

Clinical study of six patients with foreign bodies into maxillary sinus

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Abstract

Six patients with iatrogenic and non-iatrogenic foreign bodies in the maxillary sinus are presented. Four patients had iatrogenic foreign bodies, including a dental implant, a maxillary wisdom tooth, a maxillary wisdom tooth root and a dental root canal filler. The other two patients with non-iatrogenic foreign bodies fractured an interdental brush while cleaning their teeth and it entered the maxillary sinus. For surgical extraction of foreign bodies, the intra-oral and trans-nasal approaches were performed in 5 patients and 1 patient, respectively. A total of 130 Japanese patients with foreign bodies in the maxillary sinus from 1981 to 2015 were reviewed. The rate of iatrogenic and non-iatrogenic cases were 97.7%, and 2.3% respectively. With regard to dental foreign bodies, all of the reported patients had a tooth root in the maxillary sinus, and our patients with

displacement of an entire tooth (including the crown and root) in the maxillary sinus was rare. It is necessary for dentists to perform detailed preoperative evaluation and careful extraction of maxillary wisdom teeth. There were 3 patients with broken interdental brush in the maxillary sinus. The common point of those 3 patients and our 2 patients was that relatively new interdental brushes were used, and been inserted into the periodontal pocket, which is an incorrect cleaning method. It is important for dentists and dental hygienists to provide instructions on the appropriate method of cleaning the teeth with interdental brush in order to prevent fracture and entry of the broken brush into the maxillary sinus.

Key words: foreign body, maxillary sinus, iatrogenic, non-iatrogenic.

Introduction

Many patients with foreign bodies in the maxillary sinus have been reported in Japan,¹⁻¹⁹ and these foreign bodies are generally classified as iatrogenic and non-iatrogenic.^{4,13,14} We have recently managed six patients with iatrogenic and non-iatrogenic foreign bodies in the maxillary sinus at our hospital. Among them, we managed two non-iatrogenic patients with an

interdental brush in the maxillary sinus. We document these six patients and also review previous Japanese reports, and discussed non-iatrogenic patients with interdental brushes in the maxillary sinus.

Case report

Case1

Patient: 30-year-old female

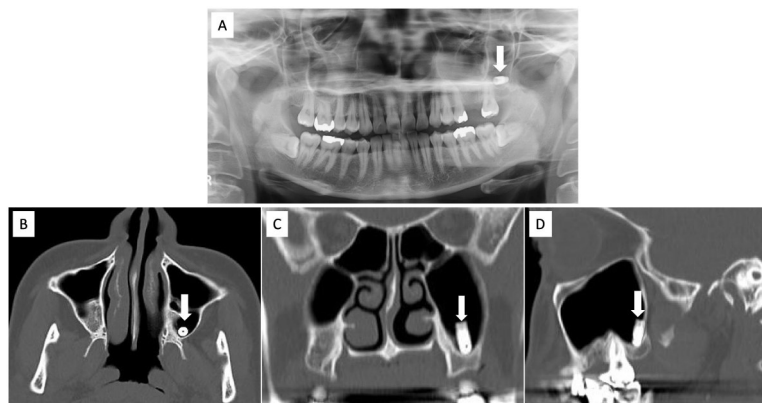


Fig. 1 Imaging findings at the first consultation in case 1
 A : Panoramic X-ray (arrow : dental implant).
 B, C, D : Computed tomography (arrow : dental implant).

Chief complaint : Insertion of a dental implant into maxillary sinus.

Clinical history : In February 2016, the patient underwent insertion of a dental implant to replace the left first maxillary molar at a dental clinic. However, the dentist noticed that the implant had entered the left maxillary sinus and the patient was referred to our hospital on the same day.

Imaging findings : The panoramic X-ray film and CT scans obtained image at the first consultation revealed a dental implant-like structure in the left maxillary sinus posterior to the second maxillary molar (Fig. 1 A-D).

Clinical diagnosis : Displacement of a dental implant into the left maxillary sinus.

Surgical procedure : Sixteen days after the first consultation, extraction of the implant from the maxillary sinus was performed via the intra-oral approach under general anesthesia.

