Sinus Lift Procedure in Presence of Mucosal Cyst: A Clinical Prospective Study

C. Maiorana[1] • M. Beretta[1] • M. Benigni[1] • M. Cicciù[2] • E. Stoffella[1] • GB Grossi[1]

Abstract

Background: Sinus lift procedures are considered safe and predictable procedures for the rehabilitation of the athrophic upper posterior maxilla. The presence of sinusal neoformation, highly reported in the literature, could represent a problem for sinus lifts. The removal of these lesions is recommended in order to limit intra- and post-operative complications. The aim of this prospective study is to describe the surgical removal of sinusal cyst concurrently with sinus lift procedures.

Methods: 10 patients, 7 male and 3 female, presenting edentulism of the posterior maxilla associated with severe pneumatization of the maxillary sinus and presence of an antral cyst, were enrolled in the study. 14 sinus lift procedures were performed following aspiration of the liquid contained within the cyst. Radiographic exams were performed before, immediately after, and six months after the surgery.

Results: All patients showed successful integration of the implants and the survival rate was 100% at the most recent recall. Intraoperative complications were rare and included minor membrane perforations in 3 cases. In 11 cases the CT scan examination revealed no sign of presence of the lesion after 6 months. In 3 cases the total volume of the lesion was significantly reduced. 4 patients presented thickening of the Scheiderian membrane up to 2 mm with no sign of inflammation.

Conclusions: This study proposes a modified surgical approach to drain the endoluminal liquid during the sinus lift procedure. The new proposed technique allows the reduction of the surgical morbidity thanks to the elimination of one surgical phase in case of staged approach. The Authors consider this technique safe and predictable.

KEY WORDS: Maxillary sinus lift, cyst, dental implant, bone augmentation

1. Department of Dental Implants, Fondazione IRCCS Cà Granda, University of Milan, Ospedale Maggiore Policlinico, Milan, Italy

2. Human Pathology Department, University of Messina University of Messina School of Dentistry

INTRODUCTION

Implant therapy in the posterior maxilla can be complicated by the qualitative and quantitative limitations of the residual bone, often interrelated with the pneumatization of the maxillary sinus.[1] The sinus lift is a predictable surgical technique, strongly supported in the literature[2,3] for many decades, providing a safe and stable base for endosseous implant placement.[4] Some authors have stated that the presence of an antral cyst would be a contraindication for the predictability of the sinus lift procedure in these particular patients[5] while other studies assess that pseudocysts do not affect the possibility to perform a sinus grafting procedure.[6] The aim of this prospective study is to evaluate, by means of clinical and radiological examination (CT scan), the effectiveness of a modified sinus lift procedure in case of severe pneumatization of the maxillar sinus associated with presence of antral cyst.

MATERIALS AND METHODS

Patients

10 patients, 7 male and 3 female, presenting edentulism of the posterior maxilla associated with severe pneumatization of the maxillary sinus and presence of an antral cyst, were enrolled in the study. Fourteen sinus lift procedures were performed. The group had a mean age of 45.3 years, ranging from 27 to 73 years.

Demographic data, medical and dental health history and smoking habits were registered. General inclusion criteria for oral surgery procedures were considered. Patients were excluded from the study if they had a medical history of any systemic disease that would impair wound healing, such as non-controlled diabetes mellitus, immunosuppressive drugs and heavy smoking (more than 10 cigarettes per day). Each patient received a comprehensive dental examination and a periodontal chart was filled, in order to determine the periodontal and dental status.

Radiographic examination included Panoramic exam, coronal and axial CT scans. Assessment of maxillary sinus anatomy, vertical dimension of the sinus floor and an evaluation of any pathologic findings were carried out on each patient. All patients with a radiographic finding of a dome-shaped radiopacity compatible with an antral pseudocyst were included in the study (Figures 1-3). Patients with a lesion less than 1 cm^2 with diffuse mucosal thickening or irregular calcifications were excluded. Criteria for sinus augmentation were a maxillary vertical dimension of less than 8 mm with al least 1 mm of residual bone height.

