

Odontogenic Maxillary Sinusitis

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Abstract-

Maxillary sinusitis of odontogenic origin, also known as maxillary sinusitis of dental origin or odontogenic maxillary sinusitis (OMS), is a common disease in dental, otorhinolaryngologic, allergic, general, and maxillofacial contexts. Despite being a well-known disease entity, many cases are referred to otorhinolaryngologists by both doctors and dentists. Thus, early detection and initial diagnosis often fail to detect its odontogenic origin.

Keywords: Maxillary sinusitis, odontogenic, inflammation, maxillary sinus

Introduction

Maxillary sinusitis of odontogenic or dental origin, also known as chronic maxillary sinusitis of dental origin, or odontogenic maxillary sinusitis (OMS), is a comparatively well-known disease in dental, otorhinolaryngologic, and allergic contexts. Any diseases arising from dental or dentoalveolar structures could affect the Schneiderian membrane (SM), leading to diverse pathologic disease presentations in the maxillary sinus. Exact and accurate diagnosis of odontogenic origin is necessary to avoid the long-term administration of inappropriate medications or unnecessary surgical management. Odontogenic maxillary sinusitis usually manifests unilaterally, and its pathophysiology, microbiology and management are different from those of non-odontogenic sinusitis. Sinusitis of odontogenic origin arise from: (A) Periapical abscess, (B) Chronic apical or extensive marginal periodontitis, or (C) After dental extraction^[1].

Etiology

- I. Acute Odontogenic Maxillary Sinusitis
- II. Chronic Odontogenic Maxillary Sinusitis

Acute Odontogenic Maxillary Sinusitis

Results primarily from multiplication of bacteria invading from the mouth or the focus of a dental infection. Distance between the dental root apices and the antral floor generally correlates with the likelihood of sinusitis. Since maxillary premolar and molar teeth have the closest proximity to the antral floor, infection of

these teeth is the most common cause of the disease. Multiplication of bacteria invading from the focus of a dental infection results in odontogenic maxillary sinusitis.(Figure 1)

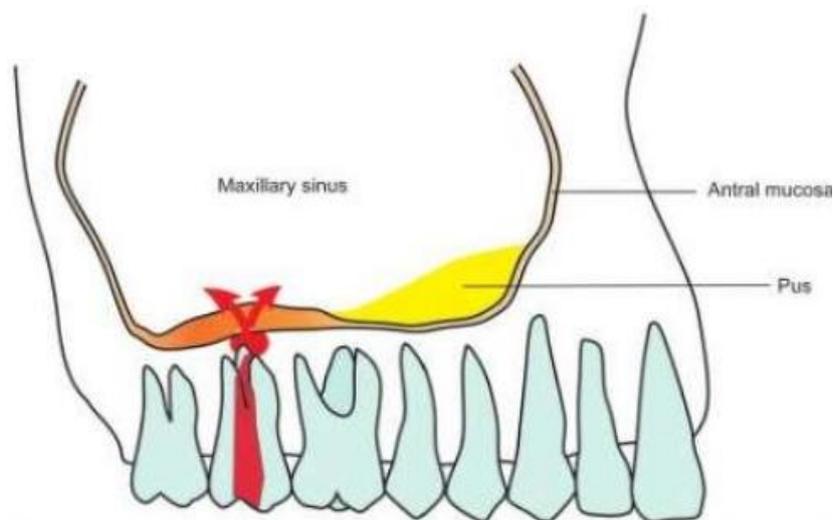


Figure 1: Multiplication of bacteria invading from the focus of a dental infection results in odontogenic maxillary sinusitis.

Additional etiology includes: 1. Dental or Alveolar Trauma 2. Odontogenic Cysts 3. Maxillary Osteomyelitis 4. Iatrogenic or accidental displacement of foreign bodies (e.g. fragments of broken instruments) during routine dental treatment or dentoalveolar surgical procedures (e.g. dental extraction) 5. And other surgical complications that result in sinus exposure.

Chronic Odontogenic Maxillary Sinusitis

Results from prolonged low-grade inflammation in antral mucosa following acute phase or recurrence of acute sinusitis. The antral mucosa is thickened with edema, infiltration of leukocytes and fibers, sometimes accompanied by polyps^[2,3].

Pathogenesis

Excluding close anatomical relationships, which can be thought of as facilitating inflammatory spread from the maxillary molars and premolars to the inferior maxillary sinus wall, many other conditions can contribute to the pathogenesis of OMS. Endo-antral syndrome was presented as a spreading pulpal disease by Selden, characterized by pulpal disease, periapical radiolucency or lamina dura loss on radiographs, faintly radiopaque mass bulging into the sinus wall, and variable radiopacities on the inferior sinus wall. Rapid spreading of dental infections may also lead to infraorbital cellulitis, transient blindness, and even life-threatening cavernous sinus thrombosis^[2,4].

