A Case of Simultaneous Sinus Augmentation and Oroantral Fistula Closure for Implant Preparation

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An oroantral communication may form in the upper molar region after tooth extraction. The patient is a 59-year-old female, who is a nonsmoker. At the initial visit, teeth #14, #15, and #17 were missing. After tooth #16 was extracted due to apical periodontitis, a bone defect with a diameter of approximately 4 mm was observed, leading to the formation of an oroantral fistula (OAF). Another window was created in the lateral wall adjacent to the superior part of the bone defect at the fistula site to achieve closure of the OAF through bone formation and simultaneously perform sinus floor elevation (lateral approach) for implant placement. Through this lateral window, instruments were inserted into the maxillary sinus towards the bone defect at the fistula site. During this process, the remaining bone between the lateral window and the bone defect at the fistula site was carefully removed with instruments, connecting the two bone defects to facilitate manipulation of the instruments. The Schneiderian membrane was elevated without enlarging the tear. Six months after these surgeries, a cone beam computerized tomography (CBCT) scan confirmed the closure of the fistula with hard tissue and the elevation of the sinus floor. Subsequently, three implants were placed, and prosthetic treatment was completed. Follow-up data is provided, including periapical X-ray and CBCT images taken 2 years and 3 months after surgery (1 year and 3 months after the placement of the final prosthetic structure). The progress so far has been favorable.

Key Words: oroantral fistula (OAF), oroantral communication (OAC), sinus augmentation, lateral approach, bone defect closure, implant placement, Schneiderian membrane, bone grafting, PRF, PRP, maxillary sinus

Introduction

An oroantral fistula (OAF) can form after the extraction of maxillary molars.[1]

Various surgical methods for closing such fistulas have been reported. Among them, closure with soft tissue has been commonly performed. On the other hand, closure techniques using autogenous bone grafts, artificial bone grafts, and various membranes have also been reported.[2]

When implant placement is planned for the fistula site, it appears that the fistula is first closed using the methods above, followed by sinus floor elevation surgery at a later date or simultaneously.[3]

In this case report, we achieved 2 objectives simultaneously: closure of the fistula through solid bone healing and elevation of the sinus floor for implant placement by creating a lateral window at a position different from the fistula site. Specifically, we accessed the maxillary sinus through this separate window, carefully detached the Schneiderian membrane around the fistula site from the sinus floor, and filled the area with artificial bone.

Later, 3 implants were placed, and the prosthetic treatment was completed.

Case Report

The patient is a 59-year-old female, who is a nonsmoker. She was referred to our clinic in July 2021 for implant treatment in the right maxillary molar region. At the initial consultation, teeth #14, #15, and #17 were missing in the upper molar region (Figure 1). As the remaining tooth #16 exhibited occlusal pain and mobility, it was extracted.

After the extraction, an oroantral communication (OAC) developed.

Three months after the tooth extraction, the OAC did not improve and transitioned to OAF.

Fortunately, there were no symptoms of acute maxillary sinusitis or discharge from the fistula, but air leakage into the nose and nasal discomfort persisted.

Cone beam computerized tomography (CBCT) imaging revealed that the bone defect at the fistula site was approximately 4 mm in diameter, and there were no signs of inflammation, such as thickening of the Schneiderian membrane (Figure 2).

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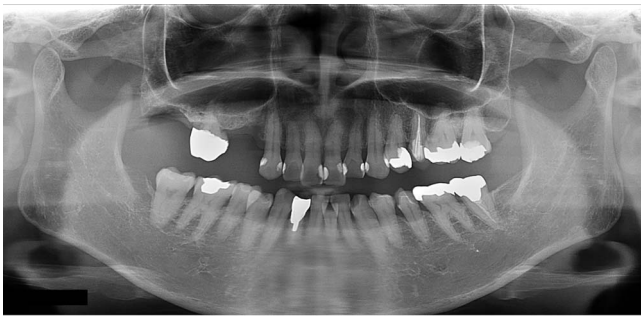

Figure 1. Panoramic radiograph before treatment.

A sinus elevation (lateral approach) was performed to close the fistula with solid bone healing and to lift the sinus floor for implant placement.

When the vestibular flap was raised from the bone, to avoid enlarging the soft tissue fistula beyond its current size, the soft tissue over the fistula was separated into the gingival-alveolar mucosa side and the maxillary sinus mucosa side, making the soft tissue on the Schneiderian membrane side thicker.

