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# Enophthalmos, a Sequela of Maxillary Sinusitis

Ross T. Eto and James M. House

**Summary:** Enophthalmos developed in a 44-year-old woman with history of respiratory infection but not of sinus disease. Sinus roentgenograms and MR revealed opacification of the right maxillary antrum, deviation of the nasal septum to the right, obstruction of the right osteomeatal complex, and diminished volume of the right maxillary sinus.

**Index terms:** Eyes, abnormalities and anomalies; Paranasal sinuses, inflammation

Since Montgomery's 1964 paper (1) described enophthalmos caused by maxillary sinusitis, a number of papers (2, 3, 5, 6) have been published relating chronic sinus disease, with and without mucocoeles, to the development of such ophthalmologic complications. Speculation has been offered that enophthalmos is caused by erosion of the orbital floor or is coincidentally associated with development of sinusitis within a congenitally hypoplastic right maxillary antrum. We present a case that demonstrates that obstructive sinus disease can cause a resculpturing of the bone architecture of the maxillary sinus, resulting in enophthalmos in a short time.

## Case Report

N.M. was a 44-year-old white woman who reported gradual right enophthalmos developing over a period of at least 4 months. She denied diplopia and previous orbital trauma. She had suffered from recent respiratory infections but had no history of sinus disease.

Sinus roentgenograms and magnetic resonance (MR) revealed opacification of the right maxillary antrum, deviation of the nasal septum to the right, obstruction of the right osteomeatal complex, and a diminished volume of the right maxillary sinus (Fig 1). An MR scan done 1 year earlier, or approximately 8 months before the onset of the enophthalmos during an evaluation of headaches, showed no evidence of diminished maxillary sinus volume (Fig 2).

After failure to respond to topical steroids and cefaclor for 2 weeks, a right antral lavage demonstrated no purulent material and a negative culture for pathogens. Six weeks after initial treatment, a septoplasty, right antral meatoplasty, right Caldwell-Luc, and right orbital exploration with implantation of a Silastic prosthesis in the orbital floor were performed. A satisfactory cosmetic and functional result was obtained with complete relief of the enophthalmos. Repeat MR 1 year after the original surgery (Fig 3) showed proper position of the prosthesis in the right orbital floor and a partial reexpansion of the sinus when compared to the preoperative study (Fig 2).

## Discussion

A number of papers (2-6) have been published relating obstructive maxillary sinus disease, with or without mucocoeles, to the development of enophthalmos. In the absence of trauma, the triad of obstructive sinus disease, diminished antral volume, and enophthalmos have been thought to be caused by inflammatory erosions and inferior displacement of the orbital floor; development of sinusitis in a congenitally hypoplastic antrum; or restructuring of the maxillary sinus caused by pressure changes resulting from sinusitis.

In our case, an MR was obtained for evaluation of headaches 8 months before the onset of enophthalmos. This study showed normal maxillary sinuses bilaterally. One year later (and 4 months after the onset of enophthalmos), a second MR revealed not only opacification of the right antrum, but also a decrease in antral size secondary to caudal displacement of the orbital floor and medial displacement of the lateral maxillary wall. After medical and surgical treatment of the sinusitis and enophthalmos, the volume and contour of the sinus returned to near normal.

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Fig 1. A, Anteroposterior coronal MR image (500/19/2 [repetition time/echo time/excitations]) demonstrates caudal displacement of the floor of the right orbit (*small arrow*) and near total opacification of the antrum.

B, Axial 400/19/2 image demonstrates medial displacement of the lateral wall of the right maxillary antrum with loss of the normal reverse-S configuration and decrease in total volume of the right maxillary antrum (*small arrow*). An air-fluid level is present.

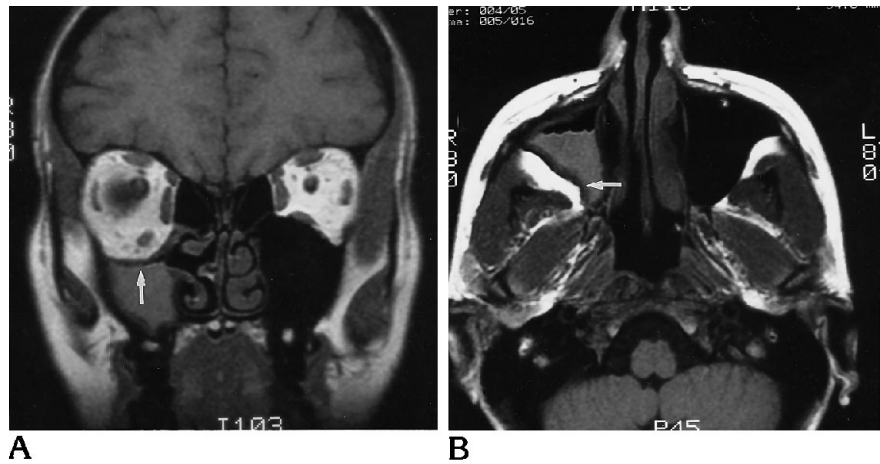


Fig 2. A, Anteroposterior coronal 2500/20/1 MR demonstrates pneumatized normal-size maxillary antra.

