SINUSCOPY IN PATIENTS WITH TITANIUM IMPLANTS IN THE NOSE AND SINUSES

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Abstract. Foreign bodies in the nose and sinuses can cause chronic infections. Long titanium fixtures through the maxilla to the zygomatic bone were followed up with a sinuscope in 14 patients after more than one year. There were no signs of infection or inflammation in the mucosa around the fixtures.

Key words: sinuscopy, titanium implant, zygoma.

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It has been known for more than 300 years that, in rare cases, suppurative sinusitis can lead to the formation of antral stones, which in turn produce chronic infections in the sinuses (4). Since the beginning of this century, radiographs have been helpful in diagnosing foreign bodies and chronic infections in the sinuses. When the sinuscope came into common use, about 25 years ago, it became easier to inspect the maxillary sinuses directly and to evaluate the condition of the antral mucosa in a way that could previously be done only by operation. Our knowledge of mucosal reactions has therefore increased and the reliability of the diagnosis of foreign bodies has improved.

In the late 1960s the osseointegration method was introduced for the treatment of total edentulism (5). A long-term follow-up study showed that 78% of the 229 osseointegrated implants in the maxilla were stable at 15 years, compared with 86% in the mandible (1). At 15 years, at least 92% of the maxilllas had continuously stable prostheses, while the figure for the mandible was 99% at 15 years. The lower survival rate for implants in the maxilla is the result of there being only small volumes of bone available below the nose and maxillary sinuses; the residual bone is often thin as a result of absorption.

To provide better support for implants in the maxilla, and to avoid iliac bone grafts, it is possible to use long fixtures through the maxilla to the zygomatic bone. The aim of this study was to assess the reactions in the nasal and maxillary mucosa with a sinuscope after implants had been placed in the maxillary cavities.

Foreign bodies in the nasal cavity

Children are more likely than adults to insert objects, such as pieces of paper, rubber, cotton, herbs, beads or stones, into their noses and then forget about them (3, 14). Careless physicians or surgeons may leave cotton sponges, tampons, and (broken) pieces of metallic instruments in the nose postoperatively. The symptoms of a foreign body are usually one-sided nasal occlusion with mucopurulent discharge and swollen nasal mucosa. After a while, the patient starts to sneeze, and develops headaches, nosebleeds, and (in some cases) fever. The treatment is to remove the foreign body at once.

Non-metallic foreign bodies in the sinuses

Usually these foreign bodies have been left by a doctor or dentist. During an operation a tampon might be left, silicone sheets are used to substitute for the orbital floor, plastic tubes are used to increase antral ventilation, drugs are instilled, and talcum powder from gloves may irritate the mucosa. A dentist may use too much filling material, leave the root of a tooth or tampons in the sinus, with or without disinfectant chemicals. The signs are similar to those in the nose: unilateral mucopurulent discharge often with an unpleasant smell caused by anaerobic bacteria, nasal occlusion, and pain in the cheek. The treatment is to remove the foreign body with a sinuscope through which you can inspect the mucosa, which looks swollen and inflamed (18, 19).
Metallic foreign bodies in the sinuses

In war it is common for shrapnel to find its way into the maxillary sinuses. In peacetime airgun or shotgun bullets are more common. The symptoms depend on the chemical composition of the metal and on the amount of dirt covering the metal surface (13).

There is usually hyperplasia of the mucosa within a month, particularly close to the foreign body. After some time, a chronic infection usually develops, but there might also be periods without symptoms. The treatment is to remove the metallic foreign body.

PATIENTS AND METHODS

Patients

This study comprises 14 consecutive patients examined between September 1992 and January 1997. The mean age at follow up was 59 years, there were two men and 12 women and the mean (SD) follow-up period after insertion of the fixture was 41 (17) months.

Grafting procedures and installed fixtures

In nine patients, bone grafts were taken from the iliac crest, while in one a tibial graft was used. The method for bone grafting and the installation of conventional fixtures was described by Bränemark in 2001 (7).

All the grafting procedures to the palate were done at the same time as the fixture was inserted into the zygoma (8). Zygomatic fixtures were inserted bilaterally in nine patients and unilaterally in one (Table I).

Rhinoscopy and sinuscopy

All the nasal cavities were thoroughly examined through an endoscope. In all but one patient, one or both maxillary sinuses were examined under local anaesthesia. The findings related to the mucosa, secretion, and fixtures were recorded on videotape.

Method

How to improve the ventilation and visualisation of the maxillary sinus in patients with titanium fixtures in the zygoma. There are two ways to reach the maxillary sinuses from the nose: through an opening lateral to the inferior turbinate in the inferior meatus or through an antrostomy in the middle meatus lateral to the middle turbinate. To be sure to get the best result, I usually use both methods.

