

# Histopathological study of sinus mucosa in patients diagnosed with odontogenic maxillary sinusitis

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**ABSTRACT: Purpose** - The aim of the study is to analyze the changes that occur in the mucosa of odontogenic maxillary sinusitis patients. **Material and methods** - The study included 127 patients diagnosed with odontogenic maxillary sinusitis admitted to the County Hospital Craiova, ENT Clinic in 2006-2010; out of them there were selected 47 patients who underwent surgery, practicing radical Caldwell-Luc sinus cure. Sinus mucosa taken during these interventions was analysed in terms of histopathological hematoxylin-eosin staining. **Results** - Histopathological study of sinus mucosa taken during surgery allowed us to observe the presence of the following cellular infiltrates: existence of a microscopic respiratory type epithelium, often ulcerated, subjacent dense collagen stroma with myxoid areas alone or combined with hyalinisation areas; presence of diffuse lymphoplasmocitary infiltrate, subepithelial or focal, periglandular; the presence of this lymphoplasmocitary infiltrate shows chronic inflammation of sinus mucosa; presence of eosinophilic infiltrate with or without lymphoplasmocitary infiltrate; presence of chronic xantogranulomatous infiltrate. **Discussion and conclusion** - In odontogenic maxillary sinusitis histopathology of sinus mucosa, performed regularly, confirms the clinical diagnosis. Histopathological examination is necessary to identify a possible malignant lesion. In general, the changes are not characteristic for sinusitis of dental origin but we have to take into consideration the adagium "if it is important enough to have it removed, it is important enough to have it investigated".

**KEYWORDS:** *odontogenic sinusitis, histopathological examination, chronic inflammatory infiltrate*

## Introduction

The odontogenic sinusitis is an independent entity, representing approximately 10-12% of all the maxillary sinusitis cases [1]; recent studies assess its occurrence to be 20% [2] or even 40% of the sinusitis [3], much more than the initial estimates.

The aim of this study was to analyse the maxillary sinus mucosa in patients diagnosed with odontogenic maxillary sinusitis; this analysis allowed us to determine the true frequency of chronic odontogenic maxillary sinusitis of all odontogenic sinusitis operated. It also allowed us to assess whether it was a chronic rhinogenic maxillary rhinosinusitis that overlapped dental osteitis sinus focus.

## Material and method

The study is part of a comprehensive analysis that included 127 patients diagnosed with odontogenic maxillary sinusitis, admitted to the County Hospital Craiova, ENT Clinic in 2006-2010. This study is conducted on a total of 47 patients, namely those who underwent surgery, practicing radical Caldwell-Luc sinus cure.

Odontogenic maxillary sinusitis diagnosis was based on the patients' medical history –

which revealed the existence of a fetid purulent rhinorrhea, usually unilateral – on clinical examination and nasal endoscopy, as well as on radiological exploration – simple radiography of anterior sinus (Tcheboul incidence), skull CT and skull MRI.

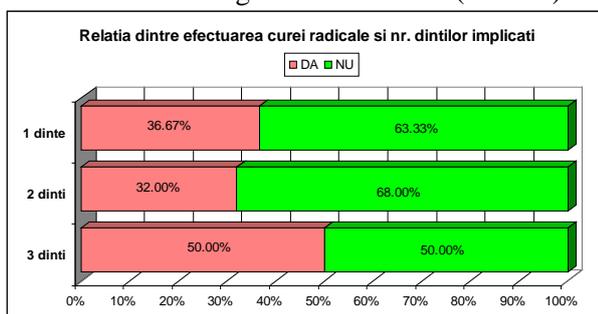
Dental examination which revealed dental-periodontal pathology in the sinusogenic teeth established the etiology of suppurated maxillary sinusitis.

Patients who received surgical intervention benefited from radical maxillary or ethmoid maxillary Caldwell-Luc cure. During surgery sinus mucosa was completely removed and was sent to histopathological examination.