After a mucosal flap was elevated, a bone window was created in anterior wall of the left maxillary sinus (Fig. 2 A, B). Then the dental implant was extracted from the sinus through the window (Fig. 2 C, D) and the bone window and mucosal flap were replaced.

Case2

Patient : 36-year-old male

Chief complaint : Wisdom tooth in the maxillary sinus.

Clinical history : In March 2016, the patient underwent extraction of a left maxillary wisdom tooth at a dental clinic. However, the tooth became displaced into the left maxillary sinus and the patient was referred to our hospital on the same day.

Imaging findings : The panoramic X-ray and CT scans obtained at the first consultation revealed a tooth-like object located above the second maxillary molar in the maxillary sinus

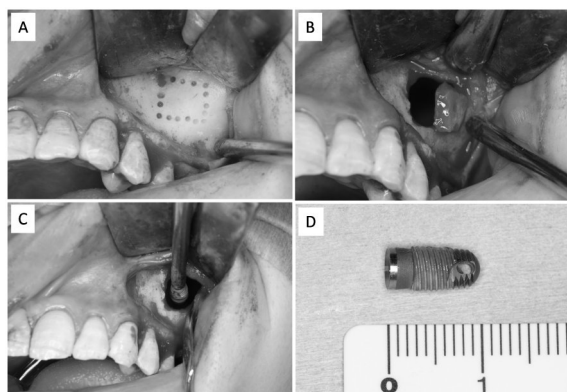


Fig. 2 Operative findings in case 1
 A : Osteotomy of the anterior maxillary wall.
 B : Bone window under a flap of maxillary sinus mucosa.
 C : Extraction of the dental implant from the maxillary sinus.
 D : The extracted dental implant.

(Fig. 3 A-D).

Clinical diagnosis : Displacement of a maxillary wisdom tooth into the left maxillary sinus.

Surgical procedure : Twenty-one days after the first consultation, extraction of the wisdom tooth from the maxillary sinus was performed via the intra-oral approach under the general anesthesia.

The tooth was removed from the maxillary sinus by the same procedure as used for Case 1 (Fig. 4 A, B).

Case3

Patient : 44-year-old male

Chief complaint : Abnormal sensation of the left side of the face.

Clinical history : This patient underwent the extraction of a left maxillary wisdom tooth at a dental clinic in August, 2016. The patient developed fever (temperature >38°C) and an abnormal sensation of the left side of the face on the 30th day after tooth extraction and consulted a

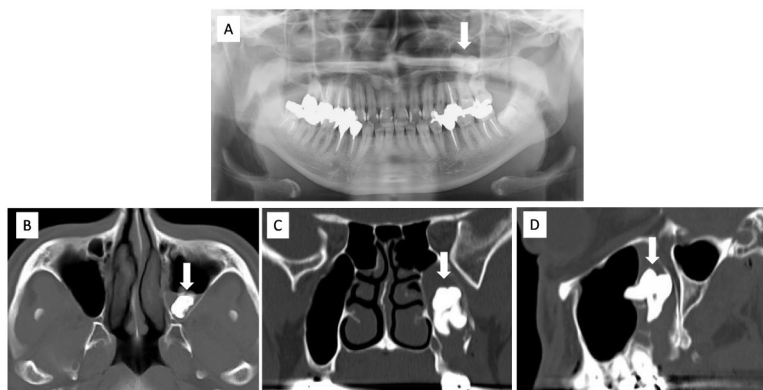


Fig. 3 Imaging findings at the first consultation in case 2
 A : Panoramic X-ray (arrow : wisdom tooth).
 B, C, D : Computed tomography (arrow : wisdom tooth).

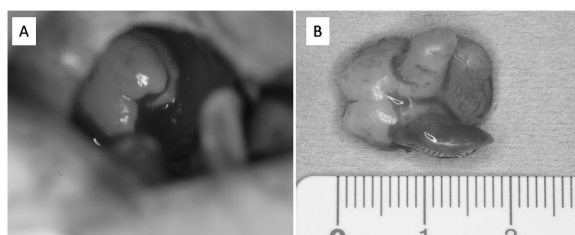


Fig. 4 Operative findings in case 2
 A : The wisdom tooth in the maxillary sinus.
 B : The extracted wisdom tooth.

first consultation, extraction of the tooth root from the maxillary sinus was performed via the intra-oral approach under general anesthesia by the same procedure as that employed for Case 1 (Fig. 6).

