BJCR
Brazilian Journal of Case Reports

PCAA
Publicações Científicas de Acesso Aberto

Case Report

Osseointegration of a displaced dental implant in the maxillary sinus: a 7-year follow-up case report

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Abstract: Foreign bodies into the maxillary sinus are rarely mentioned in literature. Many of them might be asymptomatic and an inadequate planning of the case or an unskilled professional can easily lead a dental implant into the maxillary sinus in a poor bone situation. We aim to present and discuss what is to our knowledge the first case and the management of a dental implant that has osseointegrated inside the maxillary sinus after its displacement. A patient had a dental implant placed immediately after upper molar extraction, but at the end of the procedure it was displaced into the sinus during healing cap adaptation. Images exams done after 1 day, 24 months, 36, and 84 months demonstrated a healthy maxillary sinus with the implant osseointegrated at the same site since its migration, surrounded and filled by mature bone. Due to an asymptomatic patient the removal of the implant is not planned until now.

Keywords: Dental implants; Osseointegration; Maxillary sinus; Accidental displacement.

Citation: Azenha MR, Watanabe PCA, Errázuriz SP, Jardim LF, Sório ALR. Osseointegration of a displaced dental implant in the maxillary sinus: a 7-year follow-up case report. Brazilian Journal of Case Reports. 2025 Jan-Dec;05(1):bjcr3.

https://doi.org/10.52600/2763-583X.bjcr.2025.5.1.bjcr3

Received: 23 October 2023
Accepted: 10 June 2024
Published: 24 June 2024

1. Introduction

Teeth and an adequate planning are essential to reach a successful treatment. After tooth loss the alveolar bone starts to reabsorb, and it may cause difficulties to install an adequate implant concerning its position and primary stability. The maxillary posterior region might present a poor bone quality (type IV bone), higher bone resorption compared to other regions, thin cortical bone, and maxillary sinus pneumatization leading to a more difficult implant surgery procedure and sometimes the necessity of additional techniques to acquire ideal conditions and primary implant stability1. If there is insufficient stability during the implantation or no osseointegration after a few weeks during prosthesis rehabilitation the implant can accidentally be displaced into the maxillary sinus [1].

The literature has shown that most of displaced implant cases to maxillary sinus are asymptomatic and depend on each patient, but complications like sinusitis, facial pain, and nasal obstruction can be expected and should be treated following the characteristics of each case [2]. There are few reports of displaced implant into the sphenoid and the ethmoid sinus with the majority of the displacements occurring into the maxillary sinus with surgical foreign body removal recommended3. To the best of our knowledge, there are no previously reported cases of a dental implant that has osseointegrated inside the maxillary sinus after its accidental displacement. We aim to demonstrated and discuss this rare situation.

2. Case Report

A 32-year-old health woman was referred to our university after upper left first molar fracture with an extensive coronary fracture. Clinical and radiographic exams revealed a longitudinal fracture separating the palatal root from the rest of the tooth and the indication of tooth extraction. A bone height of 7 mm from the cervical of the tooth to the beginning of the maxillary sinus membrane was observed using a panoramic radiography and the surgical planning was to install an external hex implant of 10 mm of length and 3.5 mm of diameter in the center of the alveolus immediately after tooth removal (Figure 1).

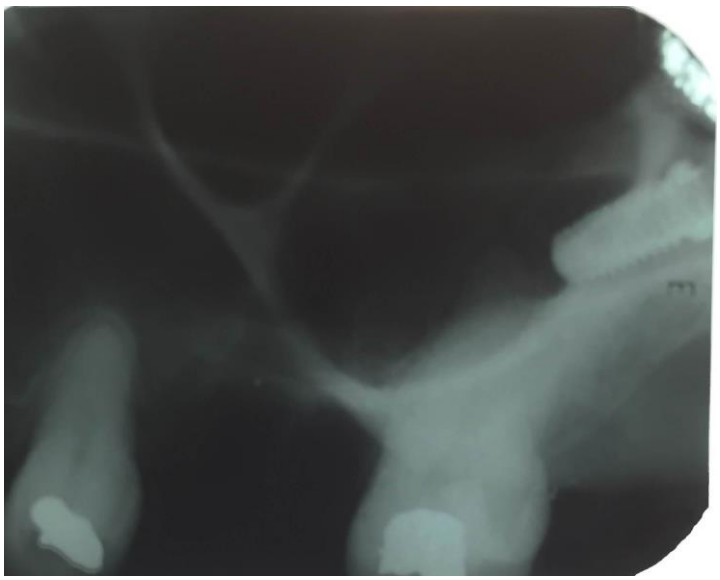
Figure 1. Initial panoramic radiography used to plan upper left first molar extraction.