Therefore, the material studied is of human origin and consists of sinus mucosa fragments taken during surgery from the patients with odontogenic maxillary sinusitis. The collected biological material was fixed in 10% neutral formalin solution and then paraffin embedded, buffered in sodium phosphate and pH7.2–7.4. Certain section of 5 microns thickness were cut with microtome (HM350 Micromuse) equipped with a special cutting system (Section Transfer System, STS, Microm) and were stained with hematoxylin-eosin.

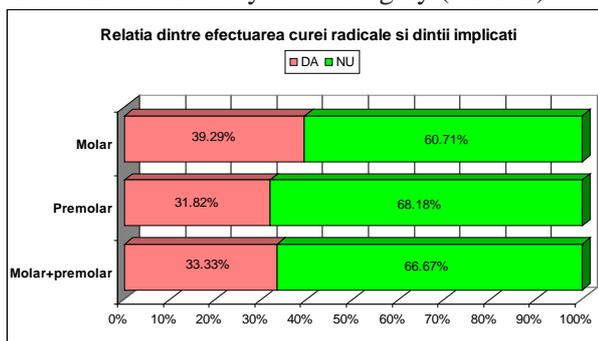
## Results

We analyzed the number of teeth involved in the pathological process in the patients who underwent radical surgery– Caldwell Luc – full removal of the lining of sinus mucosa (Chart 1).



**Chart 1 - Distribution of odontogenic maxillary sinusitis patients who underwent radical cure Caldwell Luc depending on the number of teeth involved in pathological process**

We also checked the necessity of Caldwell Luc radical cure depending on the type of causative tooth – molar or premolar – in the patients with odontogenic maxillary sinusitis. We found that more often it was the molars the ones which ultimately led to surgery (Chart 2).



**Chart 2 - Distribution of odontogenic maxillary sinusitis patients who underwent radical cure Caldwell Luc depending on the type of the tooth involved**

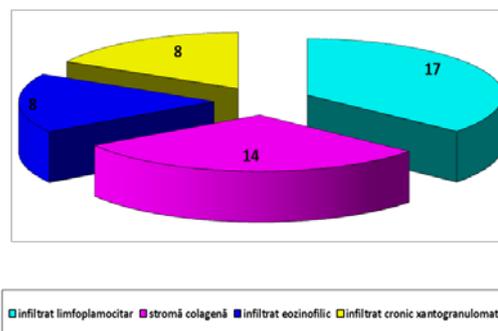
Histological study of sinus mucosa taken during surgery allowed us to observe the presence of the following cellular infiltrates:

- existence of a microscopic respiratory type epithelium, often ulcerated, subjacent dense collagen stroma with myxoid areas alone or combined with hyalinisation areas
- presence of a diffuse lymphoplasmocitary infiltrate, subepithelial or focal, periglandular; this lymphoplasmocitary infiltrate shows the presence of a chronic inflammation of sinus mucosa;
- presence of an eosinophilic infiltrate with or without a lymphoplasmocitary infiltrate;
- presence of chronic xantogranulomatous infiltrate.

In terms of the frequency of these changes, the results obtained at the histopathological examination of sinus mucosa were as follows: the majority of patients - 17 (36,17%) revealed the presence of a respiratory epithelium and, predominantly subjacent, a lymphoplasmocitary infiltrate; 14 (29,78%) had respiratory epithelium and, subjacent dense collagen stroma; presence of eosinophilic infiltrate was shown in 8 (17,02%) and in 8 (17,02%) patients there was found chronic xantogranulomatous infiltrate (Table 1, Chart 3).

**Table 1 - Distribution of patients with odontogenic maxillary sinusitis operated by histo-pathological changes of sinus mucosa**

Histopathological modification	No. of patients	%
Lymphoplasmocitary infiltrate	17	36,17%
Collagen stroma	14	29,78%
Eosinophilic infiltrate	8	17,02%
Chronic xantogranulomatous infiltrate	8	17,02%



**Chart 3 - Distribution of patients with odontogenic maxillary sinusitis operated by histo-pathological changes of sinus mucosa**

These changes were not identified only one in the histopathological examination, the patients were categorized in terms of their predominant lesions.

