



Is inferior meatal antrostomy still relevant? A 12-year analysis of 93 oroantral fistulae closure with concomitant Caldwell-Luc operations

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Objective. The aim of this study was to retrospectively evaluate clinical outcomes after closure of oroantral fistulae with concomitant Caldwell-Luc operations (OFCLOs) with or without inferior meatal antrostomy (IMA).

Study Design. Records from consecutive OFCLOs carried out over a 12-year period at the oral and maxillofacial surgery department at a single medical center were reviewed. Background data included age, sex, medical status, indications, and etiologies. Outcome data included operative time, hospitalization time, and postoperative use of analgesics and complications.

Results. From 2002 to 2013, 54 male patients (58%), 39 female patients (42%) (mean age 50 years; range 12–84 years) underwent OFCLOs. IMA was carried out in 66 cases (70%). All patients had minimal complications. We found statistically significant shorter operating times (72 vs 84 minutes), shorter postoperative hospitalization times (4.1 vs 5.6 days), lower need of analgesics (1.44 vs 2.88 per day), and fewer complications (11% vs 38%) when IMA was not used.

Conclusions. IMA during OFCLOs carries increased morbidity without apparent benefits. Its routine use should, therefore, be discontinued. (Oral Surg Oral Med Oral Pathol Oral Radiol 2021;131:180–185)

The Caldwell-Luc operation (CLO) was described over a century ago as a surgical approach to treat maxillary sinusitis. Currently, closure of oroantral fistulae (OAF) is its main indication. The mainstay of treatment for sinus pathologies is functional endoscopic sinus surgery (FESS). Nevertheless, CLO is still used to surgically remove diseased tissue or neoplasms that cannot be reached even with extended endoscopic approaches (e.g., treatment of chronic maxillary sinusitis secondary to odontogenic pathologies; complications in dentoalveolar procedures, such as oroantral communication (OAC) after tooth extractions; displaced root tips or dental implants into the antrum).^{1–6}

In the standard CLO, the maxillary sinus is entered through the canine fossa, and the diseased sinus membrane is stripped and removed. An inferior meatal antrostomy (a counteropening on the lateral wall of the nasal cavity) is created to promote sinus drainage. Temporary antral packing is usually inserted through the antrostomy. The suggested rationale for performing IMA was that after the diseased sinus lining is stripped, the anatomically favorable inferior nasal antrostomy would allow passive sinus drainage.^{7–9} This procedure, however, has been criticized in the past for its

additional operation time, early loss of the opening, and risk of injury to the nasolacrimal duct.^{10–13} Moreover, it has been shown that physiologically, the mucociliary transport always drives the mucus toward the natural ostium despite surgical alteration.^{14,15}

The present retrospective study compared the results of oroantral fistulae with concomitant Caldwell-Luc operations (OFCLOs), with or without IMA.

PATIENTS AND METHODS

All consecutive patients who underwent OFCLOs at the Department of Oral and Maxillofacial Surgery in the Rabin Medical Center, between 2002 and 2013 were included. The institutional ethical committee of the Rabin Medical Center approved the study protocol (No. 0234-13-RMC).

Inclusion criteria

Inclusions criteria were existing OAF requiring closure; chronic sinusitis; no additional sinus pathology; American Society of Anesthesiology (ASA) physical status classification I–III^{16,17}; and data available in patient files.

Exclusion criteria

Exclusion criteria were acute sinusitis; additional sinus pathology; ASA physical status classification greater than III; concurrent FESS; and lack of data in patient files.

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Statement of Clinical Relevance

Use of inferior meatal antrostomy during concomitant Caldwell-Luc operations is controversial. All outcome parameters of the present study demonstrated improved clinical healing without inferior meatal antrostomy.