Case4

Patient : 42-year-old male

Chief complaint : Abnormal sensation of the right maxillary first molar region.

Clinical history : In February 2014, while this patient was cleaning between the first maxillary molar and second premolar area on the right side

nearby otolaryngology clinic. The otorhinologist detected a foreign body (suspected tooth root) in the left maxillary sinus. He consulted our hospital on the 40th day after extraction of the wisdom tooth.

Imaging findings : According to the panoramic X-ray film and CT scans obtained at the first consultation, there was a tooth root-like object located above the second maxillary molar in the left maxillary sinus (Fig. 5 A-D).

Clinical diagnosis : Displacement of a wisdom tooth root into the left maxillary sinus.

Surgical procedure : On the 58th day after the

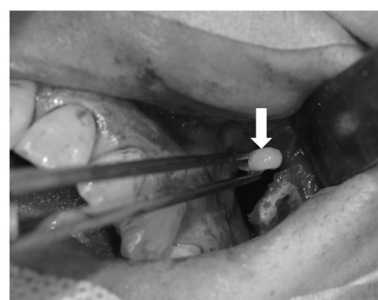


Fig. 6 Operative findings in case 3
 The extracted wisdom tooth root (arrow : wisdom tooth root).

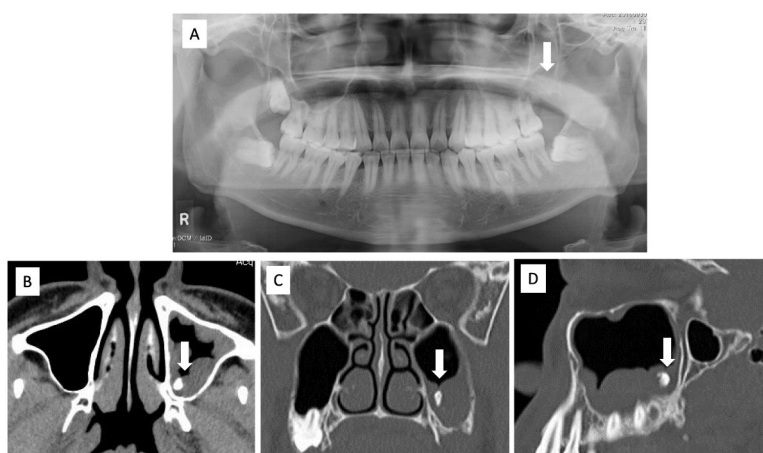


Fig. 5 Imaging findings at the first consultation in case 3
 A : Panoramic X-ray (arrow : wisdom tooth root).
 B, C, D : Computed tomography (arrow : wisdom tooth root).

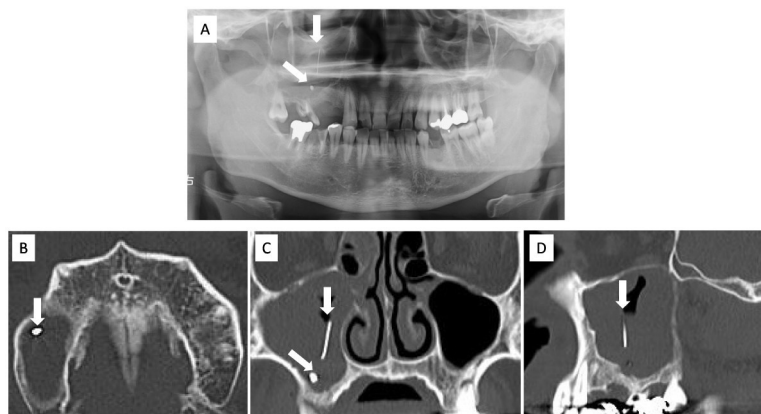


Fig. 7 Imaging findings at the first consultation in case 4
 A : Panoramic X-ray (arrow : foreign bodies).
 B, C, D : Computed tomography (arrow : foreign bodies).