A new lateral window was created above the OAF site by piezosurgery (Silfradent, Italy) at a different position (on the upper side wall adjacent to the bone defect) from the initial bone defect site of the fistula. Initially, to prevent further enlargement of the Schneiderian membrane tear, the bone defect site of the fistula and the newly created window were intentionally not connected, making them separate openings (Figure 3a). While detaching the Schneiderian membrane, the 2 windows were gradually connected, and the membrane around the fistula site was detached (Figure 3b and c).

Platelet-rich fibrin (PRF) membrane and platelet-rich plasma (PRP) were made from the patient's preoperatively drawn blood. The PRF membrane was patched over the perforation site of the maxillary sinus mucosa.[4,5] Then, a bone graft material comprising a 50:50 mixture of low-crystalline carbonate apatite granules (Cytrans Granules, GC, Japan)[6] and FDBA[7] (OraGraft, Mineralized Cort/Can Mix, LifeNet Health, USA) combined with PRP was filled in (Figure 4a).[8,9]

The window area was subsequently covered with a collagen membrane (Bio-Gide, Geistlich Pharma AG, Wolhusen, Switzerland)[10]and sutured closed (Figure 4b).

Immediately after the surgery, a periapical X ray was taken (Figure 4c).

After the sinus elevation, there was no nasal bleeding and only minimal swelling. Immediately after the surgery, there was no air leakage into the nose.

After a 6-month healing period postsurgery, bone formation was evaluated using CBCT (Figure 5).

Seven months after the sinus elevation, 3 implants (Straumann #14 BLT, D 3.3 mm L 10.0 mm, #15 BLT, D 4.1mm L 10 mm, #16 SP, D 4.1mm L 8 mm)were placed in the areas of #14, #15, and #16 (Figure 6 a and b).

Four months after the implant placement, a connected zirconia implant superstructure was fixed with 3 screws (Figures 6c, 7, and 8).

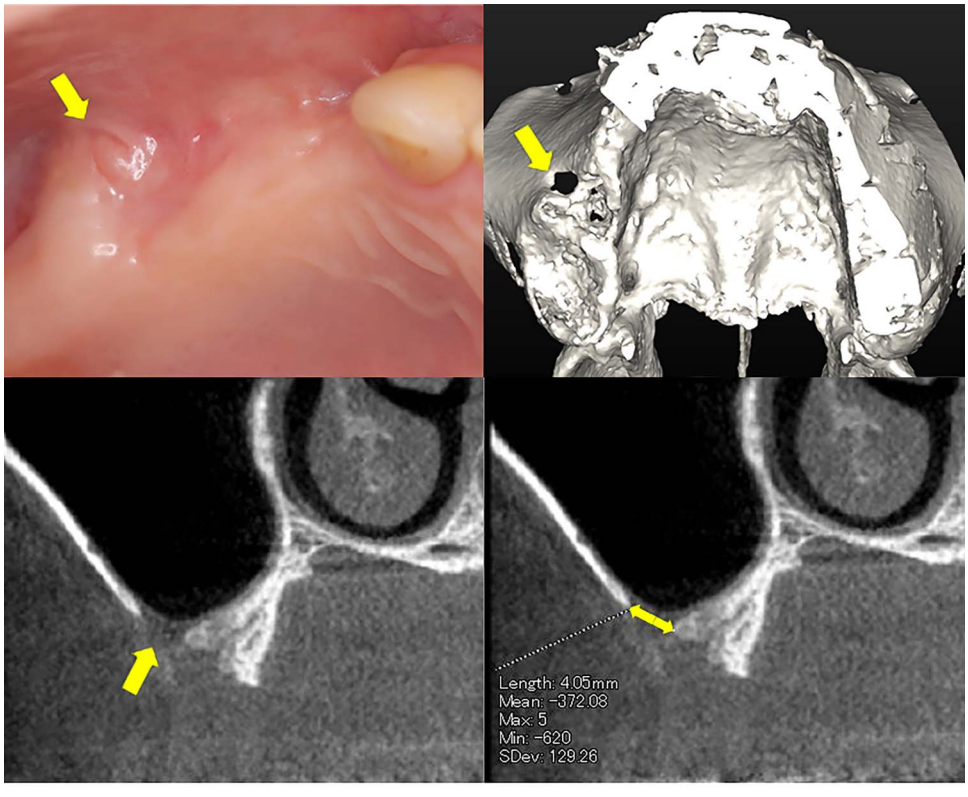

Figure 2. The arrow indicates the location of the fistula. 3D and cross-sectional images of the fistula area on CBCT. The fistula was approximately 4 mm in diameter.