The tooth was uneventfully removed, and the septum bone prepared 7 mm in length to receive the implant at 04/18/2016 (Figure 2A and 2B). At the end of implant installation, it was displaced into the maxillary sinus due to student´s lack of experience and poor bone´s quality in the region. After several attempts to remove it from alveolar socket (Figure 2c) and due to patient´s anxiety condition it was left inside the cavity as seen in the periapical radiography (Figure 3). Patient was medicated with antibiotics, analgesics, and nasal decongestant and oriented to sneexe with the mouth open, no to drink soda beverages and alcohol, to maint soft diet for the first 5 days and to avoid hot food for the first 48 hours after the surgery. One day after the surgery the patient was evaluated and a computed tomographic (CT) was done demonstrating the exactly position of the implant in the posterior region of the maxillary sinus surrounded by blood clot (Figures 4A and 4B).

The patient decided not to do the surgery and didn´t return to our clinic until 06/25/2018 when we did a new TC exam that revealed the implant was surrounded by bone suggesting it was osseointegrated (Figures 5A and 5B). Maxillary sinus was healthy with no signs of infection. Patient was again evaluated after 36 months of the surgery and a panoramic radiography confirmed the same findings as previous TC exams (Figure 6). The last TC exam was done in 04/12/2023 (7 years after the surgery) and it was conclusive to demonstrate the dental implant is osseointegrated and located at the same position as in the first TC surrounded and filled by mature bone with no evidence of local infection neither any complain from the patient (Figures 7A to 7C). The excellent images of the 3D TC were vital to our conclusion. This must be the first and only reported case of a dental implant totally osseointegrated inside the maxillary sinus surrounded and filled by bone with no sign of sinus infection. Patient still under control every year and was instructed to seek assistance when needed.

Figure 2. A. Upper left first molar extracted. B. Implant preparation in the center of the alveolous. C. After implant displacement the alveolar bone was removed attempting to recover the implant. Unsuccessful maneuver.

Figure 3. Immediate radiography after implant displacement.



3. Discussion and conclusion

With the increased number of professionals doing implant surgeries, it is expected a higher number of accidents and cases reporting dental implant displacement into the maxillary sinus during the surgical procedure or even postoperatively at functional loading phase [3,4]. Only during the year of 2019 were installed 2,7 million dental implants only in Brazil which makes it the country that most produces and performs this type of treatment. Another important fact is that about 25% of dental offices in the country perform treatments with implants, demonstrating that some implant placement may be performed by inexperienced professionals. Statistics provided by the American Academy of Implant Dentistry revealed that until 2018 close to 3 million people have received an implant in the U.S. and when combined, U.S. and E.U. market for dental implants is expected to be valued at more than $4 billion [5, 6].

The posterior region of the maxilla may present the thinner and the poorest bone in mouth and one should be aware of an important anatomical site during the planning and especially during the surgical procedure: the maxillary sinus. It is a pyramid-shaped cavity lined with mucoperiosteum-containing cilia of approximately 1.0-mm thick and known as Schneiderian membrane [7]. After teeth loses and with no implant rehabilitation the ridge under the maxillary sinus starts a physiological process of resorption and the majority of the patients will present a sinus with moderate to intense pneumatization which may impair dental implant installation.

Figure 4. A. Immediate computer tomography (coronal view) showing implant located inside the left maxillary sinus. B. Immediate computer tomography (sagittal view) showing implant located inside the left maxillary sinus.

