

## Sinus Membrane Perforation: A Case Report

Saad M Alqahtani, B.D.S

Saudi Board in Peridontics , KSA  
[dr-s-q@hotmail.com](mailto:dr-s-q@hotmail.com)

**Abstract:** The maxillary posterior edentulous region presents many unique and challenging conditions in implant dentistry. Grafting of the maxillary sinus has become a highly predictable surgical technique for posterior maxillary site development and implant reconstruction if proper treatment planning, careful surgical technique, adequate clinician experience, and patient compliance criteria are met. There are, however, complications associated with this technique that would be expected with any surgical procedure. The most common complication is membrane perforation. The aim of this report to review the procedures adopted when a perforation of the sinus membrane takes place during sinus lift, and factors that may cause the perforation, and the complications that may happen from the perforation. Conclusion, the most effective treatment of sinus membrane perforations is their prevention. Sinus membrane perforations may be successfully managed when encountered during sinus augmentation thereby resulting in significant bone augmentation in the treated sinus area. Implant may be placed in these augmented sinuses and restored successfully.

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### 1. Introduction

The maxillary posterior edentulous region presents many unique and challenging conditions in implant dentistry. Grafting of the maxillary sinus has become a highly predictable surgical technique for posterior maxillary site development and implant reconstruction if: proper treatment planning, careful surgical technique, adequate clinician experience, and patient compliance criteria are met.<sup>1</sup>

The sinus floor elevation, or as formerly called, sinus lift procedure is an internal augmentation of the maxillary sinus which is intended to increase the vertical bony dimension in the lateral maxilla in order to make the use of dental implants possible. The operation was conceived and introduced by Tatum 1976. The first publication on this surgical technique was however by Boyne followed by Tatum himself (Boyne et al. 1980; Tatum 1986).<sup>1</sup>

The classical sinus lift operation consists of the preparation of a top hinge door in the lateral maxillary sinus wall. This door is luxated inward and upward together with the Schneiderian membrane to a horizontal position forming the new sinus bottom.

The space underneath this lifted door and sinus mucosa is filled with graft material.<sup>2</sup>

Sinus membrane perforation is the most prevalent complication of the sinus floor elevation procedure. It occurs in 10% to 35% of sinus floor elevation procedures.<sup>1-3</sup> Infection, bacterial invasion, loss of the graft material, and disruption of normal sinus physiologic function have been attributed to intraoperative sinus membrane perforation.<sup>1,4,5</sup> Anatomic as well as technical factors have been

implicated in membrane perforation. The shape of the osteotomy and whether the lateral bony window is wholly detached or hinged in both can have a direct effect on the risk and severity of a membrane perforation.<sup>6</sup> The presence of antral septa can complicate membrane elevation and increase the risk of perforation during the procedure.<sup>5,7</sup>

Several attempts have been made to classify membrane perforations. Vlassis and Fugazzatto<sup>6</sup> proposed 5 classes based on location and difficulty to repair. Pikos<sup>11</sup> referred to small (5 to 10 mm wide) and large (greater than 10 mm wide) perforations.

Repair of sinus membrane perforations intraoperatively may be performed using a variety of techniques and materials, including sutures, collagen membranes, fibrin glue, and freeze-dried lamellar bone sheets. Special care and delicacy are required to avoid enlarging the perforation.<sup>1,6</sup> Various grafting materials have been used during sinus augmentation procedures, including autogenous bone, freeze-dried bone allografts, xenografts, hydroxyapatite (HA), tricalcium phosphate, and combinations of these materials.<sup>8-12</sup>

The aim of this report to review the procedures adopted when a perforation of the sinus membrane takes place during sinus lift, and factors that may cause the perforation, and the complications that may happen from the perforation.

### 2. Case Report

A 28-year-old man presented to the office for a consultation, seeking dental implant to replace missing tooth #16. Review of the medical history

was noncontributory, and there were no current medications. Before treatment, the patient was clinically and radiographically examined [by panoramic radiography and computed tomography

(CT) scanning for available bone volume, bone quality, anatomy and any existing sinus pathology.