In terms of the lesions encountered, most often we faced with an extensive chronic inflammatory infiltration of subepithelial tissue represented by plasma cells, lymphocytes, macrophages and monocytes (Fig.1, Fig.2).

Another common lesion was inflammatory ulceration (Fig.3, Fig.4). This inflammatory ulceration occurred regardless of the cellular infiltration in the epithelium. These ulcers were sometimes superficial and other times very deep, exceeding basal membrane; in these cases histopathological examination highlighted the presence of hemorrhagic infiltrate located usually in chorion (Fig.5, Fig.6).

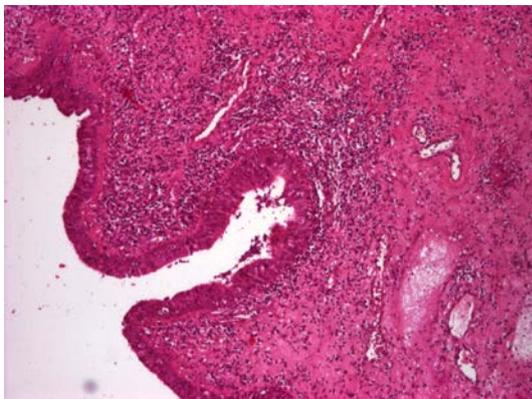
Sinus mucosa examination revealed both hyperplastic epithelium with xantogranulomatous infiltration (Fig.8, Fig.9) and eosinophilic infiltrate with inflammatory lymphoplasmocitary infiltrate (Fig.10, Fig.11).

We are presenting the following cases:

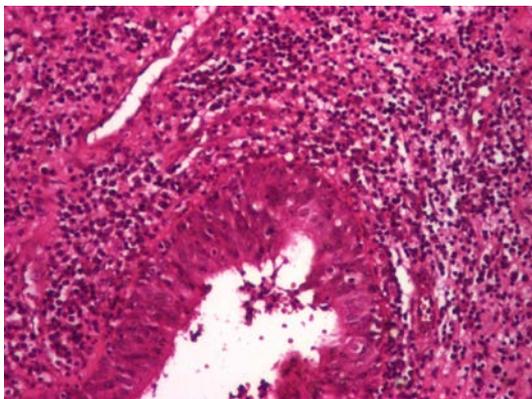
Case 1. B.I. 39 years old

Clinical diagnosis: left suppurative odontogenic maxillary sinusitis – surgical procedure

Histopathological examination (BHP 401559/10.08.2010) : microscopic structure of respiratory epithelium ulcerated on large areas and subjacent fibrocollagenic tissue with abundant hemorrhagic infiltrate and diffuse chronic inflammation (Fig.1, Fig.2).



**Fig.1. Sinus mucosa: chronic inflammation (H.E x 40 staining)**



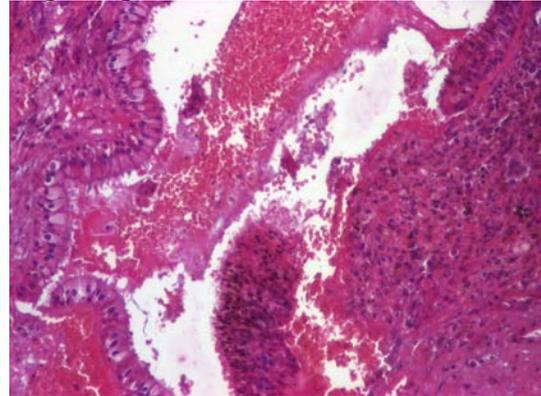
**Fig.2. Sinus mucosa: chronic inflammation –detail (H.E x 100 staining)**

Case 2. C.C. 76 years old

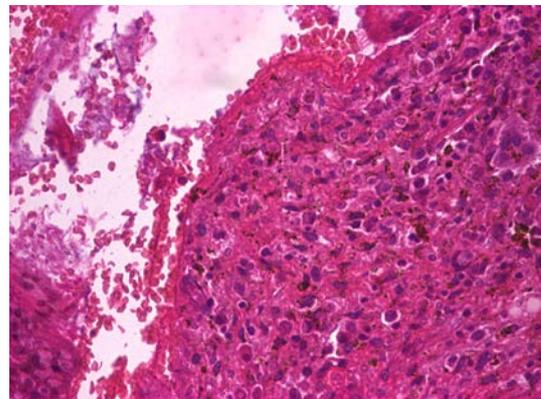
Clinical diagnosis: acute suppurative odontogenic maxillary sinusitis – surgical procedure

