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CLINICAL RECORD

# Maxillary sinus atelectasis (silent sinus syndrome): treatment with balloon sinuplasty

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## Abstract

*Introduction*: Maxillary sinus atelectasis is a form of chronic rhinosinusitis of uncertain aetiology. Previously, the conventional treatment for this condition has been standard endoscopic surgery. There are no reports in the literature of successful treatment using balloon sinuplasty.

*Methods*: A case of a patient with right maxillary sinus atelectasis is presented, who was treated using the balloon sinuplasty technique.

*Results*: The patient's right maxillary sinus atelectasis was successfully treated using balloon sinuplasty. Three-month follow-up evaluation documented retention of the remodelled form of the uncinate process, and of maxillary sinus os patency.

*Conclusion*: This is the first report of successful use of the balloon sinuplasty technique for the treatment of maxillary sinus atelectasis. Follow up demonstrated resolution of the underlying pathophysiology. Further study of the balloon sinuplasty technique for the treatment of maxillary sinus atelectasis is required to determine whether it has widespread applicability, given the current standard treatment.

**Key words:** Endoscopic Surgical Procedure; Maxillary Sinus; Sinusitis

## Introduction

Maxillary sinus atelectasis is an uncommon form of chronic rhinosinusitis of unknown aetiology. It was first described by Montgomery[1] in 1964 as a mucocele of the maxillary sinus causing ipsilateral enophthalmos. Thirty years later, the term silent sinus syndrome was coined by Soparkar *et al.*[2] to refer to maxillary sinus atelectasis with ipsilateral enophthalmos in an asymptomatic patient. The pathophysiology of the disease consists of obstruction of the maxillary sinus ostium which leads to hypoventilation and absorption of sinus gases. This creates a negative pressure, on average $-8.4 \pm 2.6$ cm $H_2O$, which draws sterile fluid from the mucosa and leads to a low-grade inflammation.[3] This inflammation in turn causes bone resorption and, in the setting of the negative pressure, inward displacement of the affected maxillary sinus wall(s). Inward movement of the maxillary sinus roof leads to an increase in the volume of the ipsilateral orbit, resulting in globe enophthalmos and hypoglobus. Once diagnosed, sinus surgery results in cessation of the sinus atelectasis and possible partial reversal of the secondary orbital changes. Not all patients will require orbital surgery for correction of orbital defects.[4]

To date, only traditional sinus surgery has been successfully utilised to remove the lateralised uncinate process and to perform a maxillary antrostomy, in order to improve ventilation and remove the trapped mucus within the sinus. Although the balloon sinuplasty technique has been available since 2006, to date there are no reports of its successful use to treat maxillary sinus atelectasis.[5] This paper describes the successful treatment of maxillary sinus atelectasis using balloon sinuplasty.

## Case report

A 40-year-old woman was evaluated for bilateral sinus barotrauma during air travel, a problem which had been ongoing for several years. She complained of bilateral frontal pain during air flights, indicating a likely frontal sinus origin. She had tried numerous over the counter medications to prevent this pain, without success. The patient was non-atopic and had no history of asthma. She was a non-smoker, took no medications and was otherwise healthy. She had no history of previous sinonasal procedures or facial trauma.

During her evaluation, endoscopic examination revealed lateral displacement of the right infundibulum. There was no endoscopic evidence of polyps or purulent secretions on either side.

Computed tomography (CT) scanning of the paranasal sinuses was performed. There was minimal mucosal thickening in the frontal recess bilaterally (the patient had flown 1 day prior to the CT scan, during which she experienced her typical bilateral, frontal headache). There was complete opacification of the right maxillary sinus (Figure 1), with

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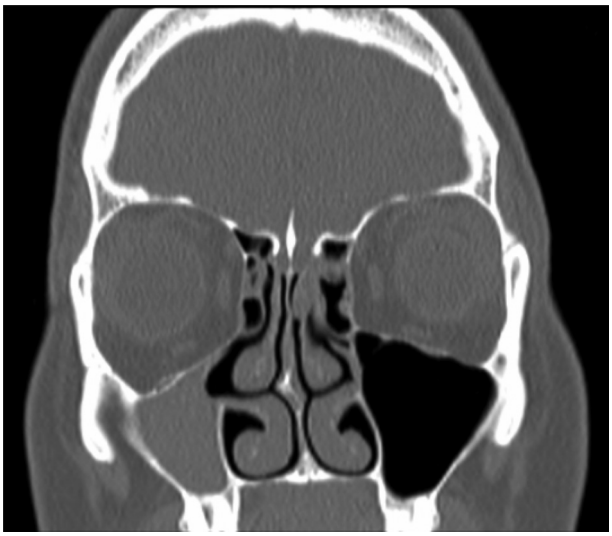

FIG. 1
Coronal computed tomography scan demonstrating lateralisation of the right uncinate process with resultant maxillary sinus atelectasis, causing complete opacification of the right maxillary sinus.

evidence of remodelling of all maxillary sinus walls (Figure 2). A diagnosis of right maxillary sinus atelectasis was made, with a concurrent history of frontal barotrauma.