Clinical Features

The most frequent clinical features of OMS can be divided into dental and sinonasal symptoms. Dental symptoms including involved tooth pain and hypersensitivity are not easily identified as odontogenic causes, but infrequent dental discomfort may occur after OMU patency preservation with continuous progression of maxillary sinus symptoms. Representative sinonasal symptoms are unilateral cheek pain with nasal obstruction, purulent rhinorrhea, foul odor, foul taste, headaches, anterior maxillary tenderness, and postnasal drip. These symptoms cannot be distinguished from other causes of rhinitis, nor can any typical symptom be considered predominant in OMS^[4]. Unilateral nasal obstruction with facial pain and pressure is also a common symptom in OMS, and foul odour with rotten taste combined with tooth pain appears to clinically differentiate CMS and OMS. The most common dental causes are periapical abscess, periodontal disease, post dental extraction, OAF, and undetected foreign bodies in the sinus. OMS can also develop due to maxillary

osteomyelitis, radicular cysts, mechanical injury of the sinus mucosa during root canal treatment, overfilling of root canals with endodontic material, incorrectly positioned dental implants, and improperly performed sinus augmentation^[5].

Signs and Symptoms of Acute Odontogenic Maxillary Sinusitis

- Dull or intense pressure-like pain
- Erythema
- Swelling of the cheek and anterior maxilla
- Pressure or fullness in the vicinity of the maxillary sinus
- Headache
- Malaise
- Fever
- Oral malodour
- Mucopurulent rhinorrhea
- Nasal Congestion or Obstruction
- Drainage of foul-smelling mucopurulent materials into the nasal cavity and nasopharynx (postnatal drip).

Signs and Symptoms of Chronic Odontogenic Maxillary Sinusitis

- Persistent pus discharge, with or without postnatal drip
- Toothache during chewing
- Increased tooth mobility
- Migraine
- Dull headache

Diagnosis of OMS

Radiographic imaging is an essential diagnostic tool in the diagnosis and management of odontogenic sinusitis. Standard dental radiographs include periapical radiography and panoramic radiography. Periapical radiography is rendered in two dimensions with high resolution allowing for the detection of dental caries and periapical radiolucency. Panoramic radiography produces a two-dimensional representation of the curved surfaces of the maxilla. This imaging modality allows for determination of the size of periapical lesions, visualization of cystic lesions of the maxilla, as well as mucosal thickening along the floor of the maxillary sinus (Fig. (Fig.2).2). However, the sensitivity of panoramic radiography in detecting periapical pathology is lower than periapical radiography due to the two-dimensional nature and resultant anatomic superimposition.¹⁹ High rates of false negatives have been reported with both modalities with one study demonstrating that periapical radiography missed more than 60% of periodontal pathology when compared to cone beam computerized tomography (CT) imaging^[6]. CT scans produce a three-dimensional rendering of pertinent anatomical structures in axial, sagittal and coronal planes. Maxillofacial CT scans allow for a detailed examination of the patient's paranasal sinus anatomy and detection of sinonasal inflammation and offers high resolution images in multiple planes. As a result, this imaging modality is the gold standard for radiographic evaluation of the paranasal sinuses in patients with chronic and recurrent acute sinonasal

disease.²² Major disadvantages of this modality include radiation exposure, limited detection of dental pathology and susceptibility to metal artifacts from prior dental restorations and craniofacial hardware.^[7-9]

Treatment for Acute Odontogenic Maxillary Sinusitis

Initial Treatment: Antibiotic therapy (Penicillin, clindamycin, and metronidazole are adequate drugs of initial choice), For moderate to severe cases, an increase drug dose and intravenous administration of antibiotics are especially recommended. Drainage to reduce pain intensity, prevents disease progression, and encourages resolution.

Treatment for Chronic Odontogenic Maxillary Sinusitis

Initial Treatment – Antibiotic therapy (Penicillin, clindamycin, and metronidazole are adequate drugs of initial choice) and surgery. Elimination of Dental Source by tooth extraction, apicoectomy, endodontic therapy, removal of any involved foreign body, might lead to full recovery. If an oroantral fistula is present, frequent irrigation of sinus cavity via fistula can prove effective, although surgical closure of the fistula is required after sinusitis is cured. However, if complete resolution is not achieved by these treatments, then surgery will be required^[10,11 - 13].

