A CLINICAL CASE OF PERFORATION OF THE MAXILLARY SINUS MEMBRANE DURING SINUS LIFT SURGERY AND A PROPOSED METHODOLOGY FOR THE MANAGEMENT OF SUBSEQUENT COMPLICATIONS

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ABSTRACT

INTRODUCTION: Bony projections on the inner surface of the maxillary sinus are divided into two main groups: exostoses, which are rounded bone structures, and septa, defined as having a pointed end. Bony septa are common anatomical structures and can lead to complications during sinus augmentation procedures.

MATERIALS AND METHODS: The study reports a clinical case of a vertical partial basal bony septum, where upon elevation of the sinus membrane, its perforation was observed (size >5 mm).

RESULTS: The present study proposes a method of treatment of perforated sinus membranes.The post-surgical period was uneventful. The bone grafting material remained compact in the sinus augmentation site.

CONCLUSIONS: The proposed method for the management of perforated sinus membranes can be applied in surgical procedures for perforations > 5 mm in size.

Keywords: *cone-beam computed tomography, bony septum, maxillary sinus, sinus lift, bone augmentation, complications*

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INTRODUCTION

Prior to any surgical procedure, it is imperative to conduct a thorough examination of the anatomical structure of the operative field (1). It is fundamental to apply cone-beam computed tomography for augmentation procedures of the maxillary sinus floor (2). Human anatomic variations determine the degree of difficulty in performing sinus augmentation. Bony projections play a role in the clinician's choice of surgical methods and modifying techniques spe-

cific to the anatomical variation (3,4). Only after an extensive study of the type of bony septa, their size and position in the sinus, and a radiographic assessment a proper treatment planning can be prescribed (5,6,7).

MATERIALS AND METHODS

A 62-year-old patient was admitted for treatment at the Department of Oral and Maxillofacial Surgery with a complaint of pain in three remaining maxillary teeth. The examination revealed that the teeth had abnormal pathologic mobility and a marked chronic periodontitis. The approach proposed to the patient was for extraction of those teeth and prosthetic restoration with dental implants and a fixed construction. The computerized axial tomography (CAT) scan showed excessive pneumatization of the patient's maxillary sinuses and a necessity for bilateral augmentation of the sinus floor prior to the dental implant procedure. After accepting the treatment plan the patient signed an Informed Consent. The radiographic analysis established the presence of bony septa in both sinuses (Fig. 1).

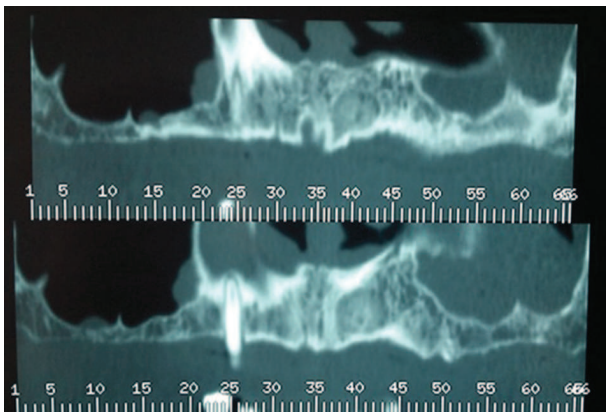

Fig. 1. Computed tomography of the right maxillary sinus

Since the right sinus displayed quite pointed bony septum, it was decided to augment the area before the septum, i.e. to restore the bone up to the missing first molar region.

The surgical intervention was carried out in the following sequence: infiltrative local anesthetic was administered, then the mucoperiosteal flap was dissected to the desired level in a diamond shape: one horizontal incision along the ridge and two vertical incisions in the region of the third and seventh tooth, respectively (Fig. 2).

