

In the era of endoscopic sinus surgery, is there still a place for the Caldwell-Luc procedure?

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Abstract. *In the era of endoscopic sinus surgery, is there still a place for the Caldwell-Luc procedure?* In this report, we present evidence in favor of the Caldwell-Luc approach to the maxillary antrum in selected cases where endoscopic techniques are inadequate to allow full resolution of the problem. Although this procedure is not as popular as it was in the past, its role in the management of benign paranasal sinus diseases is still important. We focus in particular on use of the Caldwell-Luc procedure for conditions such as fungal mycetoma, foreign body removal, empyema, and benign nasal tumours in areas that are not fully accessible by endoscopy alone. Advantages of this technique are its safety and simplicity; no special instrumentation is necessary. It can be performed with surgical equipment widely available in operating rooms in Greece and elsewhere.

Introduction

Since the introduction of endoscopic sinus surgery in the 1960s by Messerklinger, there has been significant progress using this technique, and otolaryngologists have investigated many new indications and potential applications. What can currently be achieved with endoscopy differs drastically from what was possible in 1985, due to the evolution and refinement of endoscopes, powered debriders, and advances in image guidance equipment.¹ As a result of this progress, the majority of patients with benign diseases of the paranasal sinuses are treated with endoscopy.²

The Caldwell-Luc operation is an established technique with a large amount of clinical data supporting its use. The indications for this procedure and the success and complication rates are well reported and documented.³ We present the following cases of patients in whom initial treatment with endoscopic sinus surgery had failed and that were later managed successfully by the Caldwell-Luc procedure. We propose that this technique is still indicated in specific cases and should be included in ENT surgeons' armamentarium. Institutional review board approval for this report was obtained from the University Of Thessaly School Of Medicine.

Case reports

Case 1. Retrieval of foreign body in maxillary sinus

A 28-year-old man was referred by his general dentist to our department with a diagnosis of left-sided sinusitis not responding to medication. A CT scan demonstrated total opacification of the left maxillary sinus with signs of calcification, suggesting a diagnosis of fungus ball (Figure 1). An office-based, diagnostic puncture of the inferior meatus was performed and copious pus was drained from the maxillary sinus. Due to the persistence of symptoms, a wide endoscopic middle and inferior meatal antrostomy was performed, in which the inferior and middle meatus were united to a common meatus. The sinus mucosa appeared to be edematous, friable, and hemorrhagic. Antibiotics and nasal steroid spray were also prescribed. Five months later, the patient returned with the same symptoms and a new CT scan showed findings similar to the initial scan. The patient underwent a radical antrum operation (Caldwell-Luc procedure). During the procedure, a foreign body 3 cm long impacted deep into the thickened inflamed mucosa was retrieved from the maxillary sinus (Figure 2). This synthetic material had been accidentally placed into the maxillary sinus cavity during a

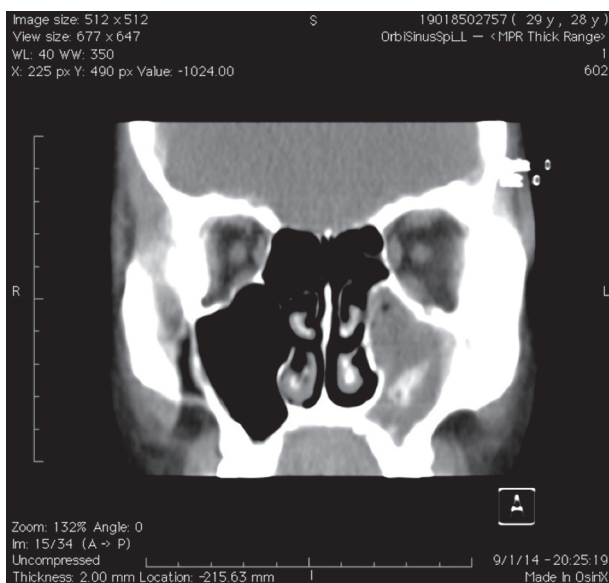


Figure 1

CT, coronal. Opacification of the left maxillary sinus with signs of calcification.

