

**Case Report****Caldwell-Luc approach for odontogenic maxillary sinusitis****Dolly Irfandy, Bestari Jaka Budiman, Putri Sari Ivanny**Department of Otorhinolaryngology-Head and Neck Surgery,  
Faculty of Medicine Universitas Andalas/M.Djamil General Hospital, Padang**ABSTRACT**

**Background:** Maxillary odontogenic sinusitis is a maxillary sinusitis of dental origin. Odontogenic origin of infection must be suspected in those sinusitis patients who have symptoms of unilateral maxillary sinusitis, sinonasal symptoms such as nasal obstruction, rhinorrhea, and/or foul odour, a history of dental pain or dental/oral surgical treatment, and in those who are resistant to conventional treatment of sinusitis. **Purpose:** To report and analyze the result of Caldwell-Luc approach for odontogenic maxillary sinusitis. **Case report:** One case of odontogenic maxillary dextra sinusitis treated by Caldwell-Luc approach. After 2 months of follow-up, there was no thick and smelly discharge coming out of the nose, no complaints of pain in the nose, nor swelling and numbness of the cheeks and gums. **Clinical question:** “Does Caldwell-Luc approach provide good result for odontogenic maxillary sinusitis?” **Review method:** Literature searching was performed through Cochrane database, PubMed, ClinicalKey, and Google Scholar using keywords “Caldwell-Luc” and “odontogenic sinusitis.” **Result:** The search obtained 76 literatures which were related to clinical question. Afterwards filtered with eligible criteria, had resulted 21 relevant literatures. **Conclusion:** The choice of Caldwell-Luc approach for treating odontogenic maxillary sinusitis is a less invasive procedure and gave a satisfying result. Overlooking to identify a dental cause of maxillary sinusitis could lead to persistent symptoms, and failure of medical, as well as surgical intervention.

**Keywords:** maxillary sinusitis, odontogenic sinusitis, Caldwell-Luc approach**ABSTRAK**

**Latar belakang:** Sinusitis maksilaris odontogenik adalah sinusitis maksilaris yang bersumber dari infeksi gigi. Sumber infeksi odontogenik harus dipikirkan ketika ditemukan gejala sinusitis maksila unilateral, gejala sinonasal seperti obstruksi hidung, rinorea dan bau busuk, riwayat infeksi gigi sebelumnya, trauma atau karena prosedur bedah pada tatalaksana gigi, dan pada pasien yang resisten terhadap pengobatan konvensional sinusitis. **Tujuan:** Melaporkan dan menganalisis hasil pendekatan Caldwell-Luc pada kasus sinusitis maksilaris odontogenik. **Laporan Kasus:** Satu kasus sinusitis maksilaris odontogenik dekstra yang ditatalaksana dengan pendekatan Caldwell-Luc. Setelah 2 bulan follow-up, tidak ada ingus kental dan berbau busuk yang keluar dari hidung, tidak ada keluhan nyeri di hidung, bengkak dan mati rasa pada pipi dan gusi. **Pertanyaan klinis:** “Apakah prosedur Caldwell-Luc memberikan hasil terbaik untuk kasus sinusitis maksilaris odontogenik?” **Telaah literatur:** Dilakukan pencarian melalui database Cochrane, PubMed, ClinicalKey dan Google Scholar, menggunakan kata kunci “Caldwell-Luc” dan “sinusitis odontogenik”. **Hasil:** Diperoleh 76 literatur yang terkait dengan pertanyaan klinis. Setelah disaring dengan kriteria riset, terdapat 21 literatur yang relevan. **Kesimpulan:** Pemilihan tatalaksana sinusitis maksilaris odontogenik dengan pendekatan Caldwell-Luc merupakan prosedur invasif minimal, dan memberikan hasil yang memuaskan. Bila sumber infeksi dari gigi pada sinusitis maksilaris tidak terdeteksi, hal itu akan menyebabkan gejala persisten, dan kegagalan dalam tatalaksana medikamentosa maupun intervensi bedah.