Treatment was planned using balloon sinuplasty for the frontal recesses bilaterally and also for the right maxillary sinus. If balloon sinuplasty could not adequately remodel the uncinate process, a standard uncinectomy and antrostomy were planned.

In order to surgically address the right maxillary sinus, a 110° guide was used under endoscopic visualisation with a 30° endoscope. An illuminated Luma catheter (Acclarent, Menlo Park, California, USA) was passed without resistance immediately via the maxillary sinus os into the antrum, with resultant transillumination of the right maxillary sinus visible externally. A 6 × 16 mm balloon was then advanced into the os using the Seldinger technique, such that the balloon straddled the os. The balloon was then inflated to 12 atm for 5 seconds then deflated. A second inflation was performed targeting the uncinate process. This resulted in medialisation and remodelling of the uncinate process, with sufficient dilatation of the maxillary os. A Vortex irrigation catheter (Acclarent) was then advanced into the antrum, using the Seldinger technique, and the retained mucus evacuated by irrigating with 40 ml sterile saline. The immediate result was satisfactory and no other procedure was performed.

FIG. 2
Axial computed tomography scan demonstrating remodelling of the walls of the atelectatic right maxillary sinus.

FIG. 3
Endoscopic view demonstrating the unobstructive position of the right uncinate process, three months following balloon sinuplasty treatment.

Post-operatively, the patient had no problems and healing occurred without incident. High-volume, low-pressure irrigations were undertaken for three weeks, starting on the first post-operative day, then stopped. At both the three-week and three-month post-operative evaluations, the uncinate process remained in a non-obstructive anatomical position (Figure 3). The patient's symptoms of bilateral frontal sinus barotrauma also ceased following treatment.

## Discussion

Maxillary sinus atelectasis is adequately treated by surgery that corrects the position of the obstructing uncinate process, enlarges the maxillary sinus os and evacuates the retained sinus mucus. To date, there have been no reports of successful use of balloon sinuplasty to treat this condition. However, this tool has been adopted widely since its introduction in 2006.[6] In our patient's case, follow up at three months demonstrated a sustained corrective effect of balloon sinuplasty.

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- **Maxillary sinus atelectasis, a type of chronic rhinosinusitis, is of unknown aetiology**
- **It causes negative antral pressure and potential remodelling of all sinus walls, with frequent ipsilateral enophthalmos and hypoglobus**
- **Standard treatment is endoscopic uncinectomy and maxillary sinus antrostomy**
- **In the presented case, balloon sinuplasty was successful**

The presented case was successfully treated using balloon sinuplasty; however, it is not yet clear whether this tool is applicable in all cases of maxillary sinus atelectasis. In the presented case, there was minimal displacement of the maxillary sinus roof (orbital floor); however, it is conceivable that, in patients with significant enophthalmos, balloon dilatation could cause rapid displacement of the orbital floor and a resultant, transient post-operative diplopia. Similarly, if the uncinate process does not retain its remodelled form following balloon dilatation, this procedure will not be successful in treating maxillary sinus atelectasis. Furthermore, given the wide variation in lateral wall anatomy and the varying degrees of uncinate process demineralisation associated with this diagnosis, additional evaluation is warranted prior to global adoption of balloon sinuplasty as treatment for maxillary sinus atelectasis. A prospective study is required to determine whether the use of balloon sinuplasty is safe and effective for the treatment of maxillary sinus atelectasis. If this seems to be the case, then consideration could be given to whether this technique could be transferred from the operating theatre to a clinic setting.

## Conclusion

This paper reports the first case of maxillary sinus atelectasis successfully treated using balloon sinuplasty. This procedure may represent a viable treatment option for this condition. However, further experience is needed to determine whether it is applicable in all cases of maxillary sinus atelectasis, particularly those with marked orbital floor displacement into the maxillary antrum.

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