All patients were referred to a otorhinolaryngologist in order to perform sinus examination and an endoscopic procedure (FESS) when required. The endoscopic and radiographic examination (CT scan) by the otorhinolaryngologist had the aim to exclude pathological conditions such as: chronic sinusitis with retention of mucous secretions in the sinus, ostium stenosis or obstruction, presence of bony destruction and communication with dental roots. All subjects were informed regarding the treatment sequence and the procedures involved and were provided a signed informed consent.

Surgical Procedure

Sinus augmentation was performed following the guidelines stressed by Tatum.[3] After antibiotic prophylaxis by means of 2 grams of amoxicillin 1 hour before the surgery, anesthesia was obtained by local infiltration of Ecocain 1:50,000 and 4 mg of dexamethasone were infiltrated locally. A crestal

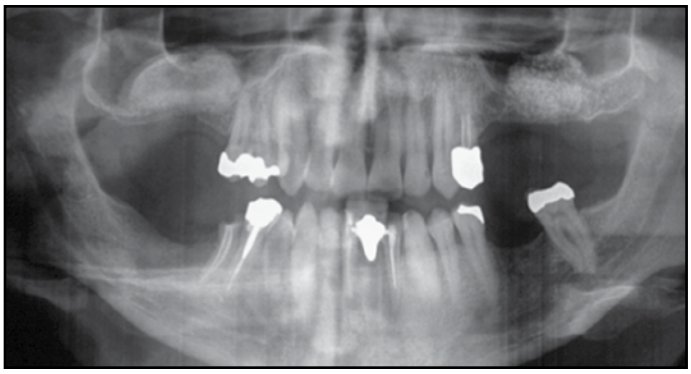

Figure 1: Panoramic exams showing a neoformation on the floor of the maxillary sinus.

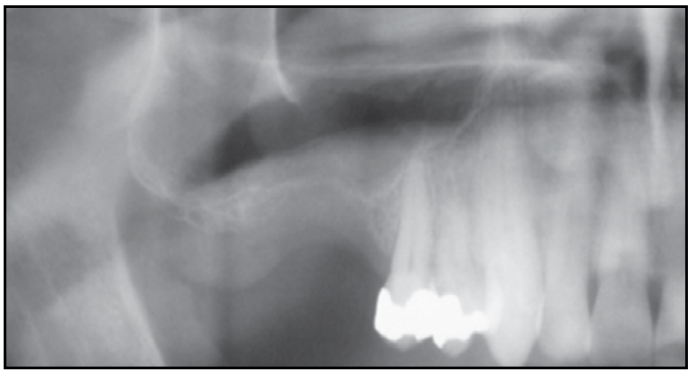

Figure 2: Panoramic exams showing a neoformation on the floor of the maxillary sinus.

incision slightly palatal to the crest in order to preserve a band of keratinized attached mucosa and two vertical release incisions were carried out to reflect a mucoperiosteal flap. The lateral wall of the maxillary sinus was exposed and an osteotomic window was performed using a round bur[7] (Figure 4). A perforation through the vestibular wall of the maxillary sinus was made 5 mm over the upper side of the bony window using a 2 mm round bur (Figure 5). This procedure was performed to allow a direct access to the mucosal cyst in order to suck out the liquid contained in the neoformation by means of a syringe inserted into this communication (Figure 6). The liquid extraction consented to reduce the internal pressure of the cyst, thus diminishing the dimension of the lesion and the risk of laceration during the lifting of the scheiderian membrane. The sinus membrane was then gently lifted from the bony floor by means of an antral curette. The created sub-antral cavity was then grafted with anorganic bovine bone (Bio-oss Geistlich, Wolhusen, CH) (Figure 7).