All data were collected from inpatient and outpatient clinic records. Background data included age, sex, ASA physical status classification, surgical indications, and etiologies. Outcome data included operative time, hospitalization time, and postoperative use of analgesics and complications. Postoperative complications were assessed in 2 stages—immediate postoperative and long-term complications. Common postoperative symptoms, such as postoperative swelling, mild postoperative pain that responded to analgesics, periodical bleeding that did not require a surgical intervention, and short-term infraorbital hypoesthesia, were not considered complications. Immediate complications were assessed from the early postoperative period and up to 1 month after the surgery. Complications that did not resolve within 1 month or developed later than 1 month postoperatively were considered long-term complications

Surgical technique

All patients had an OAF (Figure 1). Surgery was performed with the patient under general anesthesia and nasotracheal intubation. Fistulectomy was performed at the involved area, and a buccal flap was developed by using intrasulcular, midcrestal, and buccal vertical releasing incisions. A window into the antrum was created at the canine fossa by using a surgical drill. The sinus pathology, the diseased sinus membranes, and any foreign bodies were removed. IMA was performed at the discretion of the senior operating surgeon. For the cases in which IMA was performed, a Foley catheter was inserted into the antrum via the IMA opening and inflated (Figure 2). The OAF was then closed by using buccal advancement, palatal rotation, buccal fat pad, or a combination of the above flaps. Resorbable sutures were used in all cases.

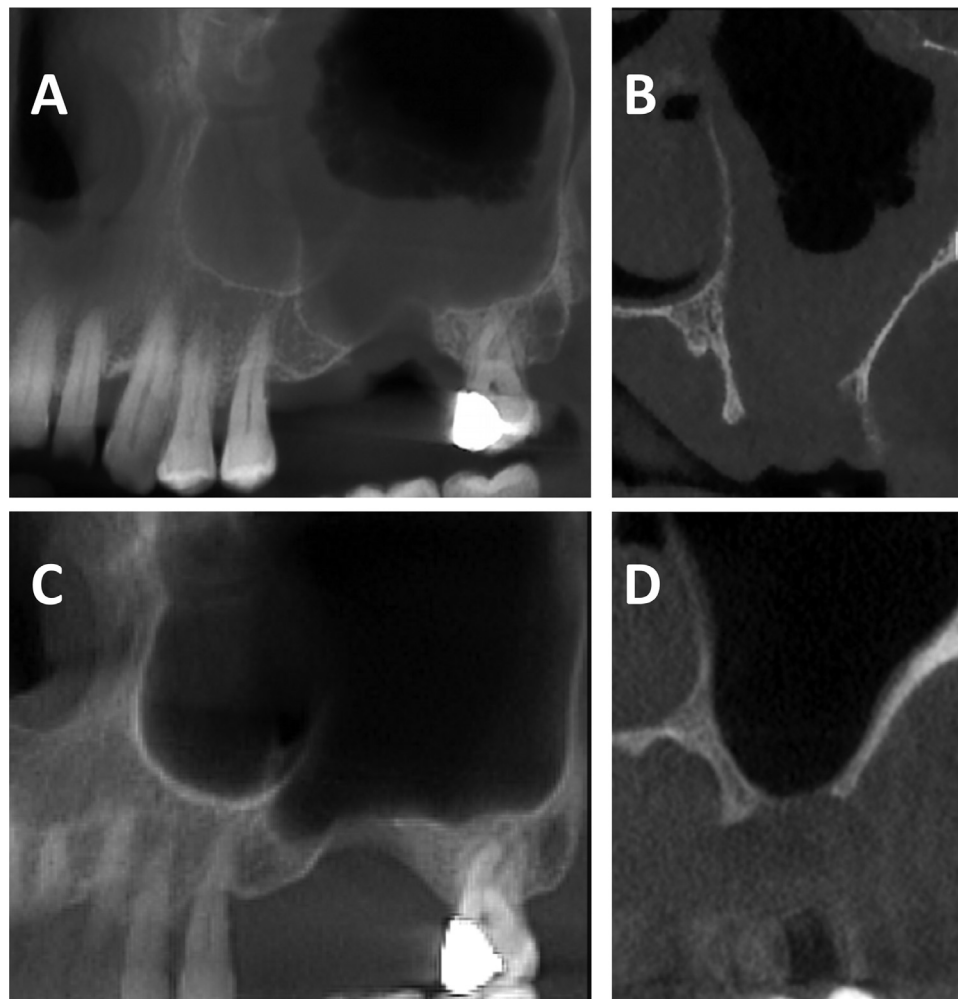


Fig. 1. (A, B) Panoramic and para-axial reconstructions of cone beam computed tomography (CBCT) of left maxilla demonstrating a bone defect in the antral floor and thickening of the sinus mucosa. After closure of the oroantral fistula (OAF), the bony defect in the antral floor is still present, but the sinus lining the mucosa is thin and healthy.

