

What about of Maxillary Sinus, a Review on Sinuses Affections Related to Dental Practice

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Abstract

Maxillary sinus usually is affected on dental pathologies and sinusitis usually is and clinical implications on dental practice. This manuscript aims to reporting some cases of diagnosis and treatment of maxillary sinus affections and review the current literature concerning diagnosis and management of maxillary sinusopathies related to the dental practice. Dentists should be well trained to identify and diagnose sinus alterations and pathologic entities and should be able to identify alterations, infections and complications. In conclusion the maxillary sinus is a structure with intense correlation to dental practice and its anatomical proximity result on many correlations between dental affections and sinusal repercussion. Dentists should be familiarized with it and must know its semiotics.

Keywords: *Paranasal Sinuses; Maxillary Sinus; Sinusitis; Dental Practice*

Introduction

Some of many functions of upper respiratory tract are performed by paranasal sinuses, that include moistening, filtration and heating the air we breathe before it reaches our lungs. Fortunately, paranasal sinuses that affect dental practice are not anatomically related to vital structures as carotid arteries, cavernous sinuses, dura mater and ocular nerves as sphenoid and ethmoid sinuses, mainly maxillary sinuses are related to dental practice [1-4]. This is a cavity with a pyramid shape located between the orbit floor and dental roots superoinferior and limited medially to the lateral nasal wall, some structures related are infraorbital nerve on his roof, dental apices on its floor and pterygopalatine fossa on its posteromedial wall abuts [1-5].

The internal coating of maxillary sinuses is mainly composed by ciliated pseudostratified columnar epithelia with pump nasal mucus to the nasal cavity through the ostium maxillary to middle meatus [1,2]. Anatomically it's located on the posterosuperior region of the lateral nasal wall, eventually an obstruction results on a sinusitis [1-3]. Sinusitis can be caused by many entities and bacterial or fungal sinusitis usually is related to dental problems, it leads to many different symptoms on nasal function. It can be classified mainly as acute and chronic sinusitis depending on the intensity and frequency of the symptoms [1,2,4,6]. Its pathogenesis can be explained by the following sequence: 1) initially an inflammatory event result on mucosal swelling that lead to obstruction or reduction of maxillary ostium; 2) followed by mucus accumulation and bacterial proliferation results on hypoxemia and inflammatory mediators accumulation; 3) both, hypoxia and inflammatory response, leads to vasodilatation and more swelling [1,4].

A hypothesis of maxillary sinusitis becomes a diagnostic when clinical and physical examination findings are superimposed, imaging investigation is complementary. Some signs and symptoms are strongly associated to sinusitis such as nasal obstruction, nasal discharge/

purulence, smell disorders, facial pain/pressure, dental pain, halitosis and headache are common features. Physical examination include palpation on sinus area, dental and periodontal evaluation, nasal inspection such as nasal turbinate edema and mucosal erythema. At this point pattern is recognized and complementary exams such as radiographs and computed tomography only confirm the diagnostic of sinusitis [1].

Dentists should be well trained to identify and diagnose sinus alterations and pathologic entities. On epidemiologic surveys about 10 to 12% of maxillary sinusitis is affected by odontogenic infections and solving dental problems usually leads to the cure of sinusopathy [4,6,7]. It's not rare the suspicion of a pathologic feature affecting the jaws be identified on routine exams as panoramic or periapical radiographs, identifying and investigating those alterations are crucial to the patient [4,6,7]. Another situation due to dental extraction is communication or fistula between the maxillary sinus and oral cavity with leads to sinusitis and discomfort⁸. Finally tooth loss on maxilla usually results on bone remodeling and pneumatization of maxillary sinus with require reconstructive surgery for dental implant placement and rehabilitation⁹. This manuscript aims to reporting some cases of diagnosis and treatment of maxillary sinus affections and review the current literature concerning diagnosis and management of maxillary sinusopathies related to the dental practice.