In 9 procedures the vertical residual bone height was sufficient to allow the primary stability of implants inserted at the same time of the sinus lift procedure. In 5 procedures a staged procedure

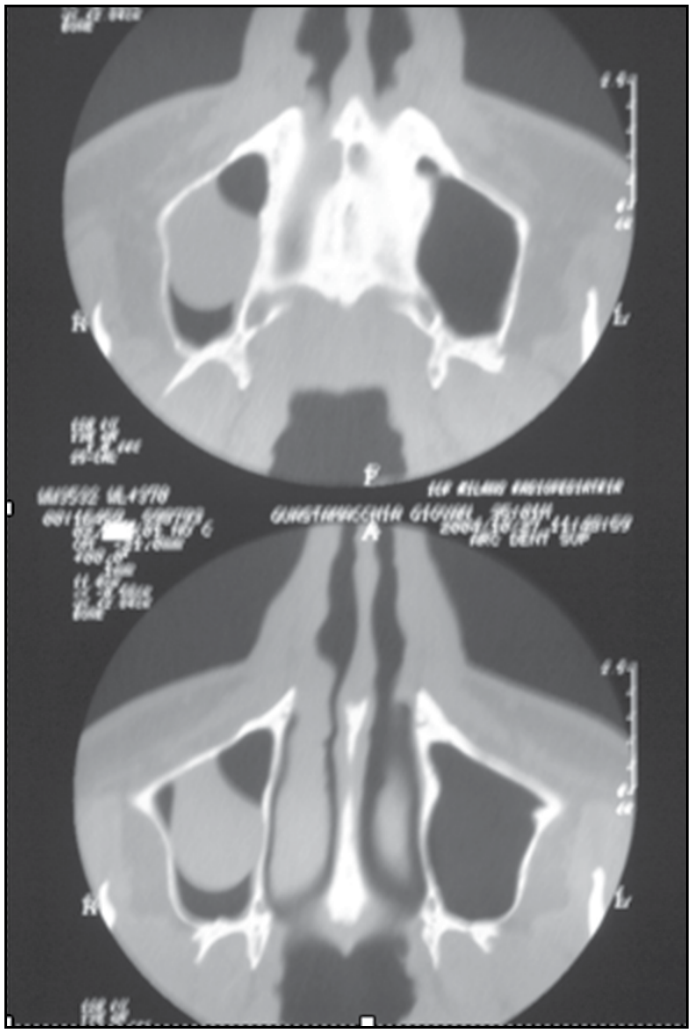

Figure 3: CT scan exam shows the presence of a neoformation in the right maxillary sinus.

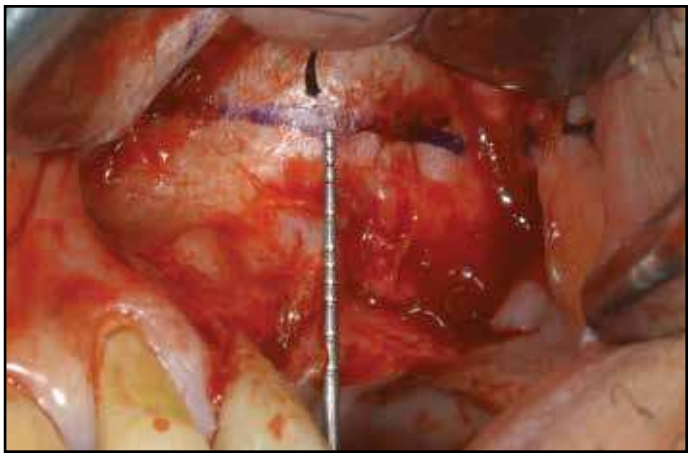

Figure 4: Crestal incision with two vertical release and exposure of the lateral wall of the maxillary sinus.