#### **Surgical technique**

All the procedure was performed under local anesthesia. Prophylactic oral antibiotics were used routinely (Amoxicilin 500–1000mg), beginning

8 h before the procedure and continued for 7 days. The sinus augmentation procedure followed the technique described by Tatum and coworkers (Chanavaz 1990; Betts & Miloro 1994). A horizontal antero-posterior incision was made slightly palatal to the alveolar crest and supplemented by buccal releasing incisions at the anterior and posterior ends of the horizontal incision. A full-thickness mucoperiosteal flap was raised and the lateral wall of the sinus was exposed. A rectangular osteotomy was made with a round bur mounted on a high-speed handpiece.(Fig. 1,2) Care was taken not to perforate the sinus membrane. The sinus membrane was carefully and completely reflected from the maxillary sinus floor and the medial wall to create enough space for the bone graft. Schneiderian membrane perforations were not considered a reason to abort the planned augmentation procedure. When a membrane perforation was discovered, the membrane surrounding the perforation was delicately dissected with a blunt instrument, in an attempt to relieve the pressure, at the perforated area. (Fig. 3) Depending on the extent of the perforation, (Fig. 4,5) patching with a collagen membrane (Bio-Gide, Geistlich Biomaterials, Wolhusen, ( fig. 6), after that sinus was augmented with Filling material consisted of inorganic bovine bone mineral (Bio-Oss;

Geistlich. (Fig. 7) After graft placement and packing, the mucoperiosteal flap was repositioned and sutured with monofilament sutures.(Fig 8)

#### **Postoperative care**

Patients were advised not to blow their noses and to sneeze opening the mouth for 1 week after surgery. Patients were also instructed not to wear their dentures for 2 weeks postoperatively. Antibiotics (Amoxicilin 500mg three times/day) were prescribed for 7 days and analgesics as required in each case. Finally, sutures were removed after 7–10 days following surgery.

After 8 months , the implant site were prepared. Preparation of the fixture site was undertaken using surgical guides based on waxup models and according to the standard clinical procedures for the implant system (Life Core , Prima Conex,USA) size 4.1\*11.5 .( Fig. 9,10). For postoperative, Patients were also instructed not to wear their dentures for 2 weeks postoperatively. Antibiotics (Amoxicilin 500mg three

times/day) were prescribed for 7 days and analgesics as required in each case. Finally, sutures were removed after 7–10 days following surgery.



Fig. 1: missing #16 .PA x ray show that the space from crest of bone to sinus wall is 4 mm.



Fig. 2: after reflection of full thickness flap

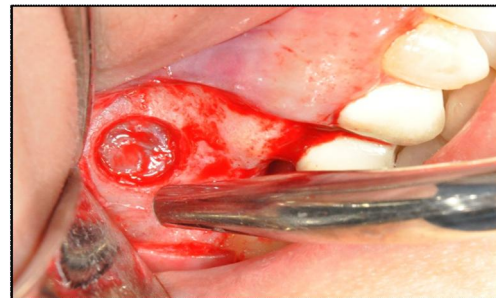


Fig. 3: using diamond bur to prepare the window



Fig 4 : sinus membrane perforation in upper right area

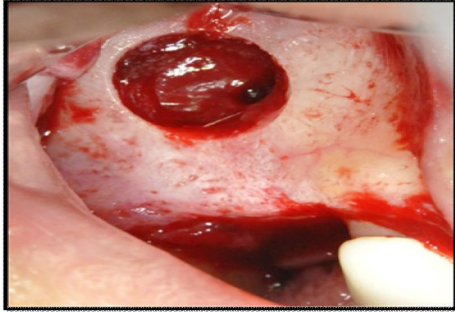


Fig. 5 complete reflection of membrane

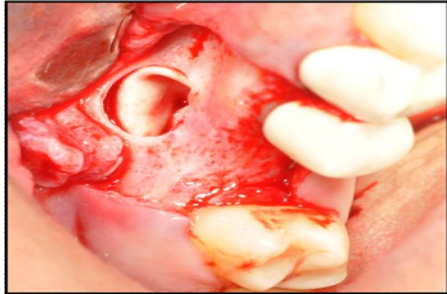


Fig. 6 placement of collagen membrane

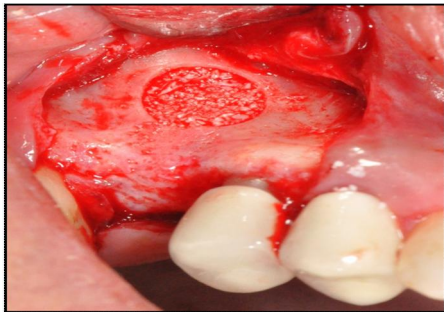


Fig. 7 placement of bone graft



Fig. 8 suture.

