



# Comparative bacteriological examination of materials, taken from the pathologically altered mucosa of the maxillary sinus and chronic inflammatory processes, developing around the maxillary teeth

Gergana Slivovska<sup>1</sup>, Mario Milkov<sup>2</sup>, Elitsa Djongova<sup>1</sup>, Tihomir Georgiev<sup>1</sup>

<sup>1</sup>Department of Oral and Maxillofacial Surgery, Faculty of Dental medicine, Medical University – Varna

<sup>2</sup>Department of Dental Materials Science and Propaedeutics of Prosthetic Dental Medicine, Faculty of Dental medicine, Medical University – Varna

## Abstract

**Aim:** To perform a comparative bacteriological examination of a material, taken from the alveolus of an extracted tooth with chronic inflammatory disease and a material from the maxillary sinus at the closure of oroantral communication, performed immediately after extraction.

**Background:** Odontogenic maxillary sinusitis is a common problem and a well-known condition in the dental practice. This type of maxillary sinusitis differs in its pathophysiology, pathomorphology, microbiology, diagnosis and treatment from the other types of maxillary sinusitis. Chronic inflammatory processes affecting the periodontium and periodontium of the teeth can often reach the maxillary sinuses and thus cause odontogenic maxillary sinusitis.

**Methods:** To perform the task assigned, microbiological samples were prepared, taken intraoperatively from the inflammatory focus around the causative tooth and from the altered mucosa of the maxillary sinus. After taking into account the results of the microbiological examination, a comparative analysis of the microflora isolated from the two sites was performed. This was done in order to prove its identity and to look for the relationship between the two pathological processes.

To accomplish the task, we selected 27 patients who had molar teeth extracted, not subjected to conservative treatment, whose roots protrude into the maxillary sinus or stand no more than 3 mm away. In patients where a direct contact with the maxillary sinus was made, we used two sterile swabs to take the microbiological sample – first from the alveolar walls of the extracted tooth and then through the communication made. In other patients, we created such a communication with a fissure burr ourselves, after we had already taken a sample from the alveoli of the extracted tooth. The hole size was no more than 5 mm.

**Results:** When comparing the samples of each patient, taken from the alveoli of the extracted tooth and the pathologically altered mucosa of the maxillary sinus, we obtained the following results – compared to the frequency distribution, we can see in the following table – a match of 88.9% of all cases and in a little over 11% of the cases where not match is found between the samples.

**Conclusions:** When the height of the available bone in the distal parts of the upper jaw between the apexes of the teeth and the floor of the maxillary sinus is below 3 mm, the risk of ascending of the inflammatory process from the periodontal tissues to the maxillary sinus is quite high – 88.89%.

**Key words:** chronic maxillary sinusitis, microbiology of maxillary sinus, maxillary sinus thickening

## Background

Odontogenic maxillary sinusitis is a common problem and a well-known condition in the dental practice. This type of maxillary sinusitis differs in its pathophysiology, pathomorphology, microbiology, diagnosis and treatment from the other types of maxillary sinusitis. (1, 2, 3)

Under the conditions of normal homeostasis of the maxillary sinuses, a variety of bacterial colonization, represented by bacteria, in the form of a biofilm and planktonic species has been identified (13). Investigation and identification of the biofilm, causing infection, is difficult, because the presence of non-pathogenic colonizing microorganisms is required (15). Colonization is characterized by the presence of microorganisms on the mucosa, but without an inflammatory response, which distinguishes it from inflammation (14). Data from sources have been reported that register the presence of pathogenic microorganisms such as *Pseudomonas aeruginosa*, *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Staphylococcus aureus* in patients without active signs of disease (16), (17).

Chronic inflammatory processes affecting the periodontium and periodontium of the teeth can often reach the maxillary sinuses and thus cause odontogenic maxillary sinusitis (1, 3, 5, 7, 8, 9, 12). According to various sources, its frequency varies from 10-12% to 50-75% among cases of maxillary sinusitis (10, 11).