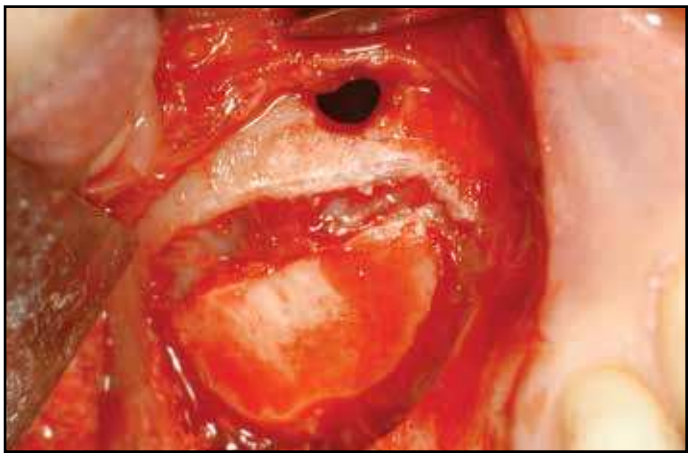

Figure 5: A perforation was made 5 mm above the upper side of the bony window to allow the suction of the liquid inside the cyst.

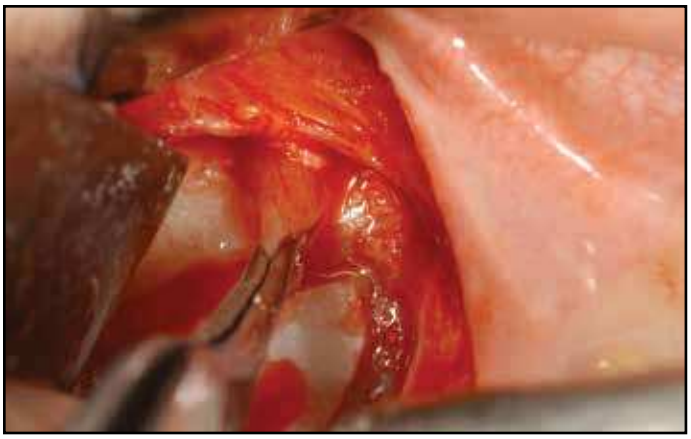

Figure 6: Enucleation of the cyst.

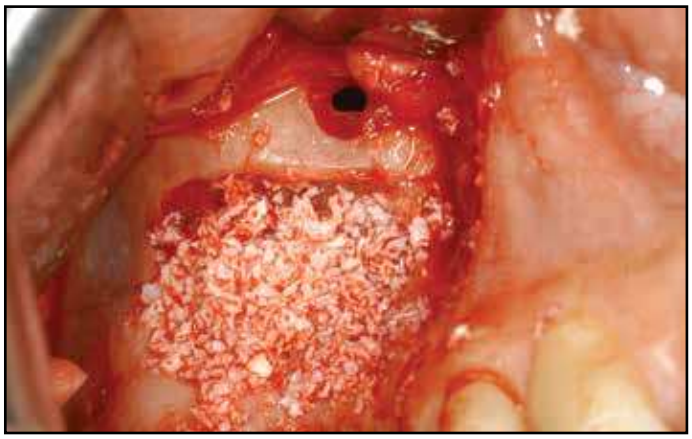

Figure 7: The sinus wall was grafted with anorganic bovine bone. (Bio-oss Geistlich, Wolhusen, CH).

with delayed implant placement because of the insufficient residual bone was performed. Thirty four implants were placed, 25 in single procedure and 9 in staged approach. The graft material was covered by a resorbable collagen membrane (Biogide Geistlich, Wolhusen, CH) and a primary closure wound healing was obtained with a 4-0 non resorbable suture (Figure 8).

Post-operative management included systemic antibiotics (1 gram Amoxicillin 3 times a day for 7 days), application of decongestant nasal spray, chlorohexidine 0.20% mouthwash (3 times a day for 15 days) and analgesic. Patients were instructed to avoid use of any removable appliance for the first 2 weeks postoperatively.