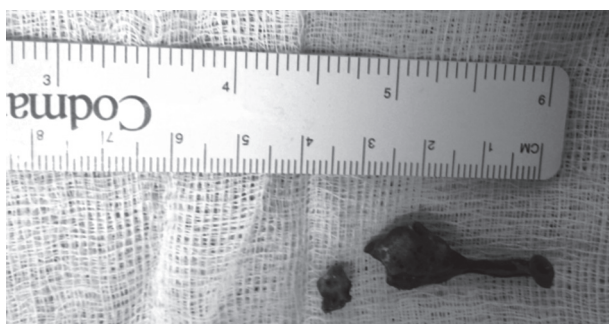


Figure 2

Foreign body retrieved from the maxillary sinus

denervation procedure to the ipsilateral second premolar a year before. Six months later, the patient was free of symptoms.

Comment: Persistent inflammation of the maxillary that fails to resolve by endoscopic intervention can be managed by radical antrum operation, provided care is taken to avoid the infraorbital nerve and all neural elements.^{4,5} This allows for a better overview of and intervention through the cavity, particularly with respect to the floor and anterior wall of the sinus, where visual control and instrumentation by endoscopic surgery is challenging. Current endoscopic instrumentation allows for extensive visualization of the nasal cavity; however, limitations remain for cases of anterolateral pathology. Moreover, if there are

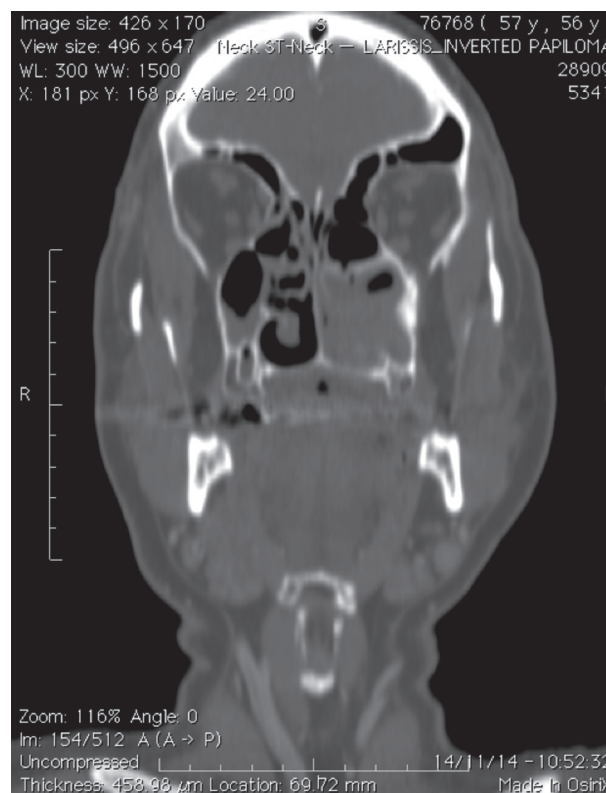


Figure 3

CT, coronal. Soft tissue density mass originating in the maxillary sinus and extending to the left nasal cavity. Focal hyperostosis at the lateral part of the sinus indicates site of origin of the mass.

persistent symptoms and radiological findings, the presence of a foreign body impacted in the thickened and inflamed mucosa of the maxillary sinus should be considered.⁶

Case 2. Inverted papilloma of maxillary sinus

A 56-year-old man presented complaining of left nasal obstruction. CT scan demonstrated a soft tissue density mass originating from the maxillary sinus extending into the left nasal cavity. There was also focal hyperostosis at the lateral part of the sinus, indicating the site of origin (Figure 3). Biopsies indicated a diagnosis of inverted papilloma. Endoscopic maxillectomy was performed, and total tumour removal was facilitated by a Caldwell-Luc approach to drill away all remnants of mucosa from the site of origin of the tumour, which would have been difficult to control by endoscopy alone. The patient remained disease free 6 months later.



Figure 4

CT, axial. Fully opacified right maxillary sinus with hyperintense densities.

Comment: In cases of benign tumours of the maxillary antrum, such as inverted papilloma, the Caldwell-Luc approach is a useful adjunct when it is necessary to access areas that are difficult to reach via endoscopy alone, such as the anterolateral part of the antrum.⁷

Case 3. Mycetoma of maxillary sinus

A 75-year-old woman with a history of common infections of the lower respiratory system was referred to our clinic due to ipsilateral facial pain with edema of the soft tissues in the canine fossa area. Endoscopic examination was unremarkable, while a CT scan revealed a fully opacified right maxillary sinus (Figure 4). A wide endoscopic middle meatal antrostomy and cleaning of the maxillary sinus was performed. Ethmoidectomy was not performed, since neither endoscopy nor radiology revealed pathology. The removed tissue was sent for biopsy. Pathology revealed inflammation without malignancy. After 1 month of medical treatment due to persistent symptoms, an endoscopic procedure was performed again. However, it was impossible to remove all of the material and the diseased mucosa, since it extended into the anterior wall of the maxillary sinus. A radical antrum procedure was then performed, and the sinus was found to be filled by intensely