**Kata kunci:** sinusitis maksilaris, sinusitis odontogenik, pendekatan Caldwell-Luc

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## INTRODUCTION

Sinusitis is a multifactorial disease, characterized by inflammation of the paranasal sinus mucosa, caused by allergy, or viral, bacterial, as well as fungal infections of the upper respiratory tract.<sup>1</sup> Odontogenic sinusitis is sinusitis originating from dental infection.<sup>2,3</sup> Odontogenic sinusitis was identified as a causative factor in 10-12% of maxillary sinusitis cases.<sup>4</sup> The management of odontogenic sinusitis is generally different from that of rhinogenic sinusitis due to different etiopathogenesis.<sup>3</sup>

Modern interpretations of odontogenic sinusitis reveal diverse etiologies including complications of all classical dental procedures and implant or pre-implant placement. Therefore, the literature began to introduce “Sinonasal Complications of Dental Disease or Treatment” (SCDDT) which has a relevant and often overlooked link as a cause of sinus infection.<sup>3</sup>

The authors would like to report and analyze Caldwell-Luc approach on a case of odontogenic maxillary sinusitis.

## CASE REPORT

A 40 years old female, came to the ORL-HNS Outpatient Clinic of dr. M. Djamil General Hospital, Padang on February 21, 2018 with chief complaint of thick and smelly discharge coming out constantly of the nose in the last one month. Discharge running down the throat, and pain or heaviness in the head and right cheek were present as well. The history of thick and smelly discharge was present since about 2 years intermittently. Dental history revealed there were tooth decays which had not been treated.

On anterior rhinoscopy examination, the right and left nasal cavities were narrow, the inferior turbinates were hypertrophic, the medial turbinates were difficult to be evaluated. In the right nasal cavity, there was a deviated septum in the form of cristae, and mucopurulent nasal discharge. Examination of the peak nasal inspiration flow (PNIF) was performed with a result of 100. On examination of the oral cavity, there were dental caries on the right upper third molar, the left upper incisor, and the left lower jaw incisor.

Based on the history and physical examination, the patient was diagnosed with a suspected chronic rhinosinusitis with turbinate hypertrophy and deviated septum. The temporary diagnosis was maxillary sinusitis dextra et causa odontogenic, with turbinate hypertrophy, and deviated septum.

She was given nasal douching with 0.9% NaCl 2x20cc. On February 21, 2018, a bacterial culture and sensitivity tests were carried out, and found *Staphylococcus aureus* that were sensitive to chloramphenicol, gentamicin and fosfomycin. On March 7, 2018, a CT scan of the paranasal sinuses was performed with result of chronic multi-rhinosinusitis and concha hypertrophy.

(Figure 1)



Figure 1. CT-Scan

The patient was diagnosed with maxillary dextra sinusitis et causa odontogenic with turbinate hypertrophy, bullous turbinate, and deviated septum. The patient was consulted to the Dental and Oral Department for tooth decay management. The patient was planned for Functional Endoscopic Sinus Surgery (FESS) and Caldwell-Luc procedure.

On March 29, 2018, FESS and Caldwell-Luc procedure were conducted with the patient lying in a supine position on the operating table under general anesthesia. Aseptic and antiseptic measures were implemented in the operating field. The nasal mucosal was anesthetized with lidocain, and the middle turbinate was infiltrated with adrenaline 1:200,000. Conchotomy was performed on the left middle turbinate. Afterwards the caudal septum was infiltrated with adrenaline 1:200,000 on both sides. An incision was made in front of the septal crista, from superior to the floor of the nasal cavity, osteotomy was performed from anterior to posterior, and the bone was removed using straight forceps.

In the right canine fossa, an incision was made  $\pm 3-5$ mm superior to the gingival sulcus. The periosteum was then elevated and the surrounding muscles were freed from the anterior wall of the antrum. Maxillary sinus irrigation was performed until the fluid was clear from pus. The wound on the gingival sulcus was closed with continuous interlocking sutures. Next, a right unsinectomy was performed.

The bleeding was controlled, and an anterior pack was placed on each nasal cavity. There was no bleeding seen on the posterior pharyngeal wall.