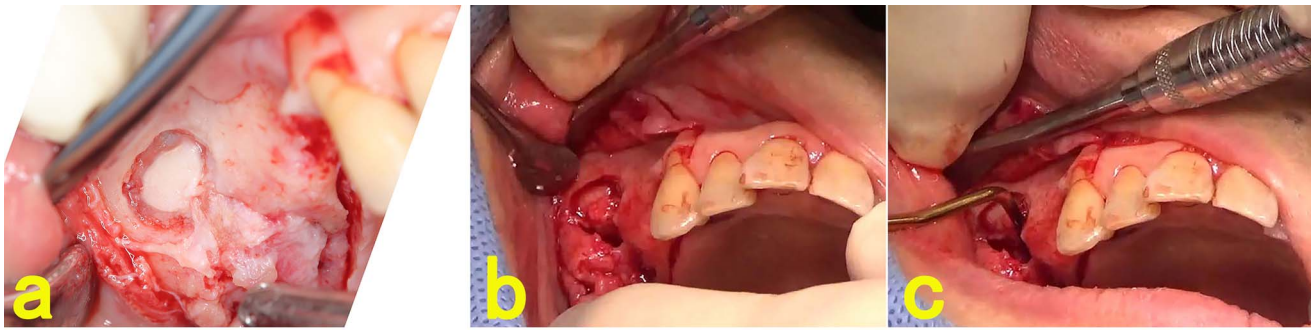

Figure 3. (a) A lateral window was created proximal and superior to the bony defect of the OAF. (b) During the stage of raising the Schneiderian membrane, the window and the bony defect of the OAF were gradually connected. (c) Connecting these two allowed for easier insertion of instruments.

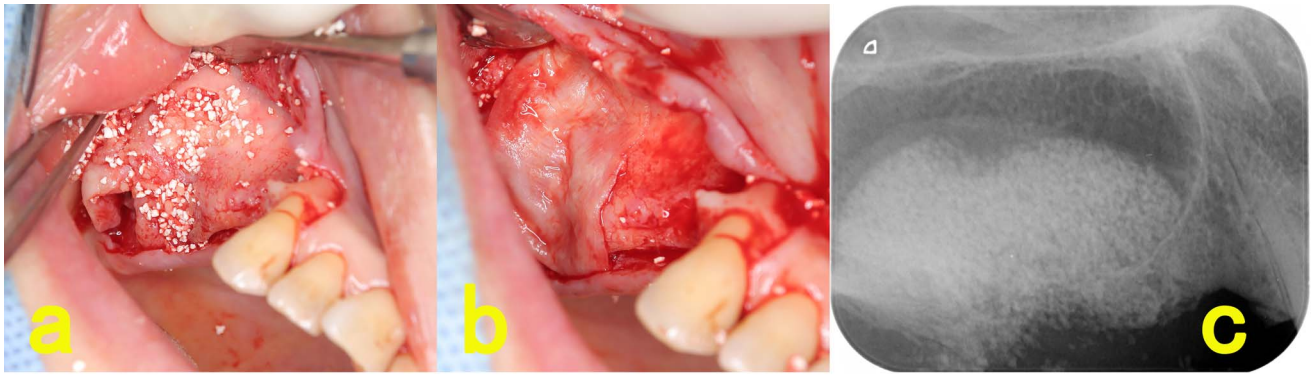

Figure 4. (a) Low-crystalline carbonate apatite granules and FDBA were mixed with PRP and filled into the maxillary sinus. (b) The 2 bone defects were covered with a collagen membrane. (c) Periapical X-ray image immediately after the surgery.