Discussion

Odontogenic sinusitis diagnosis may be a difficult task for ear-nose-throat doctors, although it's a routine diagnosis on dental office. Evaluating a clinical presentation without any investigation on pulp testing and periodontal evaluation is impossible to differentiate a sinus infection form an odontogenic infection [4,6,7].

The current literature emphasizes the physical examination findings correlated with patient history as a mandatory condition for diagnosis, transillumination, laboratory testing, sinus imaging and culture results are limited and may have some biases on diagnostic without clinical findings [1]. On dental setting usually an initial image exam is panoramic radiography and associated to clinical evaluation and complains another imaging investigation may be necessary. Actually, plain radiographs show a poor accuracy and precision and computed tomography is the best choice for sinusitis evaluation although it has an average cost and high doses of radiation. Magnetic resonance is an expensive and isn't an accessible exam, ultrasound examination are useful for evaluating mucosal thickening and sinusal fluids although its operator dependent and sometimes don't clarify a diagnosis [1,10-12]. An example can be illustrated on figure 1, patient, 22 yo, with asymptomatic suspicion of pathologic associated to tooth 16 on routine image exams for third molar evaluation. It shows a possible asymptomatic lesion inside left maxillary sinus affecting tooth 16 on panoramic radiography, otherwise computed tomography clarifies a normal expansion of maxillary sinus.

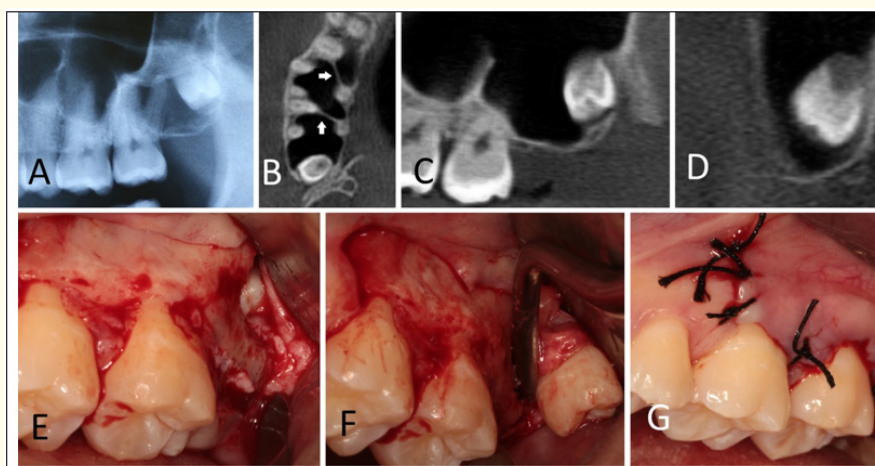


Figure 1: (A) Panoramic radiography shows an suspicious pathologic alteration related to tooth 16; (B) Axial computed tomography slice on tooth 16 shows an intense pneumatization on maxillary sinus without any lesion associated to it, note sinusal septa inside maxillary sinus(white arrows); (C) Sagittal computed tomography slice shows an ectopic positioning of tooth 16, again note another view of sinusal septa; (D) Coronal computed tomography slice shows any pathologic lesion associated to the tooth 16; (E and F) A wide mucoperiosteal flap was planned for sinus exploration and tooth removal from inside maxillary sinus; (G) Mucoperiosteal flap sutured on its original position.

Only painkillers and nasal decongestant were prescribed on post-operative care for the figure 1 case.