Post operative the patient was given intravenous ringer lactate 500cc drip with tramadol, gentamicin, and dexamethasone. A cold compress was then applied to the operating area. On postoperative evaluation

there was minimal numbness and minimal swelling in the right gingival sulcus area.

On April 1, 2018 (the third post-operative day) the nasal packs were removed. Evaluation of nose showed spacious nasal cavities, eutrophic inferior turbinates, crusts (+), clots (+), no bleeding.

Observation of the throat showed no blood clots, nor flow of blood. In the gingivobuccal region there was minimal numbness, minimal edema, and fine post-operative sutures. The patient was discharged the next day, with antibiotic, painkiller, and anti-inflammatory therapy.

On April 4, 2018 (sixth post-operative day), complaints of pain in the nose still existed, swelling and numbness in the cheeks and gums decreased. There was no blood flowing from the nose nor down the throat. Nasoendoscopic examination of the right nose showed wide nasal cavity, pink coloured eutrophic inferior turbinate, eutrophic medial turbinate, open middle meatus, and no septal deviation. There were mucoid secretions and crusts. In the gingivobuccal region, the post-operative wound was, closed and healed, no fistula. The patient was diagnosed with post FESS (conchotomy, septoplasty and unsinectomy), and Caldwell-Luc procedure. (Figure 2)



Figure 2. Sixth postoperative day

On May 24, 2018 (second month post-operative), there were no complaints of pain in the nose, nor swelling and numbness in the cheeks and gums. There was no blood flowing from the nose or down the throat. Nasoendoscopic examination of the right and left nasal cavities was performed with the results within normal limits. In the gingivobuccal region, the post-operative wound was fine, and no fistula. The patient was returned to primary health care facility and consulted to the Dental and Oral Department for further treatment.

### CLINICAL QUESTION

“Does Caldwell-Luc approach provide good result on odontogenic maxillary sinusitis?”

### REVIEW METHOD

Literature searching was performed through Cochrane database, PubMed, Clinical Key, and Google Scholar using keywords “Caldwell-Luc” and “odontogenic sinusitis.” The search was used inclusion criteria; 1) management of odontogenic sinusitis; 2) Caldwell-Luc approach; 3) maxillary sinusitis; 4) odontogenic origin; and exclusion criteria: patient with non-odontogenic infection.

### RESULT

The search obtained 76 literatures which were related to clinical question. Then, filtered with eligible criteria, resulting in 21 relevant literatures.

The choice of Caldwell-Luc approach for treating odontogenic maxillary sinusitis is a less invasive procedure and gave a satisfying result.

### DISCUSSION

Lee et al. quoted by Patel et al.<sup>5</sup> reported that the incidence of odontogenic sinusitis was equal between genders with a peak incidence in the fourth decade. The above results were in line with the results of studies reported by Matsumoto et al.<sup>6</sup> that the incidence of odontogenic sinusitis was found to be highest in the third and fourth decades with comparable incidence rates between men and women.

Odontogenic sinusitis has classic symptoms of sinonasal origin, such as nasal obstruction, rhinorrhea and foul odor and dental symptoms such as tooth pain and hypersensitivity. There are no clear and characteristic clinical symptoms for odontogenic sinusitis. Sinonasal symptoms are reported to be predominant by patients, but these symptoms do not differentiate odontogenic sinusitis from other causes of sinusitis. Furthermore, among the above sinonasal symptoms, there is no predominant symptom suggesting odontogenic sinusitis.<sup>5,7</sup> Therefore, the literature has introduced SCDDT which has relevant associations and is often overlooked or unidentified and is not categorized in the international rhinosinusitis guidelines as a cause of sinus infections.<sup>3</sup> Although odontogenic sinusitis had been known for a long time, there is still a lack of consensus regarding clinical symptoms, treatment protocols and preventive measures.<sup>3,7</sup>