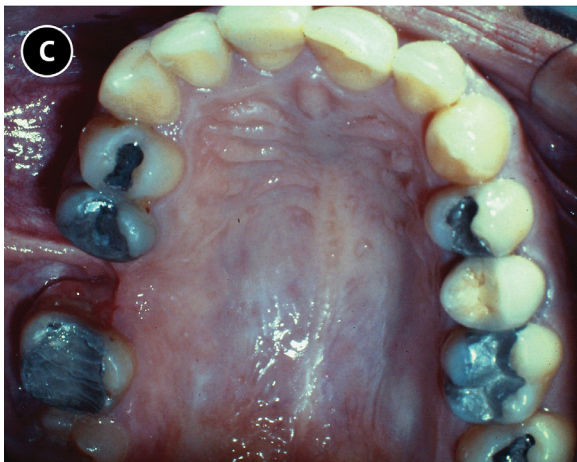
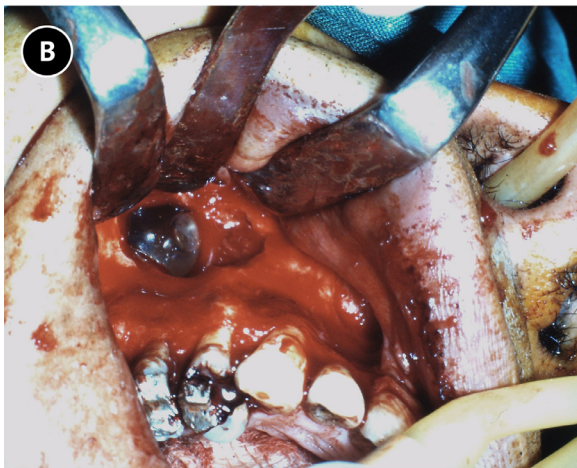
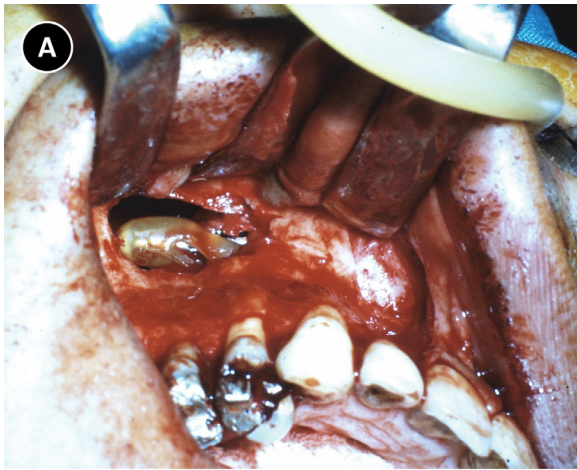


Fig. 2. (A) After cleaning of the maxillary sinus through a window in the canine fossa and creation of an inferior meatal antrostomy, a Foley catheter is introduced into the sinus via the antrostomy. (B) The catheter is inflated to fill the antral cavity for hemostasis. (C) Postoperative image demonstrating successful closure of the oroantral fistula.

Postoperative care

While in hospital, all patients received intravenous antibiotics (amoxicillin clavulanate 1 g 3 times daily or clindamycin 600 mg 3 times daily) and oral antibiotics at home for up to 1 week postoperatively. Patients were put on a soft-and-cold diet for 48 hours and received analgesics on demand. The prescribed postoperative analgesics included dipyrrone 1 g, paracetamol 1 g, or tramadol 100 mg. Recalcitrant pain was usually treated with intramuscular diclofenac sodium 75 mg. Whenever IMA was performed, the Foley catheter was removed from the antrum after 72 hours.

