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CALDWELL-LUC PROCEDURE WITHOUT INFERIOR MEATAL ANTROSTOMY

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ABSTRACT

Maxillary sinus pathology are very frequent. Caldwell-Luc along with inferior meatal antrostomy (IMA) is the stereotype surgical procedure to treat them. However, IMA has been criticised as it leads to early loss of the sinusotomy, injury to nasolacrimal duct, epistaxis from sphenopalatine artery and deviation from the normal sinus anomaly. Therefore, the necessity of IMA for the Caldwell-Luc operation is mainly for intrasinus neoplasm or trauma and for providing access to the perisinus and the pterygomaxillary fossa. The modified Caldwell-Luc operation, that is without IMA provides easier postoperative care and involves fewer complications. Newer technique like Functional endoscopic sinus surgery (FESS) has a long-term higher success rate for symptomatic improvement in patients with medically refractory chronic rhinosinusitis. With the popularity of FESS with the time, IMA has lost it's popularity.

KEYWORDS: Maxillary sinus, Caldwell-Luc, Inferior meatal antrostomy, nasal antrostomy.

INTRODUCTION

The American surgeon George Caldwell first described Caldwell-Luc operation in 1893. George illustrated the surgical approach of the anterior wall of the maxillary sinus through a gingival labial incision with the inferior meatotomy, while in 1897, French surgeon, Henry Luc, modified this approach combined with middle meatotomy.[1] This procedure was cornerstone of treatment for chronic and recurrent maxillary sinusitis until the introduction of advance technology, which is functional endoscopic sinus surgery (FESS) for improving physiologic drainage at the natural ostia.[2-3] In the Caldwell-Luc operation, the maxillary sinus is approached through the canine fossa, and the following way diseased sinus membrane is stripped and removed.[3] A counter opening is created on the lateral wall of the inferior nasal meatus to promote sinus drainage and temporary antral and meatal packs are usually inserted.[4] Caldwell-Luc along with inferior meatal antrostomy (IMA) theoretically allows passive drainage of reaccumulated material and facilitates suction toilet postoperatively.[5,6] However, this approach has been criticised due to additional operation time and wound, early loss of the opening may lead to risk of injury to nasolacrimal duct.[6,7,8]

Additionally, many studies represent that the mucociliary transport physiologically always drives the mucus towards the natural ostium, despite surgical alteration.[9] Therefore, the need of IMA for the Caldwell-Luc operation decline popularity.