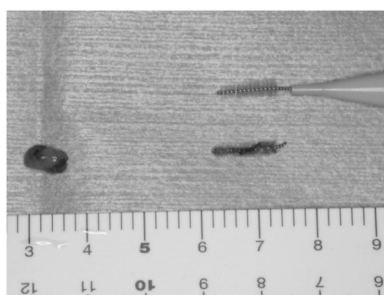


Fig. 8 Operative findings in case 4
 The extracted foreign bodies were an interdental brush and granulation tissue.

with interdental brush, he lost the brush inside his oral cavity. He noted an abnormal sensation of the right maxillary first molar area on the 7th day after loss of the brush and he consulted a nearby dental clinic. The dentist detected a foreign body (suspected to be the missing interdental brush) in patient's right maxillary sinus by X-ray examination. This patient consulted our hospital on the 9th day after loss of the interdental brush.

Imaging findings : According to the panoramic X-ray film and CT scans obtained at the first consultation, the patient had maxillary sinusitis on the right side, with a metal foreign body and a particulate mass being seen in the sinus (Fig. 7 A-D).

Clinical diagnosis : Right maxillary sinusitis and accidental insertion of an interdental brush into the maxillary sinus.

Surgical procedure : Extraction of the two foreign bodies from the maxillary sinus was performed via the intra-oral approach under general anesthesia on the 22th day after the first consultation using the same surgical procedure as that employed for Case 1.

The extracted objects were an interdental

brush and particulate granulation tissue (Fig. 8). The granulation tissue was found to be hyalinized collagen fibers by the pathological examination.

Case5

Patient : 57-year-old female

Chief complaint : Insertion of an interdental brush into maxillary sinus

Clinical history : In April 2016, while this patient was cleaning the first maxillary molar on the left side with an interdental brush, she lost the brush inside her oral cavity and she consulted a nearby dental clinic on the same day. The dentist detected a foreign body (suspected to be the interdental brush) in her left maxillary sinus by X-ray examination. She consulted our hospital on the 2th day after loss of the interdental brush.

Imaging findings : The panoramic X-ray film and CT scans obtained at the first consultation revealed a metal object in the left maxillary sinus at the level of the middle nasal concha (Fig. 9 A-D).

Clinical diagnosis : Accidental insertion of an interdental brush into the left maxillary sinus.

Surgical procedure : Extraction of the interdental brush from the maxillary sinus was performed via the trans-nasal approach under general anesthesia on the 31th day after the first consultation. The brush was removed by an otorhinologist using a nasal endoscope (Fig. 10 A, B).

Case6

Patient : 52-year-old male

Chief complaint : Foreign body in maxillary sinus

Clinical history : This patient had no relevant symptoms whatsoever. He consulted a nearby dental clinic for treatment of dental caries in

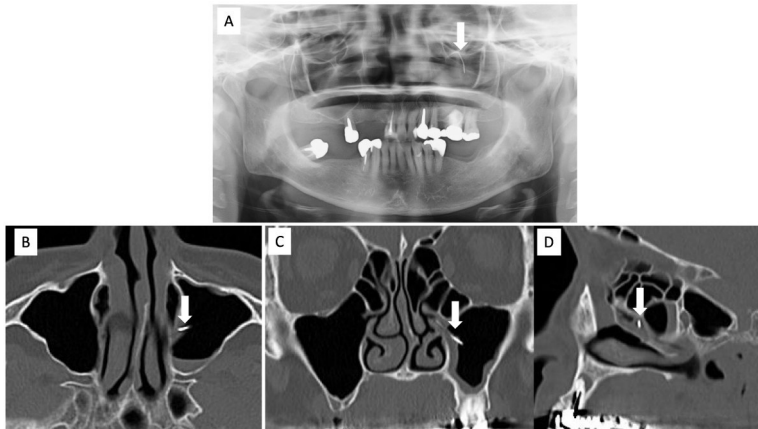


Fig. 9 Imaging findings at the first consultation in case 5
 A : Panoramic X-ray (arrow : foreign body).
 B, C, D : Computed tomography (arrow : foreign body).