Antrostomy in the middle meatus. This is a standard procedure known to most rhinosurgeons and presented in textbooks by Draf, Stamberger and Wigand, for example (18, 19). You can use a headlamp, endoscope, or microscope when you remove the uncinate process and the ethmoidal bulla and enlarge the natural ostium of the maxillary sinus (Fig. 1).

Antrostomy of the inferior meatus. To make sure that the opening does not close, I always remove the anterior and inferior square centimetre of the inferior turbinate with a conchotome (Fig. 2). It is now easy to see the lateral nasal wall, which is opened with the elevator knife, leaving the bone and attached mucosa as a door with a posterior hinge (Fig. 3). The door is removed with a small concha punch leaving an opening 1 cm wide into the maxillary sinus (Fig. 4).

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<thead>
<tr>
<th>Case No.</th>
<th>Sex</th>
<th>Age (years)</th>
<th>Examined (months after implants)</th>
<th>Bone grafts + fixtures</th>
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<th>Implants visible in the nose</th>
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n = implants not covered, c = implants covered with mucosa, - = no implants visible, ? = not examined, 0 = no implants.


Table I. Presentation of the examined patients with titanium implants in the nose and sinus
A silicone or Portex tube of suitable length is inserted into the sinus and anchored with a suture through the anterior part of the nasal septum (Fig. 5).

To improve nasal breathing during healing, another tube can be placed on top of the first. This breathing tube extends to the nasopharynx. After a week the tubes are taken away. It is now easy to inspect the zygomatic...
fixtures in the maxillary sinus with an endoscope (Fig. 6).

RESULTS

In four patients, five implants were visible in the nasal floor, four of which were uncovered and one was covered with mucosa, with no signs of infection or inflammation (Table I, Fig. 7).

Sinuscopy was done in 23 of 28 possible sinuses; no fixtures were installed in four sinuses and one patient experienced pain during the sinuscopy, despite sufficient local anaesthesia. Nine of the fixtures through the maxillary sinuses were not covered by mucosa, eight were covered, and in six sinuses no fixtures were visible. When the examination was made there were no signs of infection or inflammation around the fixtures (Figs. 8–10). There was no increased secretion.

Case 11 had had frequent sinusitis before the implants were inserted and was therefore operated on and given a new endonasal opening in the inferior meatus on both sides.

Case reports

Case 1. A man born in 1933, who had implants inserted in September 1991, and a prosthesis in April 1992, was examined in March 1995.

In the right maxillary sinus, a fixture in the lower
lateral part was not covered by mucosa. The mucosa was normal in the two regions where the implant entered the bone and the osteum was open.

In the left maxillary sinus, a fixture could be seen in the lateral part of the cavity. In the central part it rested against normal mucosa but was otherwise not covered by the mucosa other than in the proximal and distal parts, where it was anchored in the bone. The mucosa in the cavity was normal (Fig. 11).

Case 2. A woman born in 1945, who had implants inserted in June 1993, and a prosthesis in March 1994, was examined in March 1995.

The right maxillary sinus was small, probably as a result of previous infections. The mucosa was normal. No fixture could be seen.

In the left maxillary sinus, a fixture in the distal part was covered with mucosa, while in the central part it was not covered. The surrounding mucosa was thin and the osteum was open (Fig. 12).

Case 3. A woman born in 1933, who had implants inserted in October 1990, and a prosthesis in June 1992, was examined in March 1995.

The right maxillary sinus was not examined as no fixtures had been inserted.

In the left maxillary sinus, a fixture was visible for 1.5 cm in one lower lateral part. It was covered with mucosa without any signs of inflammation (Fig. 13).

Case 4. A woman born in 1936, who had implants inserted in June 1991, and a prosthesis in March 1992, was examined in March 1995.

In the right nasal floor, there was a fixture, covered with normal mucosa.

In the left nasal floor, there was a fixture covered with a small crust. The mucosa around the fixture was normal.


In the right maxillary sinus, no fixture could be seen. In the left maxillary sinus, there was a fixture in the lower lateral part with thin mucosa covering the distal part. The mucosa in the cavity was normal (Fig. 14).

In the right maxillary sinus, there was a fixture almost 2 cm long in the lower lateral part of the cavity. It was covered with mucosa, with the exception of a few mm

Fig. 10. Case 1. The implant is not covered when it exits the left side of the palate.

Fig. 11. Position of the fixture in case 1.

Fig. 12. Position of the fixture in case 2.

Fig. 13. Position of the fixture in case 3.

Fig. 14. Position of the fixture in case 4.

Fig. 15. Position of the fixture in case 5.
in the proximal part where it was uncovered. The mucosa looked normal (Fig. 15).