Clinical and Radiographic Follow-Up

The patients were seen once a week for the first post-op month, and then once a month for the following 5 months. Suture removal was

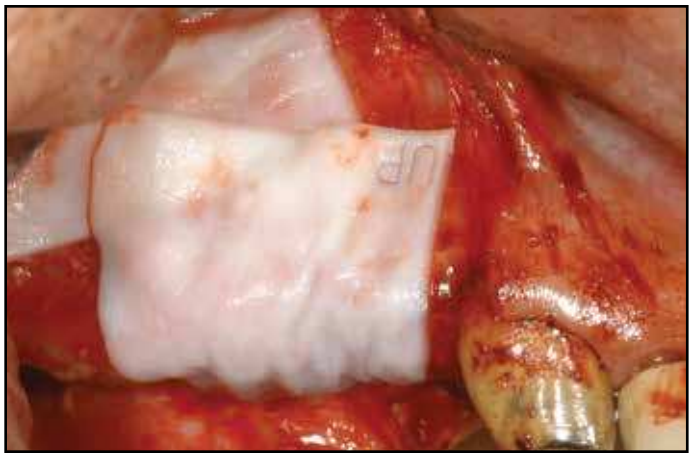

Figure 8: The graft material was covered by a resorbable collagen membrane. (Biogide Geistlich, Wolhusen, CH).

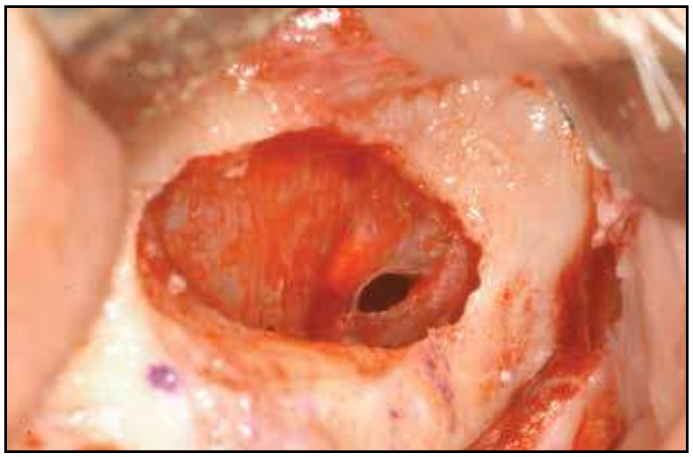

FIgure 9: in 3 cases a laceration of the schneiderian membrane occurred.

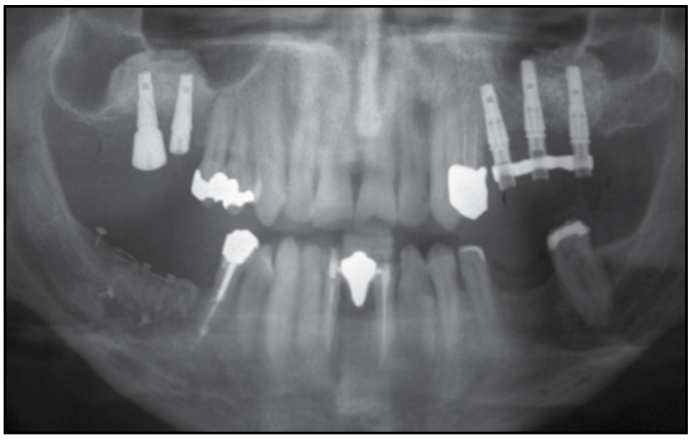

Figure 10: Panoramic exam shows implant integration in the right and left maxillary sinus.

performed 15 days post-operatively. Radiographic examinations were made at the time of surgery (panoramic exam) and after 6 months (panoramic exam and CT scan).

RESULTS

Mean follow-up was 28 months ranging from 12 to 40 months. All the patients showed successful integration of the implants and the survival rate was 100% at the most recent recall.