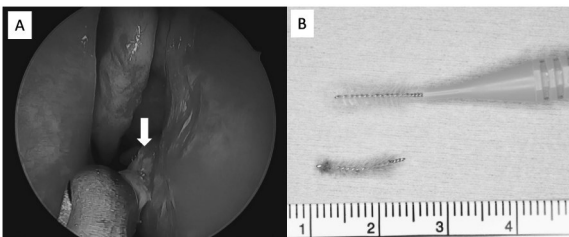


Fig. 10 Operative findings in case 5
 A : View through the nasal endoscope (arrow : interdental brush).
 B : The extracted interdental brush.

August 2016. The dentist unexpectedly detected maxillary sinusitis and a foreign body in his right maxillary sinus by X-ray examination, and the patient consulted our hospital during the same month. It was unknown when the foreign body had entered the maxillary sinus.

Imaging findings: The panoramic X-ray film and CT scans obtained at the first consultation revealed right maxillary sinusitis and a metal object in the maxillary sinus (Fig. 11 A-D).

Clinical diagnosis: Right maxillary sinusitis and a foreign body in the maxillary sinus.

Surgical procedure: Extraction of a foreign

body from the maxillary sinus was performed via the intra-oral approach under general anesthesia on the 90th day after the first consultation.

The foreign body was removed from the maxillary sinus by the same procedure as used for Case 1 (Fig. 12A). Pathological examination revealed that the extracted foreign body was surrounded by fungal and bacterial colonies. The foreign body was considered to probably be dental root canal filler (Fig. 12B).

Table 1 shows the six patients. The duration for which the foreign body had existed in the maxillary sinus was unknown in one patient.

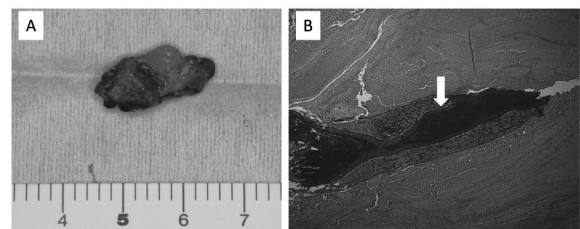


Fig. 12 Operative findings in case 6
 A : The extracted foreign body (granulation tissue).
 B : Root canal filler inside the granulation tissue (arrow : root canal filler)

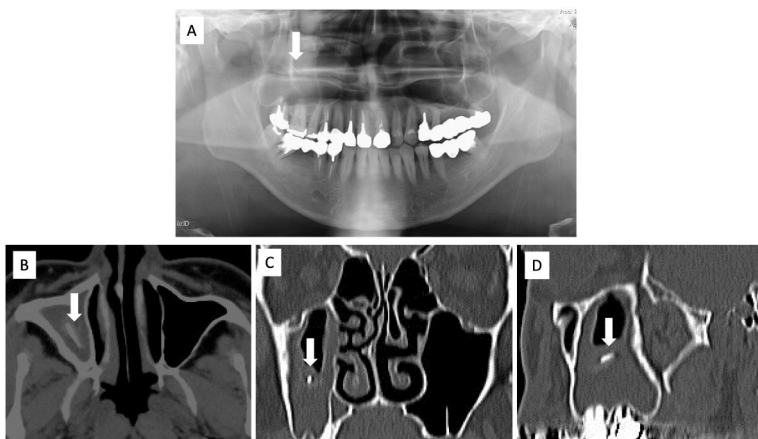


Fig. 11 Imaging findings at the first consultation in case 6
 A : Panoramic X-ray (arrow : foreign body).
 B, C, D : Computed tomography (arrow : foreign body).