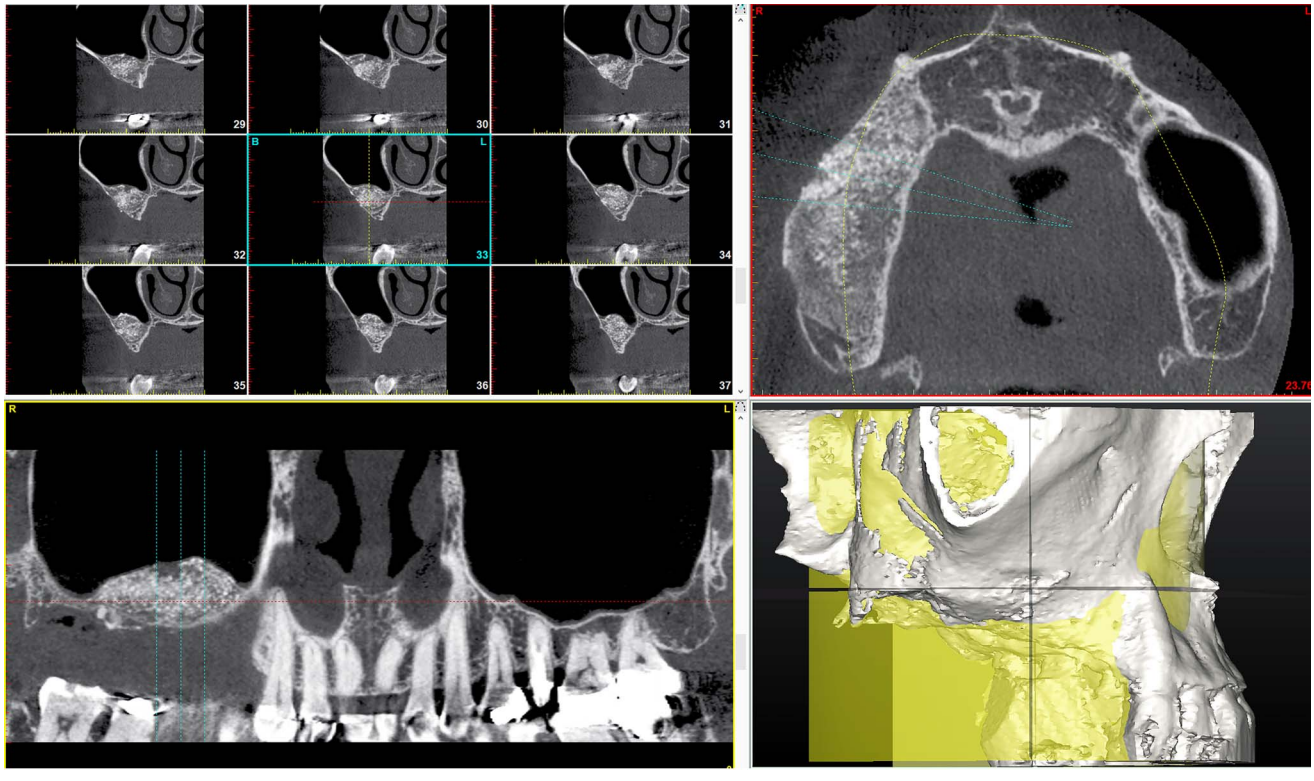

Figure 5. CBCT images 6 months post-surgery.

Figure 6. (a) Periapical X-ray image taken immediately after the placement of three implants. (b) Intraoral photograph taken at the time of implant superstructure placement. (c) A connected 3-unit zirconia superstructure designed for screw retention.

Figure 7. Oral photographs after the placement of the superstructure.

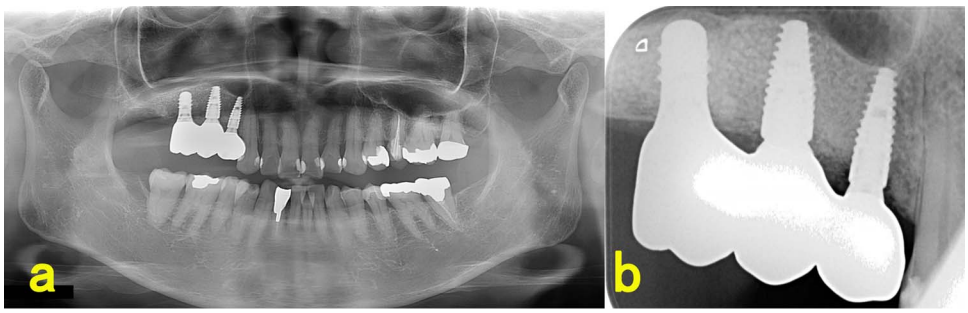

Figure 8. (a) Panoramic radiograph immediately after the placement of the superstructure. (b) Periapical X-ray image at that time.