Case 6. A woman born in 1925, who had implants inserted in September 1987, and a prosthesis in June 1988, was examined in September 1992.

In the right maxillary sinus, two fixtures were visible in the floor, one about 2 mm long and covered with normal mucosa, the other about 5 mm long, with the proximal part covered with normal mucosa.

In the left nasal floor, there was a fixture partly covered with a crust. The mucosa was normal (Fig. 16).

Case 7. A woman born in 1920, who had implants inserted in September 1990, and a prosthesis in May 1991, was examined in September 1992.

In the right maxillary sinus, a fixture could be seen as a shadow under normal mucosa in the lower medial part of the cavity (Fig. 17).

Case 8. A woman born in 1929, who had implants inserted in May 1993, and a prosthesis in February 1994, was examined in January 1997.

The mucosa in the floor of the nose was normal.

In the right maxillary sinus, the zygomatic fixture was covered with normal mucosa.

In the left maxillary sinus, no fixture was seen and the mucosa was normal (Fig. 18).

Case 9. A woman born in 1931, who had implants inserted in February 1994, and a prosthesis in October 1994, was examined in January 1997.

In the right maxillary sinus, four or five threads of the fixture were not covered proximally by normal mucosa. The distal part was covered with normal mucosa (Fig. 19).

Case 10. A woman born in 1940, who had implants inserted in February 1992, and a prosthesis in October 1992, was examined in January 1997.

In the right maxillary sinus, the fixture was uncovered proximally for 1 cm, while the surrounding mucosa was normal.

In the left maxillary sinus, the fixture was partly covered with normal mucosa for 1 cm (Fig. 20).

Case 11. A woman born in 1938, who had implants inserted in September 1991 and a prosthesis in May 1992, was examined in January 1997.

In the right maxillary sinus, the fixture was completely covered with normal mucosa for a distance of 1 cm.

In the left maxillary sinus, the fixture was completely covered with normal mucosa for more than 1 cm (Fig. 21).


In the right maxillary sinus, the fixture was covered with normal mucosa.

In the left maxillary sinus, the central part of the
fixture was uncovered. The proximal part and distal parts were covered with normal mucosa (Fig. 22).

Case 13. A woman born in 1948 who had implants inserted in May 1989, and a prosthesis in March 1990 was examined in September 1992.

In the left nasal floor, a fixture was visible, with no inflammatory reaction in the adjacent mucosa. There was no abnormal secretion (Fig. 23).


In the left nasal floor, a fixture with a few mm covered with normal mucosa was visible. There was no increase in secretion.

No implants were visible in the maxillary sinuses (Fig. 24).

DISCUSSION

It has long been known that foreign bodies such as tampons in the nose or the sinuses may cause inflammatory reactions and infections (14). Reactions to metals depend on the composition and quality of the metal (13).

The invention of zygomatic fixtures made it interesting to find out how the mucosa of the maxillary sinus reacted to the titanium implants, as they transverse the maxillary sinus on their way from the palate to the zygoma (6, 8).

These results show that there were no signs of inflammatory reactions in the surrounding mucosa when the nose and maxillary sinuses were examined with an endoscope. The titanium implants were covered with mucosa in some cases, while in others they were partly covered, but even in those cases the mucosa looked normal. There were no signs of infection around the implants or increased secretion.

It is possible to assess the condition of the nasal and maxillary sinus mucosa with the eye through an endoscope and confirm the findings with video recordings or by biopsying the mucosa to look for inflammatory cells. No biopsy specimens were taken, so that we did not create an inflammatory reaction in the biopsy area.

The soft tissues in the oral cavity adhere tightly to the titanium and create a barrier to inflammatory processes (2).

It has been assumed that the mucous membrane of the paranasal sinuses is normally sterile. An infection of the sinuses is therefore usually preceded by a nasal infection and is caused by direct propagation through the ostia (11).

Over the past few years it has been noted that there is considerable production of nitric oxide in normal maxillary sinuses (15).

Different studies have shown that nitric oxide with a concentration found in the sinuses has high antimicrobial activity against a remarkably wide range of pathogenic micro-organisms, including viruses, bacteria, and fungi (9, 10, 12, 16, 17). The nitric oxide produced in the maxillary sinuses may therefore be another important explanation of why no infections are found around titanium implants.

It is, however, possible that a patient with a zygomatic implant may contract an upper respiratory tract infection, which might close the maxillary ostium, resulting in sinusitis. When a patient with zygomatic implants contracts sinusitis, which might be chronic, it is important to restore the ventilation to the sinuses surgically.

In conclusion, there seems to be no increased risk of inflammatory reactions in the normal nasal and maxillary mucosa in regions where titanium implants pass through the mucosa.

REFERENCES

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