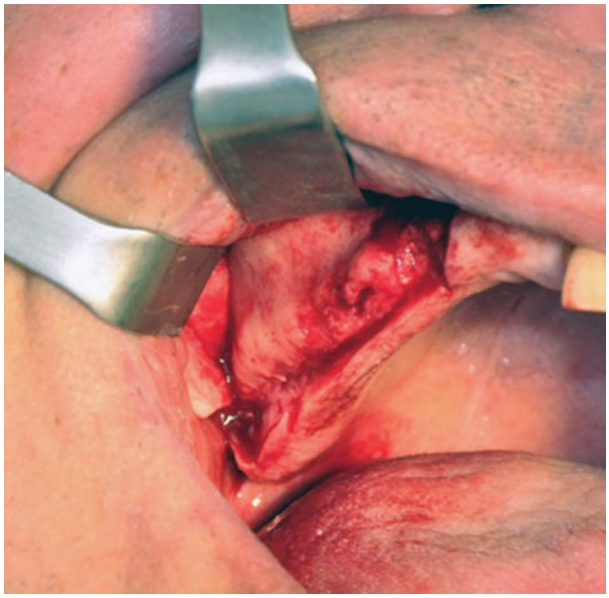

Fig. 2. The mucoperiosteal flap is dissected

The location of the bone window was carefully determined and then gradually separated from the surrounding bone (Fig. 3).

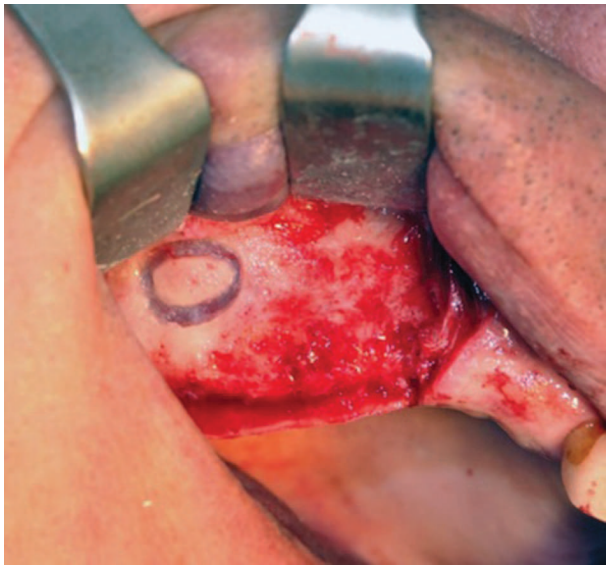

Fig. 3. The bone window was opened on the lateral wall of the maxillary sinus

The membrane was gently separated and raised from the underlying inner surface of the bone in the area of the sinus floor, mesially and above the bone window (Fig. 4). However, in an attempt to separate the distal part, a perforation of the membrane occurred (Fig. 5).

Fig. 4. Lifting of the sinus membrane

Fig. 5. Visualization of the perforation of the sinus membrane

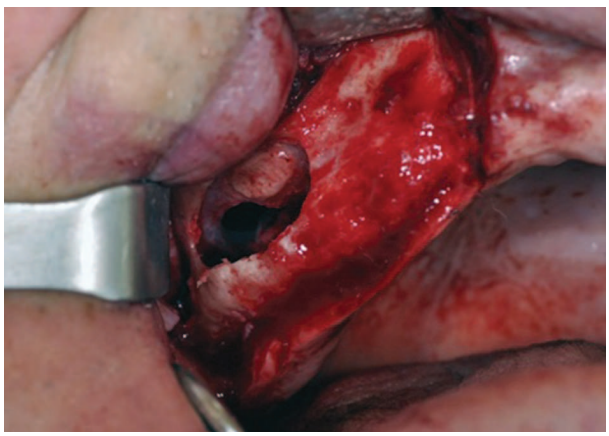

Fig. 6. Expanding the bone window

In order to resolve the perforation, it was decided to expand the window so that perforation remained at its centre (Fig. 6).

Thus, we were able to visually locate the cause of the membrane perforation (Fig. 7).