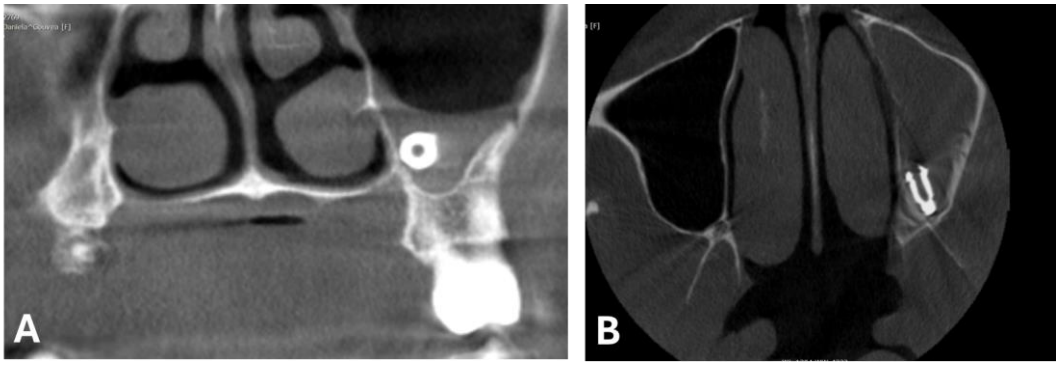


Figure 5. A. Computed tomographic image 24 months after implant´s displacement. B. Computed tomographic image (coronal view) 24 months after implant´s displacement. Implant is completely surrounded by bone and osseintegrated.

This situation may pose some difficulties during implant surgery installation leading to its displacement into facial sinus cavities. Sgaramella et al. [4] studied 29 cases of displaced implants into maxillary sinus and observed that different factors can lead to this situation, like inadequate surgical planning, professional experience and its knowledge of anatomical sites, and improper surgical procedures like overperfuration of the bone with consequent sinus membrane perforation, and lack of sensibility during implant positioning. It seems that all of these criteria were neglected in our case, culminating with implant dislocation into the maxillary sinus. Maybe the best sequence of treatment in our case should have been tooth extraction with a provisional crown installation and await around 2 months to new bone formation. Then, the dental implant placing or if necessary, a maxillary sinus graft procedure to create a new bone structure to stabilize the implant and to prevent its migration.

Some studies have shown different modalities to remove the implants from maxillary sinus. Chiapasco et al. [8] studied 27 patients who have had complications related to implant migration into the maxillary sinus and were treated by functional endoscopic sinus surgery, intraoral approach, or a combination of both procedures demonstrating reliable results using these techniques. An et al. [9] suggests implants displaced to the maxillary sinus should be removed immediately but ponders that if patient's condition is not favourable or the dentist presentes few technical experiences maxillary sinusitis should be controlled before the new surgical procedure.

Our protocol to treat displaced implant cases is always to remove the foreign body as soon as possible avoiding late complications like sinusites, headache, bad smell, facial pain, and postnasal drip, as described by previous authors [6]. The maxillary sinus is a cavity, and the mean length is 27.96 mm, width is 19.57 mm, and height is 25.33 mm and due to its size and anatomy the CT is the most appropriate exam to exactly define the

location of a lost implant [7,10]. As described before, patient didn´t agree to remove the implant after its displacement and CT exam and was discharged with antibiotics and nasal decongestantes. Respecting her decision, we kept her under surveillance and for our surprise the 24-month follow-up CT exam revealed an asymptomatic patient with no signs of sinusites and an interesting image suggesting the implant had osseointegrated inside the maxillary sinus. Similar results were observed after 36 and 84-months follow-up image exams.

Figure 6. Panoramic view 36 months after implant displacement. No signs of sinus infection and implant still osseointegrated.

Figure 7. A. Implant completely surrounded and filled by bone and no signs of infection 7 years after its displacement. B. 3D CT reconstruction of the implant that is covered by bone inside the maxillary sinus. C. Bone surrounding the implant that is located inside the maxillary sinus.

The biological principles of osseointegration have already been described and is defined as the direct and structural connection between living and structured bone, and the surface of an implant subjected to a functional load. A dental implant for osseointegration needs to be and remains stable for at least a few weeks [11]. What might have occurred in this case is that when the implant was displaced into maxillary sinus it may have become stuck and stabilized in the bone tissue of the posterior region of the maxillary sinus and the formation of a clot occurred and helped to maintain the implant at the same position. After a few days, there was healing in the region of the rupture of the membrane and the replacement of the clot by new bone tissue in contact with the implant. This is a rare and unique case of a dental implant that has osseointegrated inside the maxillary sinus and

still without symptoms after 7 years of its displacement. The real challenge of this case is to be aware of any sign of sinus inflammation and be ready to remove the implant if indicated, being surgical planning essential to minimize the risks of this complication.

Funding: None.

Research Ethics Committee Approval: We declare that the patient approved the study by signing an informed consent form and the study followed the ethical guidelines established by the Declaration of Helsinki.

Acknowledgments: None.

Conflicts of Interest: None.

Supplementary Materials: None.

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