B, Axial 2500/20 MR demonstrates pneumatized normal-size maxillary antra.

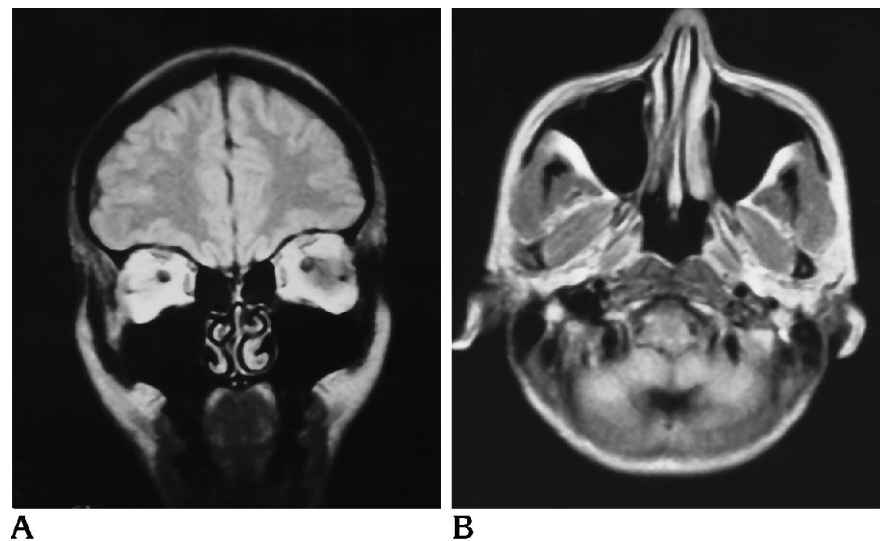
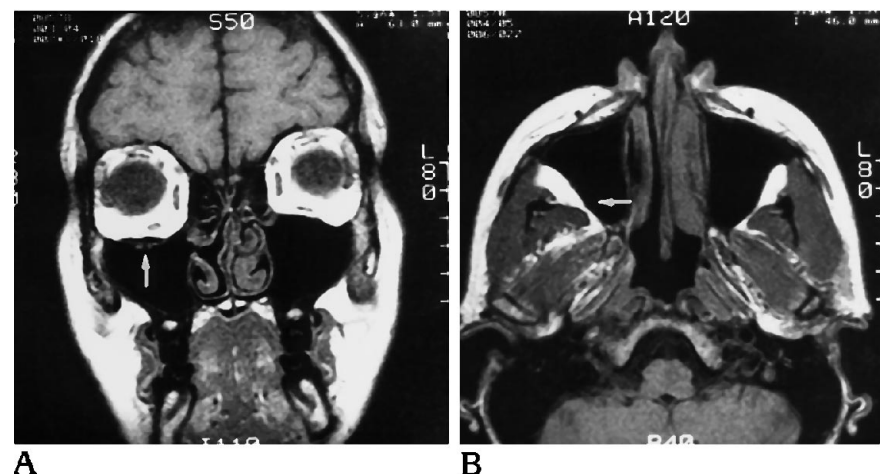


Fig 3. After treatment for sinusitis and placement of polytef implant in the floor of the right orbit.

A, Coronal 500/20/2 MR demonstrates minimal caudal displacement of the right orbital floor with the polytef implant in place (*small arrow*). The overall volume of the right maxillary antrum approaches that of the presinusitis examination.

B, Axial 650/20/2 MR demonstrates no evidence of sinusitis and near normal appearing maxillary antrum in volume and contour (*small arrow*). Note that the contour of the lateral wall of the right maxillary antrum is beginning to resemble the presinusitis images, as shown in Figure 2.



Inferior displacement of the orbital floor may be a result of osteoblastic and osteoclastic activity induced by inflammation along with gravity. In general, this goes against the classic dogma that chronic sinusitis results in osteoblastic thickening of the sinus walls induced by hyperemia and the inflammatory response. Neither theory explains the decrease in volume and contracture of the antrum.

A hypothetical mechanism for the decrease in volume may be the result of pressure changes acting on diseased bone. Osteomalacic changes induced by the chronic inflammation and hyperemia associated with obstructive sinus disease may weaken the bone. Together with negative pressure, resulting from obstruction of the maxillary ostium from sinusitis, the antral walls contract leading to a diminished volume. After resolution of the sinusitis if the pressure is returned to normal, the process reverses, and the volume returns to normal.

In summary, enophthalmos has been shown in a number of publications to be related to obstructive sinus disease. This report demonstrates the short time frame within which disease of the maxillary sinus can result in enoph-

thalmos, and further shows that such a process is partially reversible. Enophthalmos should be regarded as a potential complication of untreated obstructive sinus disease. Correction of the obstructive process can result in reversal of the contracture of the sinus. It must be left to future studies to determine whether such correction also would improve the enophthalmos without placement of an orbital floor implant.

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