General management of odontogenic maxillary sinusitis

I. 8 Steps II. By Surgical Means

8 Steps in Managing odontogenic infections

1. Determine the severity of infection.
2. Evaluate host defenses.
3. Decide on the setting of care.
4. Treat surgically.
5. Support medically.
6. Choose and prescribe antibiotic therapy.
7. Administer the antibiotic properly.
8. Evaluate the patient frequently.

By Surgical Means

Caldwell-Luc Procedure - Involves complete removal of the antral lining and creating of a new opening for more dependent drainage into the nose by transoral approach. A foreign body displaced into the antral cavity can be retrieved with small forceps and with the use of suction through the expanded extraction socket or a bone opening in the canine fossa^[14]. (Figure 1)

A: If the dental root or foreign body is displaced from extraction socket, the socket may be enlarged buccally after elevation of mucoperiosteal flap to expose the maxilla above the socket.

B: After the flap is reflected, a new small oroantral opening is created in the bone, 1cm above the root apices of the first premolar

C: Saline solution is injected into the antral cavity to flood sinus through the expanded socket or the opening and then a suction tube is inserted.

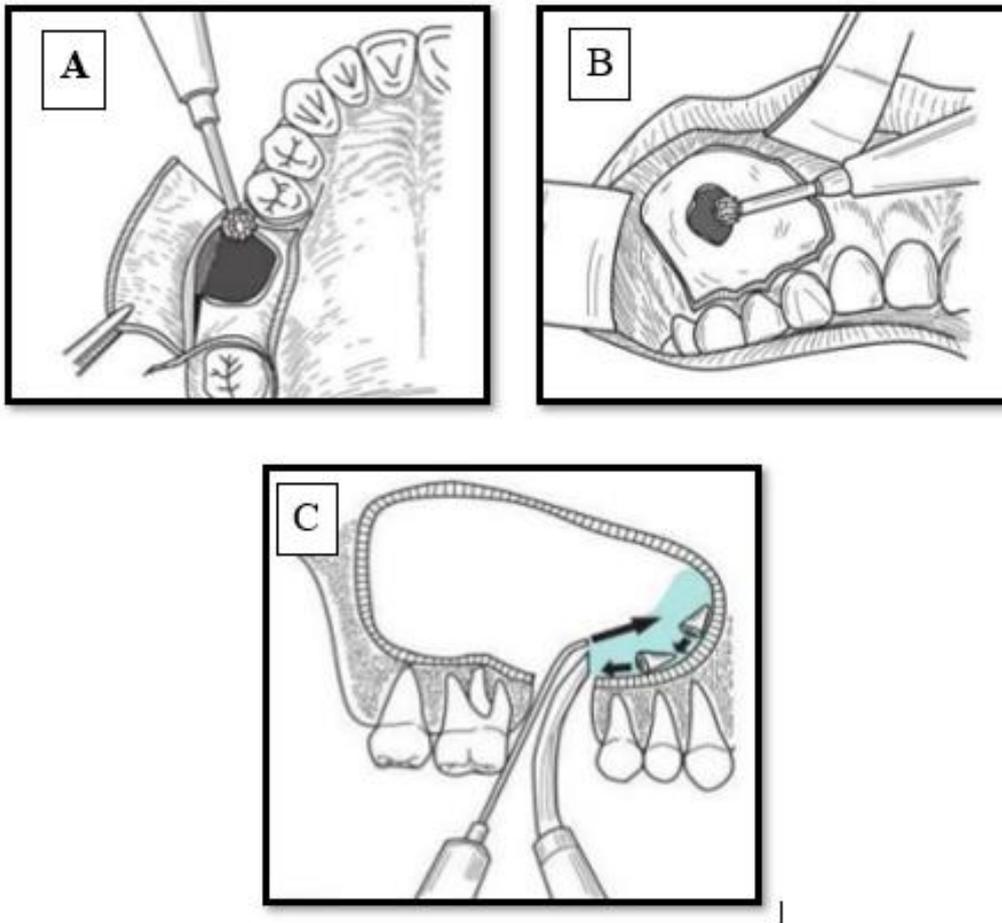


Figure 1 : Caldwell - Luc - Procedure - A, B & C

The foreign body is likely to be sucked out together with saline solution or moved close to the opening for easy retrieval. After removal of foreign body and irrigation of sinus using saline, the wound is primarily closed. Use of short-term prophylactic antibiotic is recommended.

The inflamed sinus mucosa can be removed using Endoscopic sinus surgery (ESS). This procedure is performed under general anesthesia for treatment of chronic, acute, fungal, bacterial sinusitis as well for others various sinus pathologies. An endoscope is passed through the nose and provides the view of the infected sinus mucosa, osteomeatal complex condition, polyps and etc. The natural ostium is widened surgically, and only infected sinus mucosa is removed, leaving the basement membrane intact. Thus, natural sinus mucosa is preserved and mucocilliary clearance is not disturbed. Due to the proximal contact to anatomical structure such as orbital nerve, internal carotid and eyes, this procedure requires high experience and precision ^[15,16].

