight implants were simultaneously placed in the edentulous maxillary ridge. In the area of the right posterior maxilla, two implants measuring 4×8 mm were placed. The bone quality was reported to be D4[19] and soft by the local dentist. The patient then presented for suture removal the following week and was subsequently lost to follow-up. The patient then presented to the clinic after 6 months with symptoms of mild sinusitis. In the panoramic radiograph, one implant was noted to be displaced in the ethmoid sinus adjacent to the orbit (Figure 2). At this point, the patient was referred to Asan Medical Center where anteroposterior skull radiograph and computed tomography (CT) scan were taken to verify the exact location of the implant (Figures 3–5). Coronal views of the CT scan demonstrated a narrow ostium, deemed too small to drain a wide diameter implant to the nasal cavity. The thin bone between the maxillary sinus and ethmoid sinus was eroded because of chronic inflammation. Potential pathways of migration of the dental implant are marked with curved arrows (Figure 4).

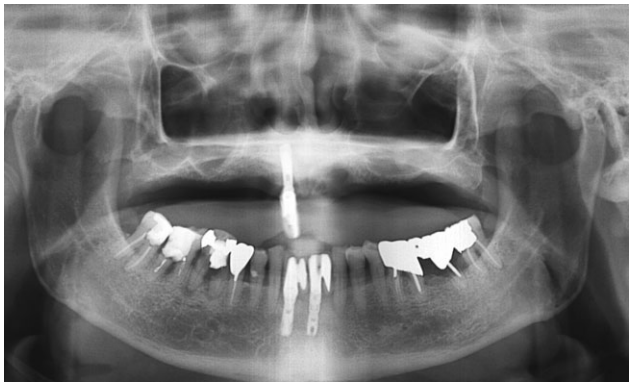

Figure 1 Panoramic radiograph of initial consultation at a local clinic in September 2009. One implant remains in the anterior maxilla. Notice the severely resorbed maxilla and sinus pneumatization.

Figure 2 Panoramic radiograph 6 months after implant placement and sinus elevation procedures. One implant is displaced into the ethmoid sinus on medial side of the orbit.

Surgical Procedure for Implant Removal

Two implants, located in the posterior maxilla (#2 area) and ethmoid sinus, were planned for removal because of bone loss and migration. The patient declined general anesthesia and endoscopic sinus surgery through the nasal cavity. The operation was performed under conscious sedation using intravenous Midazolam (5 mg; Dormicum, Roche, Switzerland) and a local injection of lidocaine (2%; 1:100,000 epinephrine, Yuhan Pharm,

Figure 3 Skull anteroposterior radiograph demonstrating a displaced dental implant in the right ethmoid sinus.

Seoul, Korea). A horizontal crestal incision, as well as two vertical incisions at the canine and second molar area, was made. The implant located at the distal side of the right maxilla (#2) was removed with Kelly forceps (Aesculap Inc., Center Valley, PA, USA) without resistance. A lateral window (15×10 mm) was made with the carbide round burand the window was out-fractured. The Schneiderian membrane attached to the lateral window was removed with the electrosurgical

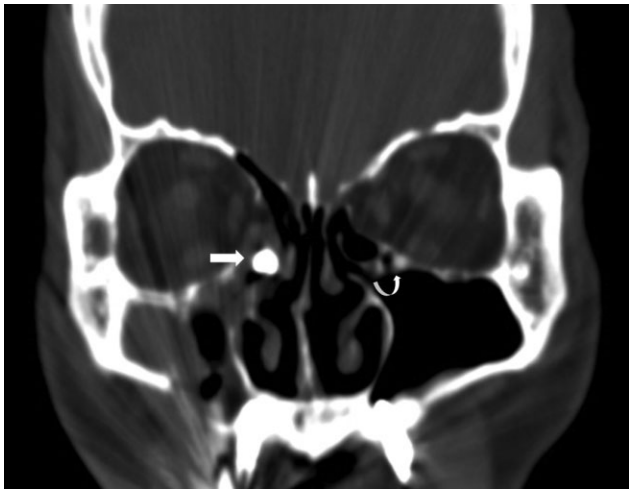

Figure 4 Coronal section of computed tomographic scan of the displaced implant into the ethmoid sinus. Mucosal thickening of the left maxillary sinus is observed (bold arrow shows displaced implant; curved arrow shows suggested migration pathway of the implant from ostium to the ethmoid sinus on the contralateral side).