Histopathological examination (BHP 347923/6.11.2008): microscopic structure of respiratory epithelium ulcerated on large areas, with areas of squamous metaplasia subjacent myxoid stroma with fibrous areas and

inflammatory xantogranulomatous infiltrate (Fig.3, Fig.4).



**Fig.3. Sinus mucosa: inflammatory ulceration (HE, x100)**

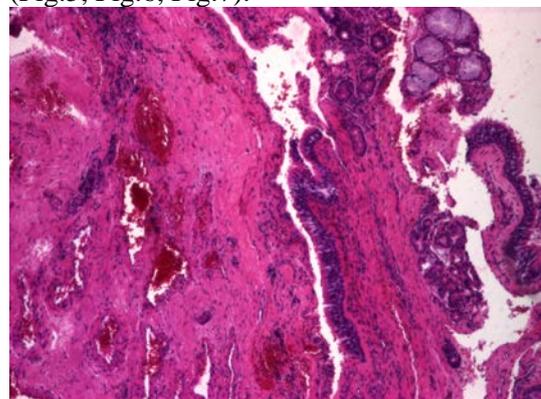


**Fig.4. Sinus mucosa: inflammatory ulceration – detail (HE, x200)**

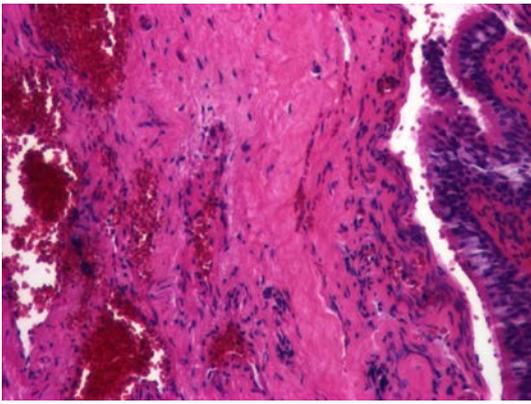
Case 3 D.M. : 53 years old

Clinical diagnosis: right chronic suppurative odontogenic maxillary sinusitis

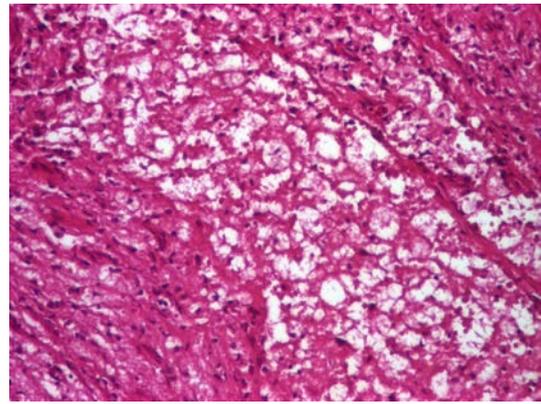
Histopathological examination (BHP:363024/04.05.2009): microscopic structure of respiratory epithelium ulcerated on certain areas, subjacent abundant fibrocollagenic tissue with chronic inflammatory infiltrate and hemorrhagic infiltrate, small fragments of bone (Fig.5, Fig.6, Fig.7).