SURGICAL TECHNIQUE

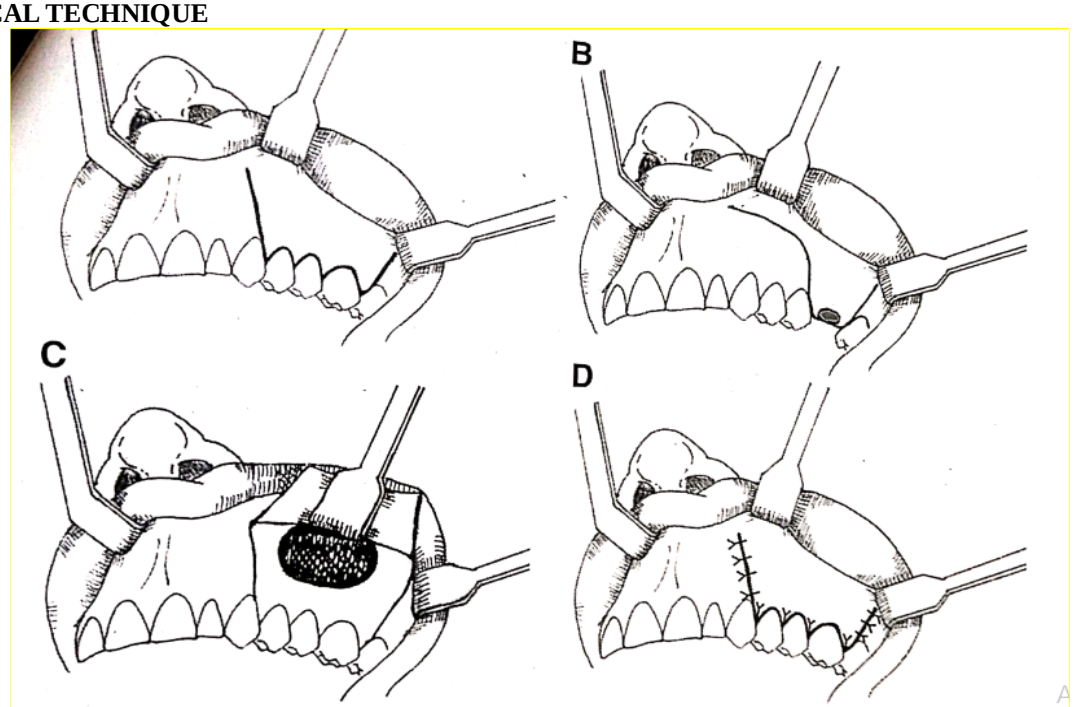

FIGURE 1. *A*, An intrasulcular incision with 2 vertical releasing cuts was made at the cyst/tumor-involving area. *B*, A buccal advanced flap to repair the oroantral communication was designed. *C*, A bone window was made at the canine fossa. No inferior meatal antrostomy was made at the end of the operation. *D*, The intraoral incision was closed with absorbable sutures.

A modified Caldwell-Luc operation without IMA is carried out with patient under general or local anesthesia and with nasotracheal intubation. Before the operation, antibiotics prophylaxis with 500mg of cephazolin is prescribed. Gingivobuccal fold incision with vertical releasing cuts are made at the cyst/tumor-involving area (fig 1A) If the patient had an oroantral communication, the incision is designed to create a buccal advanced flap to cover the defect (fig 1B). The infraorbital nerve is carefully protected during periosteal elevation. A bone window is made at the canine fossa (fig 1C). The sinus pathology and the diseased sinus membrane are enucleated and stripped down. Normal mucous membrane of the maxillary sinus is left intact. At the end of the procedure, the maxillary sinus cavity is packed with iodophor gauze impregnated with bacitracin-neomycin ointment, except the case whose sinus membrane is mostly intact with no oozing. No counter opening is made in inferior meatus. The intraoral incision is then closed with absorbable sutures. (fig 1D).

Postoperative Care

To obtain a good result after modified Caldwell-Luc surgery, frequent postoperative visits are must. Because of the mucosal extirpation, frequent debridement is required in the early weeks to fully remove the blood and scabs, which are the products of surgery. Postoperative care will either lead to remucosalization or to scarring of the sinus. Also, scarring may be preferable as it function as a mean of sinus auto-obliteration.

Antibiotics (500 mg of cefazolin intravenously 4 times daily for 3 days and 500 mg of penicillin v orally 4 times daily for 7 more days) are prescribed for all operated patients for 10 days after the surgery. For the penicillin allergic patients, 150mg of clindamycin by mouth 4 times daily was chosen. The patients are instructed to use sinus precautions for 2 weeks, and they are also instructed to avoid brushing their teeth near the operation site, touching the wound with their tongue, and blowing or forcefully sneezing.

DISCUSSION

George Caldwell and Henri Luc have illustrated an access to the maxillary antrum more than 100 years ago. This procedure had still valuable despite the introduction of functional endoscopic sinus surgery.[1] The Caldwell-Luc operation in its classic form involves making an opening in anterior wall of maxilla, superiolaterally to the canine bulge with stripping from the inner antral wall of any diseased mucosa, combined with an opening in the nose inferior to the inferior turbinates. Means it is said that, it is essentially to perform intraoral antrostomy with an IMA. However, in certain cases such as in immediate removal of a dislodged tooth in the antrum, a modified Caldwell- Luc operation is used and may involve only an intraoral antrostomy without an inferior meatal antrostomy or stripping of antral mucosa.[21]

The inferior meatal nasoantral window is traditionally part of the Caldwell- Luc procedure, A surgery that involves a direct transoral-transcanine fossa approach to the maxillary sinus cavity through its anterior wall. In patient with chronic maxillary sinusitis, the nasoantral window is made to improve sinus drainage based on

gravitation. Messerklinger's observation in the 1980, the concept of a natural sinus ostium, with its relevant draining pathway, was recognized and accepted and the FESS technique become internationally accepted. Messenklinger's characterization of the mucocilliary clearance mechanism led to a change in surgical management from addressing the sinus cavities themselves to a focus on the sinus ostia and their drainage pathway in the middle and superior meatus.[22]

The Caldwell-Luc operation is well established procedure. Caldwell-Luc procedure has largely replaced by endoscopic sinus surgery because endoscopic surgery has proven safe and effective in the treatment of chronic sinusitis. Since the development of antibiotics and endoscopic sinus surgery, this operation is a fundamental surgical technique for treating inflammatory paranasal sinus disease. Despite the success of the endoscopic technique, there are still several well documented indications for the Caldwell-Luc operation as the technique provides good access to the sinus, perisinus and pterygomaxillary fossa. In present Caldwell-Luc approach has been used in conditions like intrasinus cyst and tumors, intrasinus foreign bodies, oroantral fistulae, maxillary osteonecrosis, epistaxis control, sinusitis with irreversible mucosal change, mycotic fungal balls, and facial trauma.[1,3,5,12]