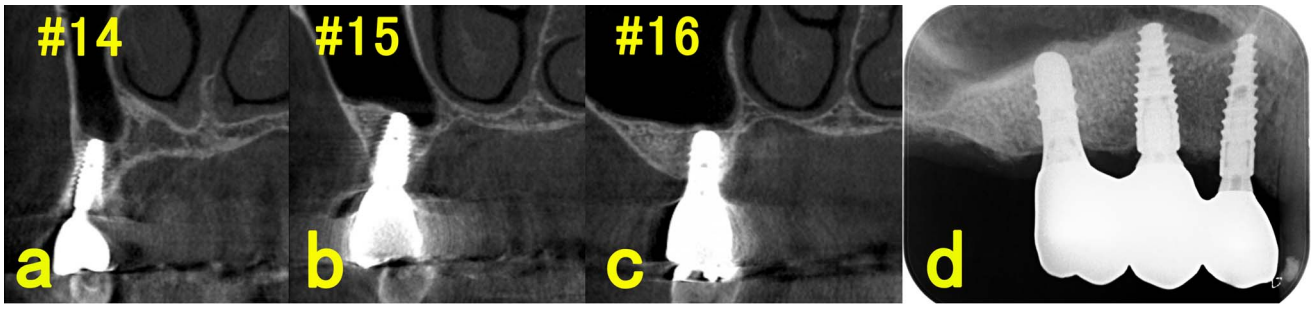

Figure 9. Two years and 3 months after sinus elevation and 1 year and 3 months after the placement of the prosthetic structure, cross-sectional CBCT images of the 3 implant sites are as follows: (a) #14 (b) #15 (c) #16. (d) Periapical X-ray image at that time.

Discussion

Many methods have been reported for the surgical closure of OAFs. When the size of the bony defect is 3 mm or more significant, appropriate surgical intervention is required to prevent sinus infection and sinusitis.[11]

Many of these reports describe techniques for fistula closure using soft tissue.[12]

In oral maxillary sinus fistula closure surgery, which is performed with the intention of implant placement, achieving 2 objectives—solid bone healing of the fistula and maxillary sinus floor elevation—in a single procedure can reduce the patient's surgical burden and shorten the treatment period.

In this case report, for closing a 4-mm diameter bone defect, we aimed to achieve the 2 objectives above in a single surgery by creating a new lateral window at a different location (above the original fistula site) and performing a sinus elevation using the lateral window technique, thereby accomplishing our goals.

There are surgical techniques reported for simultaneously closing an OAF and performing sinus elevation using the lateral window approach.[13,14]

In the report above, the OAC or OAF bone defect and the newly created lateral window were not connected. In our case, since the fistula's bone defect was relatively small at 4 mm, we decided that creating a lateral window adjacent to the upper part of the bone defect would help reduce its overall area.

We did not insert instruments for sinus elevation through the site of the original oroantral fistula bone defect because the soft tissue at the fistula site was inflamed and fragile. We determined that inserting instruments through the fistula could further enlarge the perforation in the Schneiderian membrane, posing a significant risk of increasing the fistula's size.

For this reason, a new lateral window was first created at a location adjacent to the fistula's bone defect. The 2 windows were connected while gradually detaching and elevating the Schneiderian membrane from that window towards the fistula site.

By connecting them, it became easier to insert instruments for detaching the Schneiderian membrane around the bone near the fistula from the window opening, thereby preventing further tearing of the membrane.

In this surgery, low-crystalline carbonate apatite granules, FDBA, PRF membrane, and PRP were used in the maxillary sinus.

There have been many reports on the usefulness of these materials.[15–17]

Two years and 3 months after sinus elevation and 1 year and 3 months after the placement of the prosthetic structure, CBCT and a periapical image analysis revealed bone resorption within the maxillary sinus (Figure 9).

This resorption was observed to stop at the apex of the 3 implants. There have been reports of cases where absorbable bone graft materials used in sinus elevation procedures exhibited similar resorption patterns, stopping at the apex of the implants.[18,19]

Conclusion

In the surgery for closing the OAF formed after extracting the first maxillary molar, two objectives were achieved in a single procedure: closure of the OAF with solid bone healing and sinus elevation (lateral approach) for implant placement. Seven months after the surgery, 3 implants were placed in the areas of #14, #15, and #16, and a connected superstructure was attached with 3 screw fixations.

Two years and 3 months after the sinus elevation and 1 year and 3 months after the placement of the superstructure, no symptoms of sinusitis have been observed, and the occlusion has remained stable since the superstructure was attached.

Acknowledgments

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Note

The author declares that there are no conflicts of interest related to this study.

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