Sir:

Complications appeared during or after the sinus membrane elevation are under meticulous investigation of different specialists. Among peroperative ones are: sinus membrane perforation, hemorrhage/bleeding, buccal bone fracture, nonachievement of primary stability, and infraorbital nerve injury. Postoperative complications are usually divided into acute and chronic: bleeding, graft leak, wound opening, infections, endosinus extrusion of the implant, and modification of the mucosa.

According to Barone et al a Schneiderian membrane (synonym: mucoperiosteal lining of the maxillary sinus) perforation is the most common complication (noted in the 25 percent of performed sinus lifts). Some studies reported even 56 percent of perforation accidents.1

Two different classifications of sinus membrane perforations are applied according to a 1) lateral or 2) transcrestal sinus floor elevation. In cases of lateral (synonyms: direct, open)4 lift the perforations are divided into IV Classes5 proposed by Fugazzotto and Vlassis in 2003 which became a simplified version of the 1999`s V Classes Classification6 developed by the same authors.

The 2003`s Classification by Fugazzotto and Vlassis includes Class I, II, III (which can be IIIA [along the lateral or cranial wall of the created window, when a cavity to be augmented extends a minimum of 4–5 mm beyond the perforation with additional space for performance of a further osteotomy] and IIIB [the same as upon IIIA but without the additional space for osteotomy]), and IV.5

In cases of transcrestal lift the perforations are classified by Tavelli et al7 into three types:

- Type I – small perforation caused by an implant drill.
- Type II – large perforation caused by a drill.
- Type II – perforation caused by uncontrolled forces applied during Schneiderian membrane elevation or resulting from membrane collapse during grafting, with the consequent graft migration into the sinus.
- Type III – can occur during dental implant placement and be hidden by the implant body.

HOW TO AVOID PERFORATION?

Becker et al8 and Tourbah with Maarek1 described the factors that can increase the risk of sinus membrane perforation: 1) previous entrance into the sinus (ie, scarring), 2) septa, 3) thin membrane, 4) soft tissue adhesion, 5) cyst/sinus pathology, 6) operator error, and 7) overfilling with the graft material. Kendrick insisted9 – to reducing risk of perforation can be achieved by the ultra-careful evaluation of


The word ‘Lift’ at the upper right icon means that article focused on sinus floor elevation.
preoperative CT for assessment of:

1. The thickness of the sinus bone wall.
2. Location of septa.
3. Membrane thickness: the incidence of perforation is higher when the thickness is less than 1.5 mm.¹

**MANAGEMENT**

Hernández-Alfaro et al.¹⁰ in 2008, presented six solutions for the perforations: suturing (in 11 percent of cases), resorbable collagen membrane (42.30 percent), lamellar bone + resorbable collagen membrane (26.92 percent), lamellar bone (3.84 percent), lamellar bone + buccal fat pad (9.61 percent), and bone block graft (5.76 percent).

Barbu et al.¹¹ in 2019 published their two management techniques for tearing: suturing (in 51 percent of cases) and sealing using a low-resorption collagen membrane (in 49 percent).

Beck-Broichsitter et al.¹² in 2020 reported their six ways of perforations’ management: no treatment, suture, fibrin glue, collagen membrane, suture + fibrin glue, and suture + collagen membrane. In 56 percent of cases the perforation was covered by membrane and in 20 percent a suture with membrane was applied.

Thus, the results of all three groups of surgeons demonstrate a strong position (42.30, 49, and 56 percent) of resorbable collagen membrane application among other perforation restorative techniques.

In my practice the resorbable collagen membrane is a preventive measure used in all cases of the direct lift, regardless of whether there is a perforation or not (Fig 1). But we should remember the thesis highlighted by Younes and Boukaram: when the perforation reparation is impossible, the lift is aborted and reentry is planned after 3 months.¹³

**FIGURE 1.** Uncomplicated lateral (arrowhead) sinus floor elevation (using a complete osteotomy design) in a 37-year-old male. No evidence of Schneiderian membrane (arrow) perforations (A) is noted. Bone grafting using spongious bovine bone material (1–2 mm granules) (asterisk) simultaneously with a 25 × 25-mm resorbable collagen membrane (dot) was used as a preventive measure (B).
PIEZOSURGERY

Considering the data that piezosurgery offers a 75 percent reduction in the expected Schneiderian membrane perforation rate, piezosurgery becomes a must have equipment for all clinics focused on sinus grafting. As for me, a prolonged transoperative time and a cost of piezosurgical equipment are only two minor disadvantages of that technology.

Summarizing the data, it's important to emphasize the importance of resorbable collagen membrane usage in cases of small (<5 mm), large (5–10 mm), and even complete sinus membrane tears (large dilacerations). Collagen membrane usage even in non-perforated cases is highly recommended taking into account my own experience.

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