Figure 5 Axial section of computed tomographic scan of the displaced implant into the ethmoid sinus. No ethmoid sinusitis is observed (bold arrow shows displaced implant).

unit (Bovie, Martin, Germany). An endoscopic camera with a 30-degree angle was inserted into the sinus cavity to visualize the migrated implant. Thickening of the sinus mucosa was noted without any pus collection within the sinus. The thin bone between the maxillary sinus and ethmoid sinus was eroded. The displaced implant was found embedded in the ethmoid sinus mucosa. Curved forceps were used to remove the implant from the ethmoid sinus. No other treatment was performed in the maxillary sinus. The flap was sutured with 4-0 Vicryl (Ethicon Inc., Somerville, NJ, USA). Sutures were removed in 10 days, and the healing process was uneventful (Figure 6). The patient was referred to the local clinic, and a final fixed prosthesis was delivered. The patient elected to defer treatment of the right side of the posterior maxilla.

DISCUSSION

Key factors for successful implant placement and decreased risk of implant migration are proper case

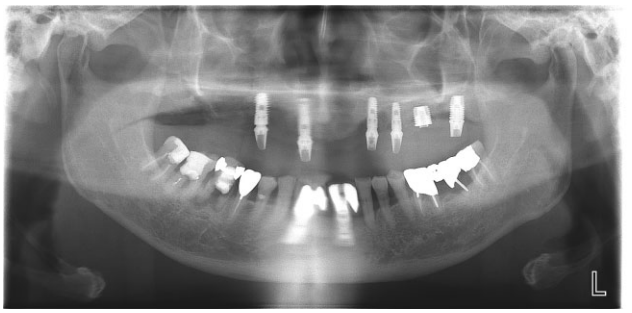

Figure 6 Postoperative panoramic radiograph showing two implants removed from the ethmoid sinus and posterior maxilla.

selection and treatment planning, utilizing the sinus elevation procedure accompanied by bone grafting and ensuring primary stability prior to osseointegration of the implant. Most cases of implant migration into the paranasal sinuses have been reported to be because of a lack of primary stability, as well as inexperienced surgeon, severe sinus pneumatization with thin residual alveolar bone, perforation of sinus membrane during the surgery, temporary denture usage without relief, overdrilling, or inappropriate application of force while removing nonintegrated implants.[12,14,20,21] Other possible etiologies include autoimmune reaction, suboptimal distribution of occlusal forces, and changes in the intrasinus and nasal pressures which may produce a suction effect, thereby gravitating the implant into the sinus. Implant displacement into the maxillary sinus has been reported in previous studies;[4–16] however, implant displacement into ethmoid sinus is an extremely rare complication. Most implant displacements are detected while the implant is still in the maxillary sinus. However, if the displacement is asymptomatic and remains undetected, the implant can migrate into osteum or ethmoid sinus. One explanation for this migration may be the ciliary movement of the columnar epithelium of the Schneiderian membrane in an effort to drain the maxillary sinus.

Sinus elevation is a predictable method for the placement of dental implants in the posterior maxilla in cases where bone deficiency is found. In general, there are two techniques for sinus elevation: the lateral window approach and the osteotome technique.[22,23] Many clinicians prefer the osteotome technique for sinus elevation as it is less traumatic and considered safer than the lateral window approach.[8] However, this technique is not free of complications either (e.g., Schneiderian membrane perforation, postoperative infection, postoperative hemorrhage, and nasal bleeding).[4]

There are three different techniques to approach a displaced implant within the sinus: Caldwell-Luc technique, endoscopic removal, and a combination of the two as was used in this case. Endoscopic approach has advantages such as better visualization, smaller incision, less morbidity, lower risk of infraorbital nerve damage, and the ability to complete the procedure with local anesthesia.[17] It is important to note that this approach has disadvantages as well, including the need for special training and equipment, and limitations in the size of objects that can be retrieved.[17]

CONCLUSION

An increasing number of cases reporting implant displacement into the paranasal sinuses have been documented, and this complication should be taken into consideration prior to delivering implant therapy. Migration of the dental implant into the ethmoid sinus is an extremely rare complication, which in this case was successfully treated with a combination of the conventional antrostomy and endoscopic surgical removal.

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