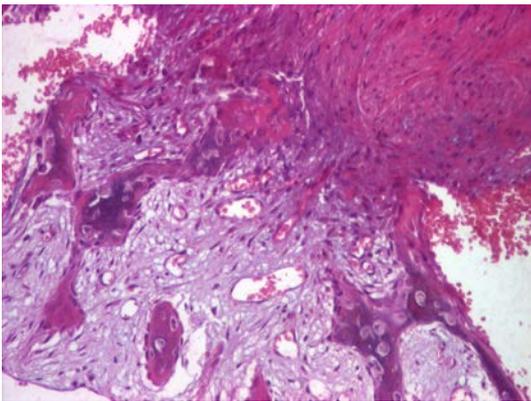
**Fig.5. Sinus mucosa: ulceration, hemorrhagic infiltrate x40**



**Fig.6. Sinus mucosa: hemorrhagic infiltrate x100**



**Fig.9. Sinus mucosa – xantogranulomatous infiltration HE, X100**

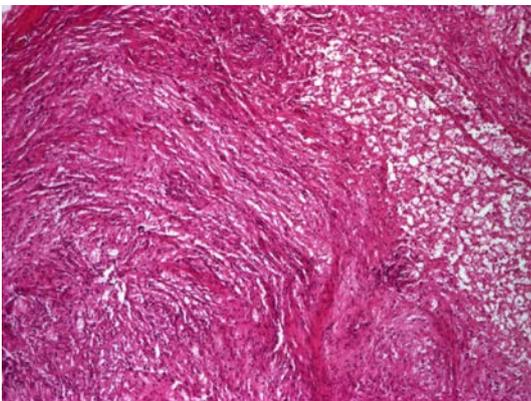


**Fig.7. Detail: bone blades X100**

Case 4: P.D.: 34 years

Clinical diagnosis: right acute suppurative ontogenic maxillary sinusitis

Histopathological examination (289744/27.09.2010): microscopic structure of respiratory epithelium, subjacent abundant fibrocollagenic tissue with chronic inflammatory xantogranulomatous infiltrate and small areas of necrosis; there are noted rare dilated mucous glands (Fig.8, Fig.9).

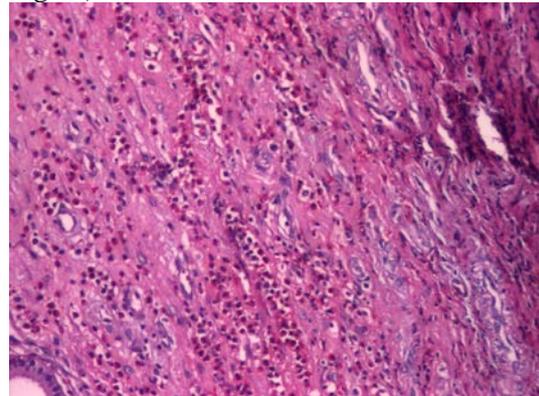


**Fig.8. Sinus mucosa– xantogranulomatous infiltration X40**

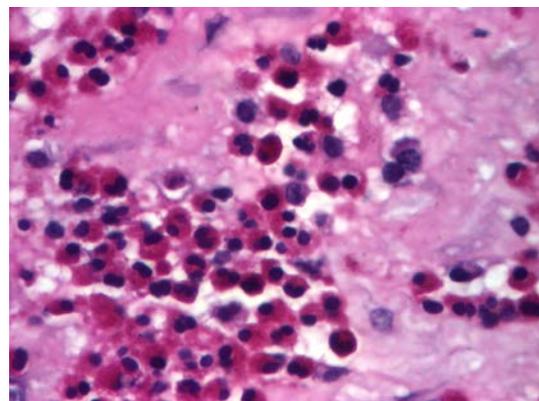
Case 5: T.A., 58 years old

Clinical diagnosis: right chronic suppurative ontogenic maxillary sinusitis

Histopathological examination (BHP 324473/28.01.2008): microscopic structure of respiratory epithelium, subjacent myxoid stroma with inflammatory infiltrate, with areas of inflammatory lymphoplasmocitary infiltrate and diffuse and focal eosinophilic infiltrate (Fig.10, Fig.11).



**Fig.10. Sinus mucosa, intense eosinophil infiltrate, x100**



**Fig.11. Sinus mucosa, intense eosinophil infiltrate, detail HE x200**

## Discussions

Odontogenic maxillary sinusitis is the most common disease resulting from pathological interactions between neighbouring periodontal and dental structures and maxillary sinus. Odontogenic maxillary sinusitis is an independent entity, representing approximately 10-12% of the total maxillary sinus [1]. However, many authors believe that the frequency of odontogenic maxillary sinusitis is underestimated [4,5]. Other authors consider that the incidence of odontogenic maxillary sinusitis remains unknown; recent studies assess the incidence of about 20% [2] or even 40% of sinusitis, much more than the initial assessments.