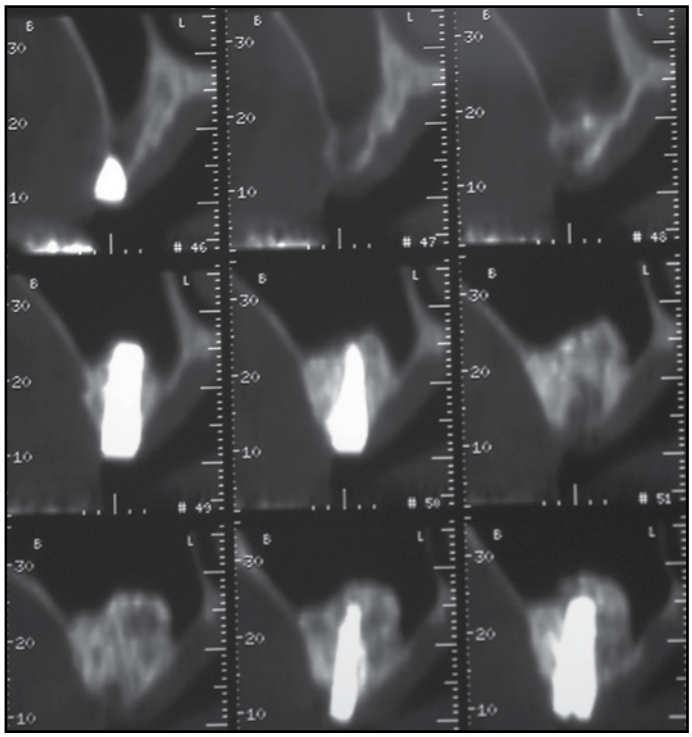

Figure 11: Cross sections show good implants integration in the sinus graft 6 months after the surgery.

Intraoperative complications were rare and included minor membrane perforations in 3 cases. The lacerations were in an area where the membrane was thin and far from the perforation created to drain the liquid from the cyst (Figure 9). No complications, such as infection of the grafted material or acute sinusitis were registered during the postoperatively period and during the follow-up recall in all the surgical sites. Six month radiologic follow-up (CT scan) showed good integration of the grafting material in all the patients (Figures 10, 11).

In 11 cases the CT scan examination revealed no sign of presence of the lesion after 6 months. In 3 cases the total volume of the lesion was significantly reduced. Four patients presented thickening of the Scheiderian membrane up to 2 mm with no sign of inflammation.

DISCUSSION

The presence of cyst-like opacity in the maxillary sinus is commonly asymptomatic and diagnosed on routine radiographic examination taken for other reasons, such as dental rehabilitation, impacted teeth, or to assess the alveolar ridge for implant rehabilitation. The literature reported two different values of antral cyst prevalence depending on the type of radiological examinations: between 1.4% and 9.6% in case of Panoramic exam[9] and 12.4% in case of CT scan.[10]

Sinus augmentation is associated with several complications, with postoperative sinusitis and bone graft infection as the most serious. The development of sinusitis following sinus augmentation can be directly related to drainage disturbances, mainly as a result of septal deviation and allergy, combined with oversized inferior and middle turbinates. The presence of antral pseudocyst reduces the size of the maxillary antrum. Therefore, it can be speculated that lifting the maxillary mucosal lining in this case would further reduce the sinus size and postoperative edema of the Schneiderian membrane. The ostium opening may be blocked causing stasis of fluids, which when contaminated, could lead to sinusitis. Nevertheless, because of the high position of the ostium relative to the sinus floor, especially in a large antrum, the reported prevalence of sinusitis following sinus augmentation in the absence of any pathology is about 3% to 20% of the cases reported in the literature[11-13]

Differential diagnosis of an antral pseudocyst from other sinus lesions is crucial for treatment planning. As the maxillary sinuses may become involved with several types of diseases, including chronic rhinosinusitis, benign and malignant neoplasms, or even dental disorders, appropriate diagnosis is mandatory prior to any intervention.[14,15] In particular radiological evaluation (Panoramic exam and CT scan) and ENT examination with endoscopic approach are necessary to determine benign or malignant nature of the lesion.[16] Ostium stenosis has been strongly associated with chronic maxillary sinusitis and nasal polyps/cysts.[17] The risk of ostium stenosis is highly augmented in case of sinus lift procedure in presence of antral cyst which can lead to the iatrogenic closure of the nasal meatus during the surgical procedure.[18] The patency of the sinonasal ostium is fundamental to guarantee the possibility for the sinus to drain the physiological mucus thanks to the mucociliar flux reducing the risk of sinusitits.