It's not unusual the suspicion of a pathological alteration on routine exams and early diagnosis of asymptomatic pathology [13-15]. Some pathologies has an diagnostic pathway starting on routine exams on dental office and the maxillary sinus frequently is affected on expansive lesions because it's an air cavity with don't inflict any resistance for growth and it is not uncommon for a pathological lesion to occupy an entire maxillary sinus [13-16]. On figure 2, patient, 55 yo, with a failed endodontic treatment on tooth 15 fourteen years ago related frequent episodes of sinusitis and periodontal infections. An inflammatory chronic cyst grows inside maxillary sinus and often inflicts on sinusitis episodes, it should be treated by infection cause removal, cyst curettage with or without burr osteotomy and resultant buco-sinusal communication closed with mucosal flaps. Many different lesions can fill a maxillary sinus, it include mucosal neoplasm and cists. Because its proximity to dental structures frequently dental cists, tumors and inflammatory lesions may be present [15,16]. Again, computed tomography is the best choice for surgical planning and radiologic investigation for differentiation between physiologic pneumatization and solid lesions [1,10,11].

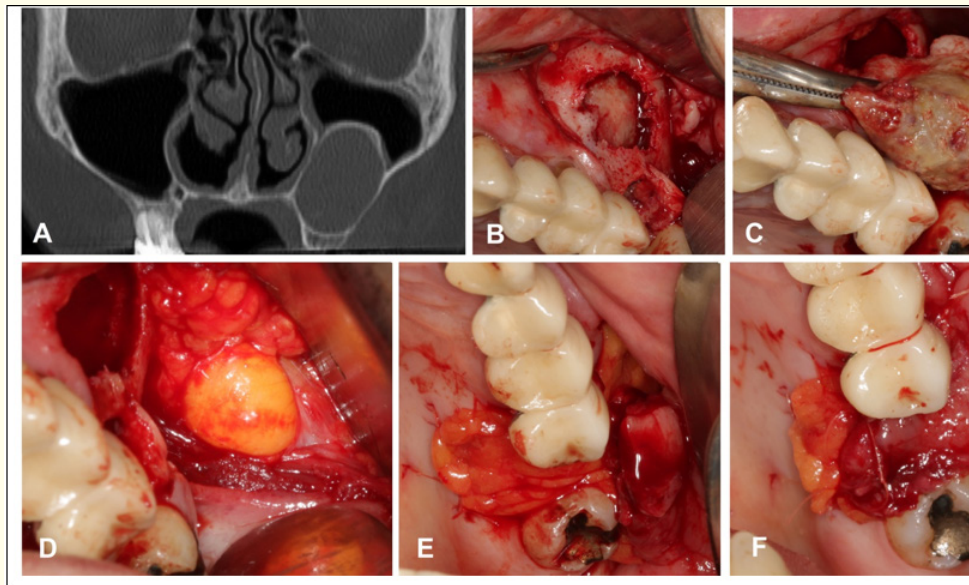


Figure 2: (A) Coronal computed tomography shows an extensive growth of an inflammatory lesion (periapical cyst) into maxillary sinus associated to tooth 16; (B) Mucoperiosteal flap retracted and lesion exposure; Debridement was planned to remove this lesion, (C) Lesion removed from the cavity after curettage, following this step an burr debridement was performed to ensure any reminiscent cyst capsule; (D, E and F) the remaining oroantral communication was obliterated with bucal fat pad and mucoperiosteal sliding flap.

Sometimes tooth loss cause severe bone atrophy and it impairs an implant placement for future rehabilitation, these problems can be solved with bone graft on sinus lift surgery¹⁷⁻¹⁹. For sinus lift surgery planning on severe pneumatized sinus a lateral approach may be the best choice and anatomical characteristics should be observed [17-19], on evaluation of 1322 sinuses on panoramic radiography and computed tomography Contantine., *et al.* 2019 showed that panoramic radiography has a low efficacy in the diagnosis of sinus disease, even when examined by experienced dental radiologists, it can be useful in excluding disease. In conclusion computed tomography is necessary for the definitive investigation of sinus lesions [11]. Investigating maxillary sinus septa usually make a sinus lift surgery more difficult due to increase on risk of membrane perforation [20]. Evaluating 602 sinuses on computed tomography Hungerbuhler., *et al.* 2019

shows approximately 30% of sinuses contain septa and about 47% of them was oriented on a direction different than coronal and wasn't visible on plain radiographs. Another important question regards on the possibility of simultaneously perform a sinus lift and implant placement, actually an implant stability on reminescent bone, more than five millimeters, permit a sinus lift and implant placement [21]. The figure 3 shows a surgical procedure for implant placement and simultaneously bone graft with an open technique for sinus lift. On the figure 1 on axial tomography axial view some sinus septa can be seen. It's necessary to insert bone graft around the implant inside the lifted cavity due to lack of influence of the Schneiderian membrane in forming new bone on apical region [22,23].