Conclusion

Odontogenic sinusitis is an inflammatory condition of the paranasal sinuses that is the result of dental pathology, most often resulting from prior dentoalveolar procedures, infections of maxillary dentition, or maxillary dental trauma. Infections are often polymicrobial with an anaerobe-predominant microbiome requiring special considerations for antimicrobial therapy. Medical management and treatment of the underlying dental pathology remains a critical initial step in the treatment of odontogenic sinusitis, however recent literature suggests that a significant portion of patients may require endoscopic sinus surgery for successful disease resolution.

Reference

1. Albu S, Baciut M. Failures in endoscopic surgery of the maxillary sinus. *Otolaryngol Head Neck Surg.* 2010; 142: 196-201.
2. Andric M, Saranovic V, Drazic R, Brkovic B, Todorovic L. Functional endoscopic sinus surgery as an adjunctive treatment for closure of oroantral fistulae: a retrospective analysis. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2010; 109: 510-6.
3. Huang YC, Chen WH. Caldwell-Luc Operation Without Inferior Meatal Antrostomy: A Retrospective Study of 50 Cases. *J Oral Maxillofac Surg.* 2012; 70: 2080-2084.
4. Huang IY, Chen CM, Chuang FH. Caldwell-Luc procedure for retrieval of displaced root in the maxillary sinus. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2011; 112: 59-63.
5. Asmael HM. The Modified Caldwell-Luc Approach in Retrieval of Accidentally Displaced Root into the Maxillary Sinus. *J Craniofac Surg.* 2018; 29: 130-131.
6. Hajioannou J, Koudounarakis E, Alexopoulos K, Kotsani A, Kyrmizakis DE. Maxillary sinusitis of dental origin due to oroantral fistula, treated by endoscopic sinus surgery and primary fistula closure. *J Laryngol Otol.* 2010; 124: 986-989.
7. Dundar S, Karlidag T, Keles E. Endoscopic Removal of a Dental Implant From Maxillary Sinus. *J Oral Implantol.* 2017; 43: 228-231.
8. Chandrasena F, Singh A, Visavadia BG. Removal of a root from the maxillary sinus using functional endoscopic sinus surgery. *Br J Oral Maxillofac Surg.* 2010; 48: 558-559.
9. Workman AD, Granquist EJ, Adapp ND. Odontogenic sinusitis: developments in diagnosis, microbiology, and treatment. *Curr Opin Otolaryngol Head Neck Surg.* 2018; 26: 27-33.
10. Longhini AB, Branstetter BF, Ferguson BJ. Unrecognized odontogenic maxillary sinusitis: a cause of endoscopic sinus surgery failure. *Am J Rhinol Allergy* 2010; 24: 296-300.
11. Akhlaghi F, Esmaeelinejad M, Safai P. Etiologies and Treatments of Odontogenic Maxillary Sinusitis: A Systematic Review. *Iran Red Crescent Med J.* 2015; 17: e25536.
19. Felisati G, Chiapasco M, Lozza P, Borloni R. Sinonasal complications resulting from dental treatment: outcome-oriented proposal of classification and surgical protocol. *Am J Rhinol Allergy* 2013; 27: 101-106.
12. Chou TW, Chen PS, Lin HC, Lee KS, Tsai HT, Lee JC et al. Multiple analyses of factors related to complications in endoscopic sinus surgery. *J Chin Med Assoc.* 2016; 79: 88-92.
13. Chiapasco M, Felisati G, Maccari A, Borloni R, Gatti F, Di Leo F. The management of complications following displacement of oral implants in the paranasal sinuses: a multicenter clinical report and proposed treatment protocols. *Int J Oral Maxillofac Surg.* 2009; 38: 1273-8.
14. Sirecia F, Nicolottib M, Battagliac P, Sorrentinob R, Castelnuovoc P, Canevari FR. Canine fossa puncture in endoscopic sinus surgery: report of two cases. *Braz J Otorhinolaryngol.* 2017; 83: 594-599.
15. Albu S, Baciut M, Opincariu I, Rotaru H, Dinu C. The canine fossa puncture technique in chronic odontogenic maxillary sinusitis. *Am J Rhinol Allergy.* 2011; 25: 358-62.
16. Mattos JL, Ferguson BJ, Lee S. Predictive factors in patients undergoing endoscopic sinus surgery for odontogenic sinusitis. *Int Forum Allergy Rhinol.* 2016; 6: 697-700.