In particular the sinus lift procedure leads to a major quantity of mucus to be drained, due to the surgical insult or an eventual migration of

the grafting material in the antral cavity in case of perforation of the Schneiderian membrane.[19] The literature suggests a surgical-endoscopic approach to remove the intrasinusal lesion, in order to consent the possibility to perform the sinus lift procedure and the implant insertion.[20, 21]

CONCLUSION

The Authors propose a modified surgical approach to drain the endoluminal liquid during the sinus lift procedure. The new proposed technique allows the reduction of the surgical morbidity thanks to the elimination of one surgical phase in case of staged approach. Furthermore, a pseudocyst of the maxillary sinus is not a contraindication for sinus augmentation. The low frequency of sinus membrane perforation and postsurgical sinusitis makes the operation safe.[6] Nevertheless, in patients with large lesions and where the diagnosis is not clear, further evaluation should be made before sinus augmentation is scheduled.

It is mandatory for the surgeon to be familiar with the anatomy and pathology of the maxillary sinus to avoid any unnecessary complications. For this reason, pre - surgical radiographic evaluation of the maxillary sinus by a trained surgeon is mandatory to avoid unnecessary complications. Most cases of antral pseudocyst are directly related to the severity of periodontal disease and odontogenic infections.

Correspondence:
Dr. Carlo Maiorana
Clinica Odontostomatologica,
Ospedale Maggiore Policlinico,
Via della Commenda n. 10 20132
Milano, Italy
Phone: 0039335602527;
Email: carlo.maiorana@unimi.it

Disclosure

The authors report no conflicts of interest with anything mentioned in this article.