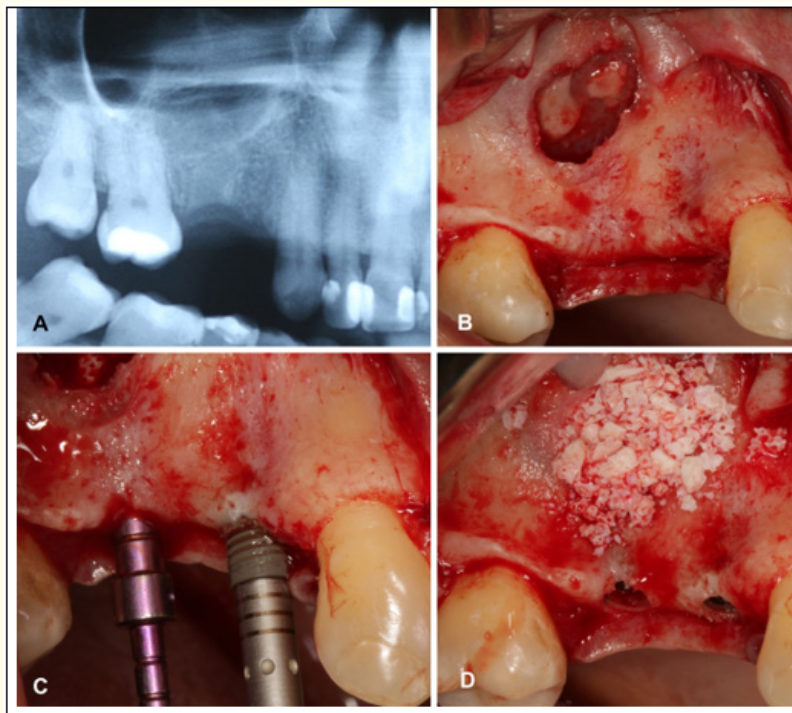


Figure 3: (A) Panoramic view of missing teeth 4 and 5 due to wide dental caries region showing some pneumatization of maxillary sinus and 7 millimeters of remaining of alveolar crest; (B) Sinus lift procedure to fill the cavity with bovine xenograft; (C) Two implants were planned to be positioned simultaneous to bone graft; (D) Final aspect after implants placement and sinus lift procedure.

Foreign bodies can be cause of maxillary sinusitis and dental practice may lead to it [20,24]. Dental procedures rarely affect the maxillary sinus and some special occasions may lead to insertion of foreign bodies on maxillary sinus, three usual situations must be observed: 1) tooth or root displacement during dental extraction [25]; 2) root filling material during endodontic treatment [7,26] and rarely 3) dental implant, burs and bone graft on oral surgery [20-24]. A special situation is called fungus ball it consist on a noninvasive fungal sinusitis composed by a dense conglomeration of fungal hyphae (*Aspergillus fumigatus*), usually localized in the maxillary sinus of immunocompetent Patients with history of dental procedures, usually endodontic treatment of a previous odontogenic sinusitis [27]. Agustí., *et al.* 2008 on retrospective study of foreign bodies on maxillary sinus found that 90% of foreign bodies on maxillary sinus was attributes do dental origin that includes titanium implants, dental roots, amalgam and fungus ball, those foreign body were removed surgically on endoscopic or oral arthrotomy approach [24,28]. The figure 4 shows an example of foreign body inside maxillary sinus of an 65 yo patient rehabilitated with dental implants and sinus lift surgery. An accidental sinus membrane perforation and bone graft insertion into the maxillary sinus caused a chronic sinusitis, the figure also show the surgical removal aiming to solve sinusal problem.