RESULTS

Ninety-three patients underwent OFCLOs from 2002 to 2013 (54 males and 39 females; mean age 50 ± 15 years; range 12–84 years). Their medical status is summarized as follows: ASA I: 44 patients (47%); ASA II: 39 patients (42%); and ASA III: 10 patients (11%). Sixteen patients (17%) were smokers. In 40 patients (43%), the right maxillary sinus was involved, in 49 patients (52%) the left maxillary sinus was involved, and 4 (5%) patients had bilateral involvement.

The causes for the pathologic communication are summarized in Table I. The main causes were tooth extraction (45 patients; 48%) and implant dentistry (26 patients; 28%).

Inferior meatal antrostomy was performed in 66 cases (71%). The overall mean operating time was 81 minutes. In the antrostomy (AG) group, the mean operating time was 84.8 minutes, whereas in the non-antrostomy (NAG) group, the mean operating time was 72.6 minutes. This difference was statistically significant ($P = .04$). Mean hospitalization time was 5.1 days (AG: 5.6 days; NAG: 4.1 days; $P = .0007$). Analgesics were administered on demand. Mean frequency of request for analgesics during hospitalization was 2.44 times higher after antrostomy (AG: 2.9 times; NAG: 1.4 times; $P = .0027$).

Table I. Etiology for Caldwell-Luc operation in 93 patients

Etiology	No. of patients	%
Tooth extraction	45	48
Implant placement	14	15
Sinus floor augmentation	12	13
Dental abscess	12	13
Odontogenic cyst	6	7
Biopsy	2	2
Root canal treatment	1	1
Unknown	1	1

Table II. Immediate postoperative complications in 93 patients

Complication	NAG		AG		Total	
	No. of patients	%	No. of patients	%	No. of patients	%
Persistent OAC	2	7%	3	5%	5	5%
Pain	1	4%	16	25%	17	18%
Bleeding	0	0%	1	1%	1	1%
No complications	25	89%	45	69%	70	76%
Total	28	100%	65	100%	93	100%

AG, antrostomy; NAG, non-antrostomy; OAC, oroantral communication.

Complications

Observed complications included the following: Pain: mild (no need for analgesics), moderate (pain alleviates with analgesics), or persistent (pain continues despite analgesics); persistence of fluid or food regurgitation to the nose; bleeding; and infraorbital sensory disturbances. Immediate postoperative complications are presented in Table II. Seventy patients (76%) experienced no immediate complications; 17 patients (18%) had persistent pain despite the use of analgesics; 5 patients (5%) experienced persistent OAC; and 1 patient (1%) suffered from intensive bleeding, which eventually receded without surgical intervention.

Long-term complications were found only in patients from the AG group. Eighty-three patients (90%) had no long-term complications; persistent pain despite the use of analgesics was observed in 4 patients (4%); persistent OAC was observed in 4 patients (4%); and infraorbital sensory disturbances were observed in 2 patients (2%).

Significantly more complications (immediate and long-term) were found in the AG group (38% vs 11%; $P = .0075$).

DISCUSSION

IMA used to be a common procedure in the treatment of maxillary sinusitis. This procedure is attributed to Mikulicz¹⁸ and was later adopted as part of the standard CLO because theoretically, it improved passive drainage of the maxillary sinus. This procedure has largely been replaced by middle meatal antrostomy at the natural ostium during FESS. Nevertheless, several authors have discussed the performance of IMA in limited indications.¹⁹⁻²¹ The

present study retrospectively examined the outcome of 93 OFCLOs with or without IMA.

The IMA procedure lengthened the operative time by 16.8%, on average, from 72.6 minutes to 84.8 minutes. The hospitalization time for AG was also made longer by 1.5 days (36.5%), on average. Both these differences were statistically significant. This finding is in agreement with the existing literature showing that an increase in the operative time may be associated with increased rate of infectious complications and increased length of hospital stay.²²⁻²⁴ This increase reflects the overall complexity of the IMA procedure. Patients in the AG group were hospitalized for at least 3 days, after which the catheter was removed, whereas patients in the NAG group (depending on their recovery) could be released as soon as 1 day postoperatively.