References

1. Naert I, Koutsikakis G, Duyck J, Quirynen M, Jacobs R, van Steenberghe D. ;Biologic outcome of implant-supported restorations in the treatment of partial edentulism. Part I: A longitudinal clinical evaluation. Clin Oral Implants Res 2002; 13(4):381-389.
2. Boyne PJ, James RA ; Grafting of the maxillary sinus floor with autogenous marrow and bone. J Oral Surg 1980; 38(8):613-6.
3. Tatum H Jr; Maxillary and sinus implant reconstructions. Dent Clin North Am 1986;30(2):207-29.
4. Jensen OT, Shulman LB, Block MS, Iacono VJ; Report of the Sinus Consensus Conference of 1996. Int J Oral Maxillofac Implants 1998;13 Suppl:11-45.
5. Ziccardi and Betts Quintessence 1999
6. Mardinger O, Manor I, Mijiritsky E, Hirshberg A; Maxillary sinus augmentation in the presence of antral pseudocyst: a clinical approach. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2007;103(2):180-184.
7. Woo I, Le BT; Maxillary sinus floor elevation: review of anatomy and two techniques. Implant Dent 2004; 13(1):28-32.
8. Wallace SS, Froum SJ, Cho SC, Elian N, Monteiro D, Kim BS, Tarnow DP; Sinus augmentation utilizing anorganic bovine bone (Bio-Oss) with absorbable and nonabsorbable membranes placed over the lateral window: histomorphometric and clinical analyses. Int J Periodontics Restorative Dent. 2005 Dec;25(6):551-559
9. MacDonald-Jankowski DS. Mucosal antral cysts observed within a London inner-city population. Clin Radiol 1994;49:195-198.
10. Bhattacharyyan N. Do maxillary sinus retention cysts reflect obstructive sinus phenomena? Arch Otolaryngal Head Neck Surg 2000;126:1369-1371.
11. Wiltfang J, Schultze-Mosgau S, Merten HA, Kessler P, Ludwig A, Engelke W; Endoscopic and ultrasonographic evaluation of the maxillary sinus after combined sinus floor augmentation and implant insertion; Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;89:2882-91
12. Timmenga NM, Raghoebar GM, Boering G, Van Weissenbruch R; Maxillary sinus function after sinus lifts for the insertion of dental implants. J Oral Maxillofac Surg 1997;55:936-939.
13. Garg AK, Mugnolo GM, Sasken H. Maxillary antral mucocele and its relevance for maxillary sinus augmentation grafting: a case report. Int J Oral Maxillofac Implants 2000;15:287-290.
14. Diecidue RJ, Streck PD, Spera JF. Diagnosis of benign lesions of the maxillary sinus. Oral Maxillofac Surg Clin N Am 1999;11:83-100.
15. Sciubba JJ. Diagnosis of malignant tumors of the maxillary sinus. Oral Maxillofac Clin N Am 1999;11:117-123.
16. Beaumont C, Zafiropoulos GG, Rohmann K, Tatakis DN; Prevalence of maxillary sinus disease and sbnormalities in patients sceduled for sinus lift procedures. J Periodontol 2005;76:461-467.
17. Gilbert JG. Antroscopy in maxillary sinus disease associated with nasal polyposis. J Laryngol Otol 1989;103:861-863.
18. Earwaker J. Anatomic variants in sinonasal CT. Radiographics 1993;13:381-415.
19. Bachert C, Ganzer U. Experimental studies on the relationship between maxillary sinus ventilation and various obstructions of the moise and the nasopharynx. Rhinology 1989;27:37-43.
20. Draf W. Endonasal surgery of the paranasal sinuses. HNO Praxis H Eute. 1992;12:59-80.
21. Stammberger H, Posawetz W. Functional endoscopic sinus surgery. Concept, indications and results of the Messerklinger technique. Eur Arch Otorhinilaryngol 1990;247:63-76.
22. Habibi A, Sedaghat MR, Habibi M, Mellati E; Silent sinus syndrome: report of a case. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2008; 105(3):e32-35.
23. Perfetti G, Rossi F, Massei G, Raffaelli L, Manicone PF, Paolantonio M, Berardi D, Neri G; Sinus augmentation procedure of the jaw sinus in patients with mucocele. Int J Immunopathol Pharmacol 2008; 21(1):243-246.
24. Garg AK, Mugnolo GM, Sasken H; Maxillary antral mucocele and its relevance for maxillary sinus augmentation grafting: a case report. Int J Oral Maxillofac Implants 2000; 15(2):287-290.
25. Thio D, Phelps PD, Bath AP; Maxillary sinus mucocele presenting as a late complication of a maxillary advancement procedure. J Laryngol Otol. 2003 May;117(5):402-3.
26. Garg AK; Augmentation grafting of the maxillary sinus for placement of dental implants: anatomy, physiology, and procedures. Implant Dent 1999;8(1):36-46.
27. Caylakli F, Yavuz H, Cagici AC, Ozluoglu LN; Endoscopic sinus surgery for maxillary sinus mucoceles. Head Face Med 2006; 6:29.
28. Busaba NY, Salman SD; Maxillary sinus mucoceles: clinical presentation and long-term results of endoscopic surgical treatment. Laryngoscope 1999; 109(9):1446-1449.
29. Gavioli C, Grasso DL, Carinci F, Amoroso C, Pastore A; Mucoceles of the frontal sinus. Clinical and therapeutical considerations. Minerva Stomatol 2002; 51(9):385-390.
30. Naudo P, Gilain L, Coste A, Lelièvre G, Peynegre R; Functional endoscopic surgery of sinusal mucocele. Ann Otolaryngol Chir Cervicofac 1994;111(1):23-27.
31. Kim HY, Dhong HJ, Min JY, Jung YG, Park SH, Chung SK; Postoperative maxillary sinus mucocoele: risk factors for restenosis after surgery and preventive effects of mytomycin-C. Rhinology 2009; 47(1):79-88.
32. Meer S, Altini M; Cysts and pseudocysts of the maxillary antrum revisited. SADJ 2006; 61(1):10-13.
33. Veltrini V, Ferreira Júnior O, Oliveira DT; Mucosal cysts of the maxillary sinus: a literature review. Med Oral 2001; 6(3):180-188.
34. Weissman JL, Curtin HD, Eibling DE; Double mucocele of the paranasal sinuses. AJNR Am J Neuroradiol 1994; 15(7):1263.