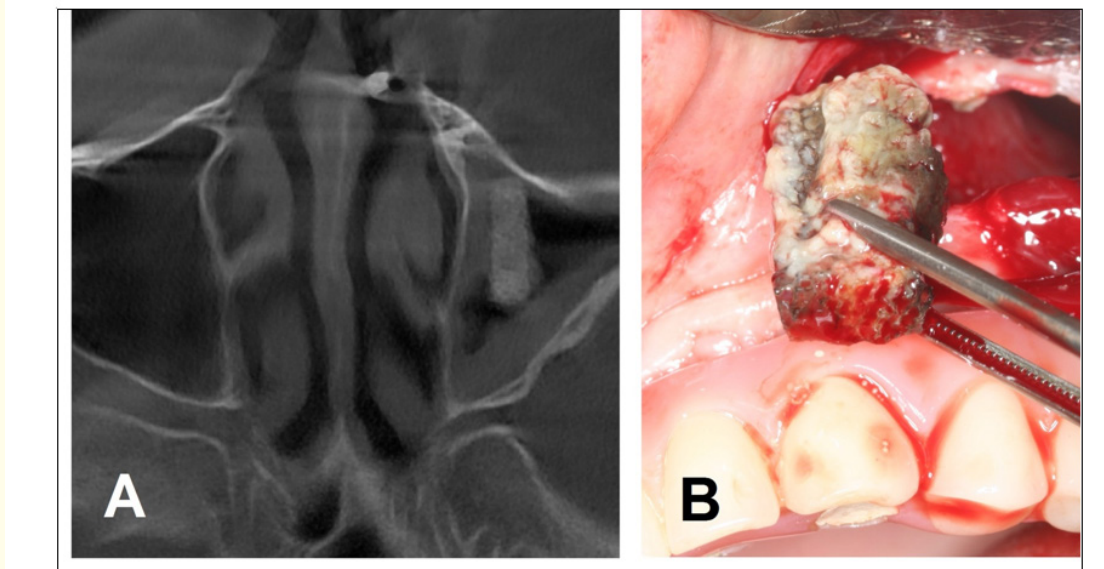


Figure 4: (A) Axial computed tomography slice showing chronic sinusitis due to foreign body inside left maxillary sinus, note increased thickness of Schneiderian membrane and radiopaque foreign body; (B) Oral antrotomy approach, curettage and remove of foreign bodies. After this procedure patient had solution of sinusitis.

Another condition that affects maxillary sinus is oroantral communications and fistulas. On the majority of cases oroantral communications are an accident of a tooth extraction and if not well treated becomes a severe complication, others reasons for those condition are maxillary tumor resection, large cysts removal, osteonecrosis, trauma injuries and peri-implantitis [8,29]. The treatment consists initially on treatment of sinusitis with nasal irrigations, nasal decongestant and in some cases antibiotics. After solution of infectious sinusitis mucosal flaps are used to obliterate those defects. On analysis of 161 patients with oroantral communications closed by Bichat's fat pad the maximum defect size were above 40 mm after tumor resection, in 12 patients (7,5%) this procedure failed, in 3 cases there was a large defect following tumor resection and 6 was due to chronic and recurrent fistulas [30]. Comparing buccal sliding flap and buccal fat pad flap Nezafati, *et al.* 2012 performed a double-blind randomized clinical trial study and, beside his short number of patients, showed no significant statistical difference between those two techniques on operative morbidity and on both techniques the success rate are the same [31]. Figure 2 illustrate an bucal fat pad for closure of oroantral communication.

Conclusion

In conclusion the maxillary sinus is a structure with intense correlation to dental practice and its anatomical proximity result on many correlations between dental affections and sinusal repercussion. Dentists should be familiarized with it and must know its semiotics.

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