Another aspect in which the 2 groups differed significantly is in the postoperative use of analgesics. Immediate postoperative consumption of analgesics was 2.44 times higher in the AG group compared with the NAG group. Mild pain is a normal finding in a proper postoperative course; therefore, in the early postoperative period up to 1 month after surgery, pain was defined as a complication only if it failed to respond to first-line analgesics. However, any report of pain (in the follow-up records) that persisted longer than 1 month after surgery was considered a long-term complication. In our study, only 1 patient (4%) from the NAG group suffered from immediate postoperative recalcitrant pain compared with 16 patients (25%) in the AG group (see Table II.). In the analysis of long-term complications, as described in Table III, all 4 patients who continued to experience pain 1 month after surgery were in the AG group.

Table III. Long-term postoperative complications

Complication	NAG		AG		Total	
	No. of patients	%	No. of patients	%	No. of patients	%
Persistent OAC	0	0%	4	6%	4	4%
Infraorbital sensory disturbances	0	0%	2	3%	2	2%
Pain	0	0%	4	6%	4	4%
No complications	28	100%	55	85%	83	90%
Total	28	100%	65	100%	93	100%

AG, antrostomy; NAG, non-antrostomy; OAC, oroantral communication.

In this analysis, we distinguished common postoperative symptoms from the less common operative sequelae, which we refer to as complications. Accordingly, postoperative swelling, mild postoperative pain that responded to analgesics, periodical bleeding that did not require surgical intervention, and short-term infraorbital hypoesthesia were not counted as complications. Immediate complications were assessed from the early postoperative period up to 1 month after surgery, whereas complications that did not resolve within 1 month were considered long-term complications.

The observed complications were refractory or chronic pain, persistent oroantral communication, persistent infraorbital sensory disturbances, and bleeding. Although a commonly reported complication of OFCLO, infra-orbital sensory disturbances were found in only 2 patients; these disturbances lasted greater than 1 month. Interestingly, both cases were in the AG group. However, no statistical significance could be shown at this level of incidence. Persistent OAC was found in 5 patients postoperatively, and yet, in 2 cases, the communication resolved within a period of 1 month. In 1 patient, the communication reopened as a result of dehiscence during the healing period. Differences between the AG and NAG groups in this aspect were not significant.

In our cohort, after antrostomy (AG group), the sinus was packed with a Foley catheter. This method of packing differs from those reported by other studies. Saito et al.¹⁰ reported packing of the sinus with two 3 × 30 cm gauzes with antibiotic ointment through the canine fossa. The gauze was removed on the third day after the operation,¹⁰ Al-Belasy¹² used iodoform gauze with topical antibiotic, and Stoopack²⁵ described packing the sinus with a 6-inch petrolatum gauze drain. Both the above 2 authors described packing through the nasal antral window; in this method, the packing also prevents premature closure of the antrostomy. In our experience, the use of a Foley catheter inserted via the IMA and filled with saline to the volume of the antrum (see Figure 2) was an effective method to achieve hemostasis, drainage, and space maintenance for the antrostomy site; it is also easy to remove once deflated. In our opinion, this technical modification is not related to the disadvantages of IMA that were found in the present study.

Interestingly, in a vast survey that included 220 consultants in Great Britain in 1986, Lund found that 79.8 of the consultants did not regularly pack the antrostomy at all.¹⁸ In this study, all patients who were not treated with antrostomy were left without any packing of the sinus at the end of the operation, and yet none of them suffered from postoperative bleeding (see Table II). This finding settles with the fact that most consultants in the Lund survey did not find the packing of the antrum necessary.

With the aim of improving treatment outcomes for all patients, every operative procedure should be periodically re-evaluated for its necessity, morbidity, risk of complications, and benefits. From our retrospective analysis, the IMA procedure, performed as part of the standard CLO procedure, not only carries significant drawbacks, including longer operative times, extended hospital stay, increased use of analgesics, and higher frequency of complications, but also offers no apparent benefits.

CONCLUSIONS

Within the limits of the present study, IMA performed during CLO carries significant disadvantages and increased morbidity, without offering any benefits. Its routine use should, therefore, be discontinued.

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