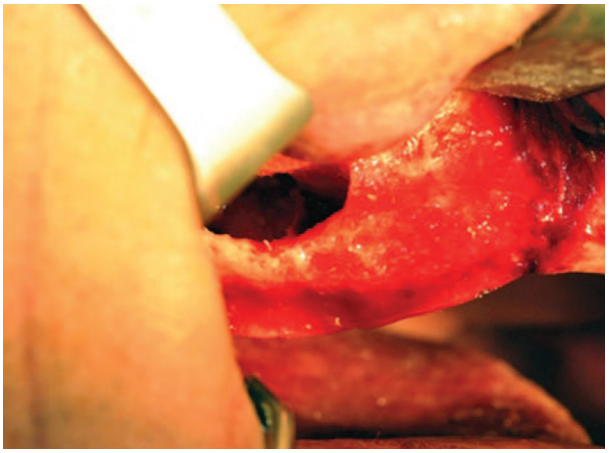

Fig. 7. Presence of bone septum on the maxillary sinus floor

The perforation was measured at 5-7 mm in diameter. We used pericardial membrane with dimensions 20 x 30 mm to be able to fully cover the ruptured part of the mucosa. We applied collagen fleece soaked in venous blood on the inner surface of the grafted sinus floor to fix the membrane (Fig. 8).

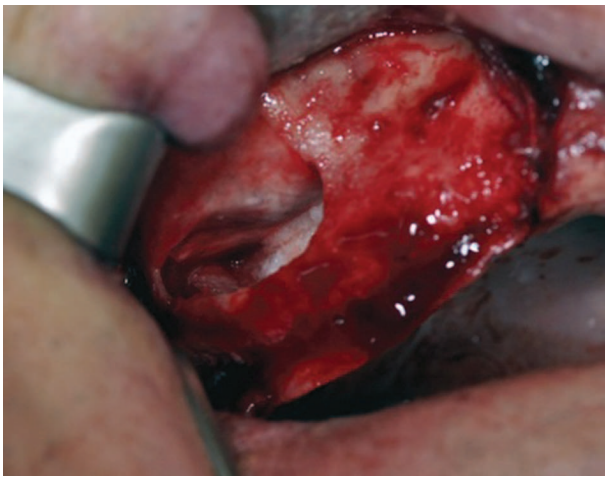

Fig. 8. Positioning of the collagen fleece and the periodontal membrane to repair the perforation of the maxillary sinus membrane

The bone grafting material was placed subsequently and then covered again with pericardial membrane sized 15 x 20 mm (Fig. 9 and Fig.10).

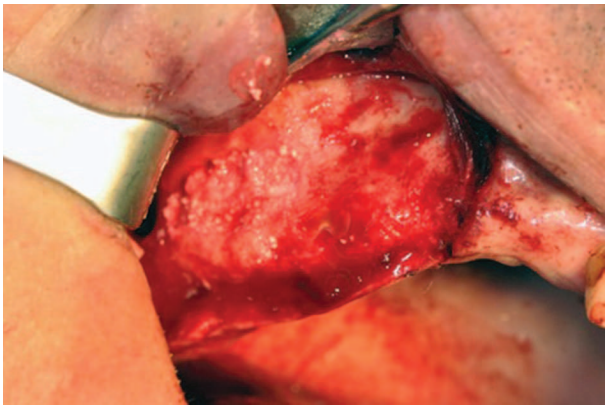

Fig. 9 .The bone graft material is placed

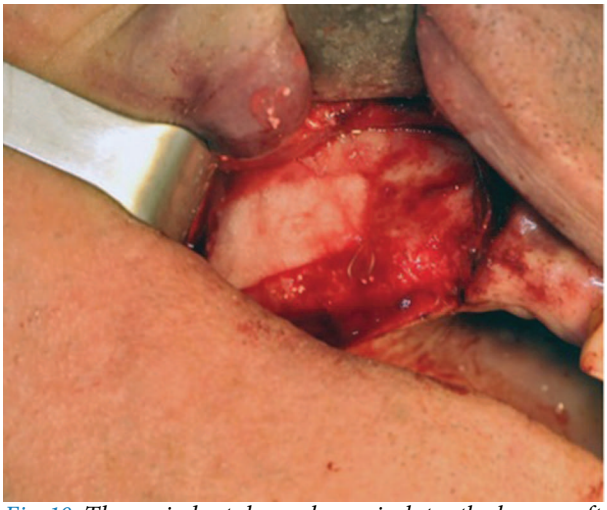

Fig. 10. The periodontal membrane isolates the bone graft from the mucoperiosteum