Table 1 Summary of six patients with foreign bodies into maxillary sinus at our hospital (Jan. 2014-Dec. 2016)

Case	The term from displacement to the first consultation (day)	The cause of displacement	Surgical approach	Foreign body	Postoperative outcome
1	0	Iatrogenic	Oral	Dental implant	Good
2	0	Iatrogenic	Oral	Entire tooth	Good
3	40	Iatrogenic	Oral	Tooth root	Good A.S. : Disappearance
4	9	Non-iatrogenic	Oral	Interdental brush	Good M.S. : recovery
5	2	Non-iatrogenic	Nasal	Interdental brush	Good
6	Unknown	Iatrogenic	Oral	Dental root canal filler	Good M.S. : Improvement

Abnormal sensation : A.S.
Maxillary sinusitis : M.S.

With regard to the cause of the foreign body entering the maxillary sinus, it was iatrogenic in 4 patients and non-iatrogenic in 2 patients. The 2 non-iatrogenic foreign bodies were interdental brushes. With regard to surgical procedures for extraction of the foreign bodies, trans-nasal approaches were performed in one patient. In all patients, the postoperative outcome were good. With regard to the 2 patients with maxillary sinusitis, one patient recovered and the other shows improvement.

Discussion

We have managed six patients with foreign bodies in the maxillary sinus at our hospital. Many patients with maxillary sinus foreign bodies have been reported in Japan.¹⁻¹⁹ Accordingly, we investigated a total of 130 patients with foreign bodies in the maxillary sinus,¹⁻¹⁹ including our six patients.

Table 2 shows the details in those 130 patients. With regard to foreign bodies, most patients were iatrogenic. All patients with teeth in the maxillary sinus had tooth roots,^{5-7,10-12,16,17} consequently, our patient with a whole tooth (including the crown and root) was very rare. When dental materials or instruments are found in the maxillary sinus, iatrogenic dental implant patients were the largest category.^{1-3,5,8-10,13,16,18} Therefore, it is necessary for dentists to perform detailed preoperative evaluation and careful extraction of wisdom teeth as well as insertion of a dental implant to the first or second maxillary molar to prevent displacement of foreign body into the maxillary sinus.

Table 2 130 patients with foreign bodies into maxillary sinus in Japan (1981-2015)

Foreign body	Cases
Teeth	78
Tooth root	78
Tooth (crown+root)	0
Dental material or instrument	48
Dental implant	26
Dental root canal filler	10
Dental reamer or file	2
Dental impression material	1
Tooth extraction instrument (elevator or route tip)	3
Interdental brush	3*
Others (bone prosthetic material, dental cutting bar, resin)	3
Others (cotton, alveolar bone)	2
Unknown	2

* : non-iatrogenic

The non- iatrogenic foreign bodies were interdental brushes that broke while patients were cleaning their teeth and entered maxillary sinus.^{4,5,10} According to the available information, all patients (including our 2 patients) used relatively new interdental brushes, but the brush was inserted into the periodontal pocket for cleaning, which is not correct method. Therefore, it is necessary for dentists and dental hygienists to provide appropriate instructions about cleaning the teeth with interdental brushes to prevent fracture and entry of a brush into the maxillary sinus.

Regarding the surgical approach for extraction of foreign bodies in the 130 patients, intra-oral

approach was performed in almost patients, and only some patients had trans-nasal extraction using an endoscope.^{6,9,13} In our patients, trans-nasal approaches were performed in one patient. Depending on the position of the foreign body in the maxillary sinus (near the ethmoid sinus or the middle nasal concha), it may be important for extraction to be done by an otolaryngologist using an endoscope via the trans-nasal approach.

Among the 130 patients, the foreign body remained in the maxillary sinus for more than one year in 23%.^{1-3,5,10,12-17} The patients with a long-term foreign body in the maxillary sinus tended to develop sinusitis on the affected side.^{1,2,10,13,15-17} In one of our patients, a foreign body had been in the maxillary sinus for an unknown time and it was suspected to be chronic. The patient had sinusitis on the affected side and the extracted foreign body was found in the center of fungal and bacterial colonies. This case suggests that foreign bodies should be extracted from the maxillary sinus as soon as possible in order to prevent sinusitis and granuloma formation.

Conflict to interest

All authors report no conflict of interest related to this manuscript

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