Odontogenic infection of the maxillary tract in some cases can extend through the root of the tooth to the maxillary sinus.<sup>8,9</sup> This is because the roots of the maxillary pre-molar (PM) and molar (M) teeth are under the floor of the sinus. The M2 roots were closest to the sinus floor about 1.97mm and were lined by a thin layer of mucoperiosteum, followed by the M<sub>1</sub>, M<sub>3</sub>, PM<sub>2</sub>, PM<sub>1</sub> and canine roots. This close proximity explains how the infectious process can easily extend from the above-mentioned teeth to the maxillary sinus,

where it is assumed that the tip of the root of the tooth will project toward the sinus floor causing minimal elevation and breakdown of the Schneiderian membrane, irritation and thickening of the sinus mucosa.<sup>4,9,10</sup>

Radiological examination is a useful diagnostic tool in establishing the diagnosis of odontogenic sinusitis.<sup>1,2,11</sup> Standard radiological examinations include periapical and panoramic x-rays. Periapical radiographs can detect dental caries and periapical radiolucency. However, periapical radiographs are inadequate in assessing the anatomic relationship between maxillary molars and the floor of the maxillary sinus.<sup>1,2</sup> Vidal et al.<sup>1</sup> reported that periapical radiographs were only useful in about 40%. A very wide periapical radiolucent image or cortical bone perforations is needed to be visualized radiologically.<sup>6</sup> Meanwhile, panoramic radiographs have lower sensitivity than periapical radiographs due to anatomic superimposition and both modalities have high false negatives.<sup>2,5</sup>

CT scan is the gold standard that can provide an assessment of the relationship of periapical lesions to the maxillary sinus floor and sinus soft tissue changes.<sup>2,5,10</sup> Research conducted by Little et al.<sup>2</sup> in 2018 found that more than 70% findings of unilateral maxillary sinusitis suggest odontogenic infection. However, Patel et al.<sup>5</sup> obtained only about 30% of radiological reports identifying an odontogenic source.

The patient underwent FESS (conchotomy, septoplasty and unsinectomy) and Caldwell-Luc procedure, with special care of identifying and maintaining infraorbital nerve. The Caldwell-Luc procedure was performed without an inferior meatal antrostomy. Theoretically, antrostomy of the inferior meatus would allow passive drainage of accumulated fluid and for post-operative cleaning.<sup>8,12,13</sup> However, this procedure has been criticized for increasing operating time, injury, risk of nasolacrimal duct injury and possible epistaxis originating from

sphenopalatine artery. Furthermore, studies have shown that mucociliary transport will physiologically drain secretions toward the normal ostium compared to surgical changes. Therefore, inferior meatal antrostomy in Caldwell-Luc surgery is still controversial. In former time, the Caldwell-Luc approach was the mainstay for maxillary sinusitis until the introduction of FESS to improve physiological drainage of the normal ostium.<sup>12</sup>

The infraorbital foramen is passed by the infra orbital nerve, arteries, and veins. The infraorbital neurovascular plexus traverses the orbital floor or sinus roof which might be open as dehiscence, and it exits from the skull through the infraorbital foramen located about 5mm below the middle of the inferior orbital rim into the soft tissues of the cheek. This condition occurs in about 14% of cases, and could become a potential risk during endoscopic sinus surgery. Branches of this nerve supply the lower eyelid, nose, cheeks, and upper lip. The operator must be careful when elevating the periosteum from the anterior sinus wall to avoid injury to the infraorbital nerve as it exits the canal. The superior alveolar ridge crosses the bone to supply the upper teeth and gums. This nerve can be injured when extending the antrostomy too low, and could cause loss of sensation to the teeth and gums.<sup>8,14</sup>

Post-surgery the patient felt minimal swelling and numbness in the cheeks and gums that disappeared within one month. No sublabial oroantral fistula, epiphora, nor maxillary osteomyelitis were found. In the 2<sup>nd</sup> post-operative month, there were no complaints of pain in the nose, nor swelling and numbness in the cheeks and gums. The patient then referred to a primary health care for further follow up.

Odontogenic maxillary sinusitis is maxillary sinusitis originating from dental infection. Overlooking to detect the source of infection from the teeth will cause persistent

symptoms and failure in medical management, which needs surgical intervention.

The advantage of treatment for odontogenic maxillary sinusitis with the Caldwell-Luc approach is a minimally invasive procedure and provides satisfactory results.

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