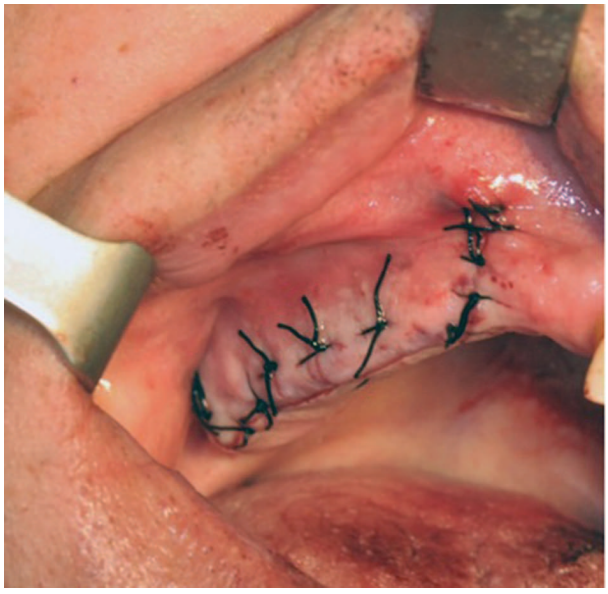

Fig. 11. The wound is sutured

The incision was gently sutured without any tightening (Fig. 11).

RESULTS

The patient had no complaints in the follow-up period and did not take any painkillers. The patient followed the prescribed instructions: to take an antibiotic for 8 days; to have the oral hygiene taken care of by the clinician in the first 48 hours after surgery; subsequently, mouthwash was prescribed to the patient as well as vasoconstrictive nasal spray to be applied 3 times a day to facilitate drainage of the sinus; not to hold the nose while sneezing; not to drink liquids using a straw; to avoid smoking. On the 3rd day after surgery the swelling was reduced. On the 8th day the sutures were removed. 8 months after surgery, implants were placed in this area and 4 months later the patient received a fixed prosthesis for the entire upper jaw.

DISCUSSION

The incidence of septa occurring in the maxillary sinus is 58.17% (8), indicating that every second patient has at least one bony formation in their sinuses. Septa have various height, thickness and width. Septa location and orientation in the sinus also vary. The mean height of bony septa in Varna district is 5.51 mm, the mean thickness is 3.19 mm, the mean width is 7.06 mm. While 84.27% were located in the molar region, 15.73% were in the premolar region (8).

There are a number of publications reporting various prevalence and location of the maxillary septa (9,10,11,12).

Prior to any augmentation of the sinus floor and before determining the location of the bone window, a careful examination ought to be carried out focusing on the presence, type and location of the bony septa. The surgeon should be ready at any time during the intervention to expand the bone window or modify the methodology in order to manage/avoid clinical implications.

In the event of membrane perforation, however unplanned and unwanted that may be, the size of the window is to be expanded so that the perforation remains in the middle of the window. Dissection of the membrane is to be initiated laterally and mesially of the rupture site, and finally around the

septum. After fully separating the sinus mucosa, the perforation remains in the middle of the surgical wound. If the perforation is up to 7 mm the authors recommend using a large pericardial membrane sized 20x30 mm to completely cover the perforation. The membrane is to be so positioned as to lie on the medial wall of the grafted sinus floor as well as on the outer surface of the vestibular wall of the maxillary sinus above the bone window. After the membrane has adapted, it is advisable to wet it with blood obtained from an adjacent source. On the membrane of the medial sinus wall a collagen fleece is to be placed, soaked with venous blood, to further fix the pericardial membrane. Afterwards, the bone grafting material is to be placed and the bone window is to be covered with a small membrane sized 15x20 mm.

There are various reports in the dental literature, suggesting multiple techniques to repair perforated Schneiderian membrane. For instance, utilizing titanium pins to fix the collagen membrane covering the rupture (13), using amnion-chorion membranes (14), platelet-rich fibrin (15), or a suturing technique to close large sinus mucosa perforations (16). Each of these methods has its application in clinical cases. The methodology proposed in the present paper suggests management of intraoperative complications using materials already at hand for the augmentation procedure (17).

CONCLUSIONS

Sinus membrane perforation is a common intraoperative complication. The method suggested by the authors of the present paper proved successful in all cases for managing small perforations <7 mm in diameter where it was applied. For perforations >7 mm it is advisable to suture the sinus mucosa.

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