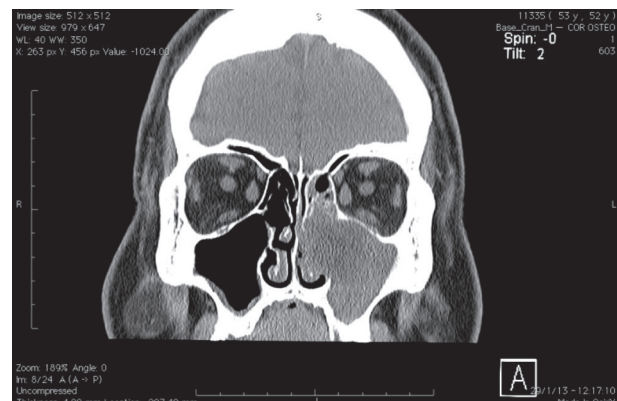


Figure 5

CT, coronal. Left sinus empyema extending into the nasal cavity.

edematous mucosa. Pathological examination of the removed tissue revealed mycetoma. The patient's symptoms resolved, and she remained asymptomatic 10 months postsurgery.

Comment: Treatment of fungus ball of the sinus involves complete removal of the lesion along with adequate resection of the diseased sinonasal mucosa. Sufficient ventilation of the cavity must be achieved to reduce the recurrence rate. This is not always easy to accomplish by endoscopic techniques, especially in cases in which the disease extends into the anterolateral wall of the maxillary sinus⁷⁻⁹. In patients who do not respond to endoscopic surgery or who are immunodeficient, the radical antrum procedure is an alternative that yields excellent results.

Case 4. Empyema with osteitis of the maxillary sinus

A 40-year-old man was referred to our clinic by a private physician. He had a diagnosis of left sinus empyema that failed to improve after 20 days of antibiotic treatment (Figure 5). Endoscopic examination showed copious purulent material emerging from the left middle meatus. Endoscopic drainage was performed through a middle meatal antrostomy. Despite the endoscopic sinus drainage and continuous antibiotic treatment, the inflammation failed to resolve and the purulent secretions continued. One month later, the patient underwent a radical antrum operation; all diseased mucosa were removed, and a wide inferior antrostomy was performed. Pathological examination of the removed mucosa showed severe chronic

inflammation. One year later, the patient remained asymptomatic.

Comment: In patients with maxillary sinus empyema, the standard treatment involves drainage of the purulent material. In the past, this took place via an inferior meatus puncture, but currently it is performed by means of an endoscopic middle meatal antrostomy with simultaneous widening of the sinus ostium area. However, in cases of refractory inflammation with irreversible mucosal lesions and concurrent bone involvement, a radical antrum procedure with total removal of the infected mucosa and any visible bone lesions may be necessary for complete response.

Discussion

Despite advances in endoscopic equipment and techniques, many indications for the Caldwell-Luc procedure remain. These include removal of foreign bodies impacted in regions not visible or accessible with endoscopic instruments, removal of benign tumours, management of maxillary osteomyelitis or osteoradionecrosis, exposure for orbital decompression for Graves ophthalmopathy, access to the pterygomaxillary space, repair of oroantral fistula, management of some types of facial trauma, irreversible scarring and metaplasia with failure of the mucociliary apparatus, and endoscopic surgical failures.⁶ The Caldwell-Luc operation is still the mainstay of surgical treatment of maxillary sinus disease after failed middle meatal antrostomy. In cases in which the mucosa has reached the point of irreversible pathology, the Caldwell-Luc procedure, with removal of diseased mucosa and subsequent regeneration, can be effective in improving the histological mucosal appearance and function.¹⁰ In addition, this approach offers the advantage of easier and safer access to the anterior wall and floor of the maxillary sinus compared to the endoscopic procedure.¹¹ Moreover, no special instrumentation is required and it can be performed using surgical equipment widely available in operating rooms.

Conclusions

The Caldwell-Luc procedure continues to be a safe alternative approach for selected cases in which endoscopic sinus surgery fails to be curative, and it

should remain in the surgical repertoire of well-rounded sinus surgeons. In clinical practice, when planning an endoscopic surgery, it may be wise to inform the patient about the possibility of an external approach and to obtain consent for both procedures.¹

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