In Caldwell-Luc operation, IMA is often performed to promote postoperative drainage of bloody discharge or sloughs through gravity.[8,12,15] However, there is controversy about the necessity of IMA for the Caldwell-Luc operation. A combination of medical and surgical intervention is usually required in odentogenic maxillary sinusitis, which is etiologically distinct from the rhinogenic sinusitis and should be managed differently. It usually occurs when the normal ciliary function of the schneiderian membrane is disturbed by conditions such as odontogenic infections or by iatrogenic factors such as tooth extraction. The treatment requires concomitant management of the sinus infection and the odontogenic focus.[4,13,14]

Over the years, the main indication for Caldwell Luc operation have differed among studies and include treatment of orbital floor fracture, treatment of upper jaw cystic lesions (such as dentigerous cyst) with antral extension, foreign body removal, maxillary antral tumor biopsy, sinus augmentation, control of several hemorrhage following facial trauma, endoscopy of antral tumor and an access to the sphenoid and pterygomaxillary fossa. Today, modified Caldwell Luc operation can be performed in patients as a ready access for hemorrhage control in the event of withdrawal of an impaled assault weapon (knife), which extended into the maxillary antrum via posteromedial wall on computed tomography scan. Moreover, there are high incidence of complete closure of the small IMAs or stenosis. There are 70% patency rate of IMAs, whereas 90% in case of middle meatal antrostomy.[6,15,17,18] The Caldwell-Luc operation does not preserve the integrity of the natural mucociliary pathway, and the regenerated sinus mucosa often lacks an adequate mucociliary function.[11,12] These parameters pose a disadvantage because the creation of an inferior meatal nasoantral window may not provide a physiologic drainage pathway. Many others authors have reported flaws of IMA which contains additional operation time and wound, risk of nasolacrimal duct injury, and possible epistaxis from sphenopalatine artery.[6]

Miculiker in 1887, discribed that Caldwell Luc operation along with IMA was the common surgical procedure in the management of maxillary sinus diseases. However, has declined as a result of characterization of mucociliary transport towards the maxillary ostium. Argument against IMA have included reports of persistence sinus diseases following surgery, low patency rates, possible injury to the nasolacrimal duct or to developing canine teeth, and the technical difficulty with performing the procedure. Hilding suggested that creation of an inferior meatal window maybe detrimental to long term mucociliary clearance. Kennedy and Shaaken noted that there was no tendency for the mucociliary clearance pattern to become reoriented following either a separate antrostomy or radical removal of the mucosa. Whenever mucociliary clearance was present, it was towards the natural ostium. Widening of the natural ostium leads to some disruption of the normal mucociliary clearance pattern. The ciliary mucosa in the vicinity of the natural ostium should not be manipulated.[22]

There are many more reported complications of the Caldwell-Luc operation, which included cheek discomfort (33%), facial swelling (90%), fever (10%), hemorrhage, facial asymmetry, facial paresthesia, oroantral fistulae, dacryocystitis, devitalized teeth, recurrent polyps, and recurrent sinusitis.[5] Modified Caldwell-Luc operation should perform to treat odontogenic sinusitis and odontogenic pathology to remove diseased sinus mucosa. In modified Caldwell-Luc operation, the IMA is not carried out as the pathophysiology of the odontogenic sinusitis is different from the rhinogenic sinusitis. Iodoform gauze impregnated with bacitracin-neomycin was packed in sinus cavity, to prevent immediate postoperative bleeding and facial swelling.[22]

For patients who had a history of the Caldwell-Luc operation and presented with maxillary sinusitis, both endoscopic revision maxillary antrostomy and a repeat Caldwell-Luc operation could be used, and the outcome would be comparable.[19] Caldwell-Luc operation is safe and effective if one is manipulate the sinus wall gently and carefully. In case of odontogenic sinusitis or odontogenic sinus pathology, the modified Caldwell-Luc operation could provide easier postoperative care and fewer complications therefore some authors suggest that it is not necessary to create IMA in the Caldwell-Luc

operation.[20,21,22] Y.huang and Wen-Ho then perform a case study in 50 patients and they conclude that modified Caldwell-Luc operation provides easier postoperative care and involves fewer complications.[23]

CONCLUSION

The modified Caldwell-Luc operation provides easier postoperative care and involves fewer complications. It is not necessary to carry out IMA in the Caldwell-Luc operation when treating odontogenic sinus diseases. Additionally, development of FESS is more convenient way for sinus diseases. Thus, IMA declined its popularity with time. Thus, IMA decline it's popularity with time.

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