According to other authors, the fact that periodontal structures are so closed to maxillary sinus may explain the influence of dental inflammatory processes on the sinus, accounting for 37 to 40.6% of the sinusitis of dental origin [6].

Odontogenic sinusitis requires special consideration because they are different from microbiological, pathophysiological and mainly therapeutic point of view from rhinogenic sinusitis [7].

Odontogenic maxillary sinusitis is the result of dento-periodontal disease occurred in the upper premolars or molars. We analyzed the damage these teeth can cause and result in odontogenic maxillary sinusitis that cannot be cured by conservative treatment but require surgery.

To investigate whether the number of the teeth involved makes any difference in the proportion of cases in which it was necessary to use radical Caldwell Luc cure sinus, we performed chi-square test. P value obtained was equal to 0.568, so the maximum threshold of 0.05 is exceeded, which indicates that there is no significant difference in terms of radical cure recommendation based on the number of teeth involved in sinus disease. We also analyzed to what extent the type of teeth involved in the pathological process can influence therapeutic decision; the results are shown in Table 2.

To specify whether there is any difference, depending on the type of teeth involved, in the proportion of cases in which radical cure was necessary, we performed chi-square test. P value obtained was equal to 0.754, so the maximum threshold of 0.05 is exceeded, which indicates that there is no significant difference regarding radical cure Caldwell Luc recommendation

depending on the type involved teeth (premolar or molar).

Maxillary sinus mucosa is a continuation of the nasal fossa mucosa. It is represented by pseudo-stratified ciliated columnar epithelium, set in a thin basement membrane, having its own tunic adherent to the periosteum. In sinus inflammation this mucosa thickens and becomes edematous. The characteristic feature of mucosa in chronic inflammation of mucosa is represented by an abundance of lymphocytes, macrophages, plasma cells and eosinophils.

In most of the institutes in the US and Europe, it is routine clinical practice to have sinus material investigated histologically to confirm the clinical diagnosis.

Histopathologic analysis was performed to assess the presence of mucosal inflammation - cellular, epithelial and stromal markers. Cellular marker evaluation included evaluation of number of neutrophils, lymphocytes, mast cells, plasma cells, macrophages and eosinophils. Cellular markers were quantified in the foci of cellular infiltrate in each reticle field at 200x power. The epithelial markers evaluated included presence of squamous metaplasia and basement membrane thickening [8].

We found that most sinus mucosa fragments analyzed showed changes characteristic of chronic inflammation: the abundance of inflammatory cells - neutrophils, macrophages, plasma cells. Also, the presence of ulceration in the epithelium was very common, which overlaps with the literature data [9].

The presence of eosinophilic infiltration should be seen in terms of chronic rhinogenic rhinosinusitis. Studies conducted by Kountakis [10] and Boudain [11] consider the presence of this infiltration as pathognomonic for chronic rhinosinusitis, usually associated with nasal polyposis.

So, we can state that the presence of eosinophilic infiltrate in 8 (17.02%) patients had evidence of rhinogenic sinusitis that overlapped dental periodontal pathology which precipitated the need for surgery.

In all cases studied, whether the clinical diagnosis was suppurative odontogenic maxillary sinusitis, acute or chronic, histopathological examination revealed the presence of a chronic inflammatory infiltrate, which shows that chronic sinusitis is often ignored by the patients who cannot specify the onset of chronic purulent rhinorrhea episodes.

Histopathological study confirmed chronic inflammation; in our study we did not encounter unexpected malignancies.

## Conclusions

In odontogenic maxillary sinusitis histopathology of sinus mucosa, performed regularly, confirms the clinical diagnosis. Histopathological examination is necessary to identify a possible malignant lesion.

In general, the changes are not characteristic for sinusitis of dental origin but we have to take into consideration the adagium is “if it is important enough to have it removed, it is important enough to have it investigated”.

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