### 3. Discussions

Grafting of the maxillary sinus is a method for reaching sufficient bone height for posterior maxillary implant placement and has proven to be a highly successful method and to give predictable results (Chanavaz 1990; Bergh van den et al. 2000a, 2000b; Aimetti et al. 2001; Nkenke et al. 2002; Shlomi et al. 2004; Sorní et al. 2005). Sinus floor elevation

procedures are routinely performed, although the function of the maxillary sinus is not clearly understood. Some of its functions might be adding resonance to the voice and some degrees of olfactory function, warming and humidifying inspired air, as well as reducing the weight of the skull (Bergh van den et al. 2000a, 2000b; Nkenke et al. 2002).

The most commonly reported intraoperative complication of sinus augmentation is membrane perforation (Vlassis & Fugazzotto 1999; Cho et al. 2001; Levin et al. 2004; Proussaefs et al. 2004; Schwartz-Arad et al. 2004; Shlomi et al. 2004; Sorní et al. 2005). It has been reported to occur in 7–35% of sinus floor elevation procedures (Khoury 1999; Nkenke et al. 2002; Stricker et al. 2003; Schwartz-Arad et al. 2004; Shlomi et al. 2004).

There is a correlation between implant failure and sinus membrane perforation (Khoury 1999). In 104 cases, sinus lift surgery was complicated by perforation of the sinus membrane, which was treated using different techniques and materials intended to act as a barrier between the sinus cavity and the site of graft placement. The results of this study point toward the idea that the extent of sinus membrane perforation can result in reduced bone formation and a compromised implant survival rate. To explain this fact, it can be hypothesized that displacement of a biomaterial through the sinus membrane can lead to transient or chronic sinusitis from 10% to 20% of sinus elevation cases, prompting the need for further treatment (Nkenke et al. 2002), and impairing the prognosis of the placed implants.

Several clinicians have recommended the use of a resorbable collagen membrane for repairing the perforated sinus membrane (Proussaefs et al. 2004). Proussaefs et al. (2004) reported repair of sinus perforations, with a collagen membrane, assuming that it forms a pouch around the sinus graft material and seals the lateral access window.

The question of placing implants simultaneously or delayed in conjunction with a sinus floor augmentation procedure is controversial. If the residual bone volume is more than 5mm in height, primary stability of the implants can usually be achieved (Peleg et al. 1999; Mangano et al. 2003) and it has also been our experience. However, if there is 0.5mm of available residual bone, it has been considered to be insufficient to maintain the implants mechanically, and a two-step procedure has been recommended (Peleg et al. 1999).

### Conclusion

The most effective treatment of sinus membrane perforations is their prevention. Sinus membrane perforations may be successfully managed when encountered during sinus augmentation thereby resulting in significant bone augmentation in the

treated sinus area .Implant may be placed in theses augmented sinuses and restored successfully .

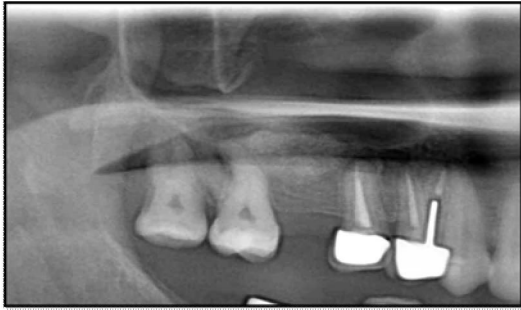


Fig. 9 X ray after 8 months

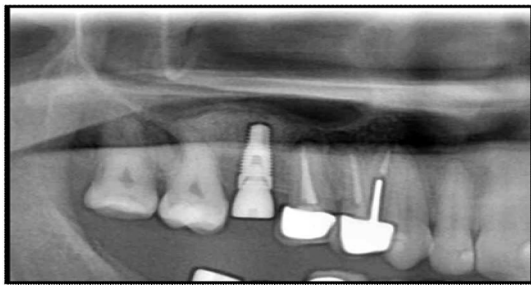


Fig. 10 after placement of implant

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