## Aim of the study

To perform a comparative bacteriological examination of material taken from the alveolus of an extracted tooth with chronic inflammatory disease and material from the maxillary sinus at the closure of oroantral communication, performed immediately after extraction.

## Material and methods

to perform the task assigned, microbiological samples were prepared, taken intraoperatively from the inflammatory focus around the causative tooth and from the altered mucosa of the maxillary sinus. After taking into account the results of the microbiological examination, a comparative analysis of the microflora isolated from the two sites was performed. This was done in order to prove its identity and to look for the relationship between the two pathological processes.

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The samples were placed in a sterile solid transport medium of 5 mm. gel. of “Amies”. We formed a trapezoidal mucoperiosteal flap, which we mobilized, adapted and sutured with a 5/0 monofilament thread, thus closing the communication with the maxillary sinus through local plastic surgery.

We sent the microbiological samples to a medical diagnostic laboratory. After delivery, the samples are seeded on a blood agar and placed in a thermostat at 37 degrees Celsius and left under these conditions for 24 hours. After removal from the thermostat, the sample is examined and microbiological growth is recorded. Microbiological agents are identified with the naked eye or by necessary microbiological identifications. To identify anaerobic strains, it is necessary to create anaerobic conditions and thermostat the samples at 37 degrees Celsius for 48 hours.

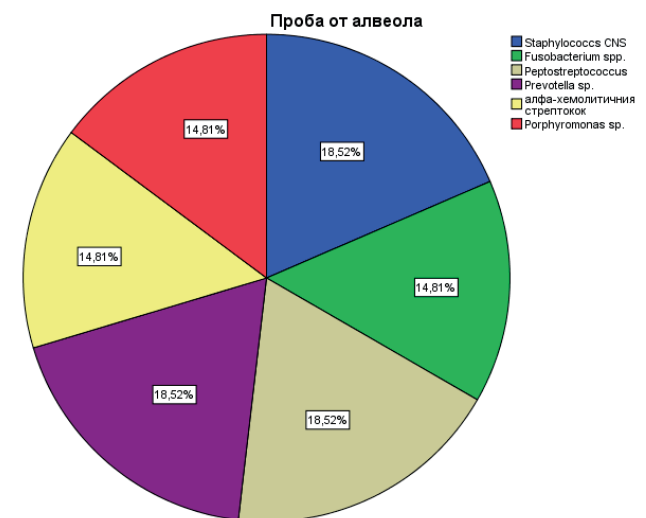
## Results

After the analysis of the frequency distribution – „Alveolar sample“ we got the following results with values: In the study of 27 patients, there were a total of six different types of microorganisms. In most of the patients, three microorganisms were found, which have a frequency distribution based on the entire sample of 18.5%, or these are five patients out of a total of 27 studied. These are the microorganisms *Staphylococcus CNS*, *Peptostreptococcus* and *Prevotella sp.* The other three species have a distribution of 14.8% and these are *Fusobacterium spp.*, *Alpha-hemolytic streptococcus* and *Porphyromonas sp.* We can clearly see the results obtained in the graph (Tables 1 and 2, and Graph 1).

Table 1.

Statistics		
Проба от алвеола		
N	Valid	27
	Missing	0
Mode		1 <sup>a</sup>
Std. Deviation		1,716

a. Multiple modes exist. The smallest value is shown



Graph 1.

After the analysis of the frequency distribution – “Sample of MS” we got the following results with values: In the study of 27 patients, a total of six different types of microorganisms were found, as well as patients without isolated microorganisms. In most of the patients, three bacteria were found, which have a frequency distribution based on the entire sample of 18.5%, or in five patients out of



a total of 27 studied. These are the bacteria Staphylococcus CNS, Peptostreptococcus and Prevotella sp. The other three Fusobacterium spp., Alpha-hemolytic streptococcus and Porphyromonas sp have a distribution as follows: 14.8%, 7.4% and 11.1%. In 11.1% of patients we did not have an isolated microorganism. We can clearly see the results obtained in Tables 3 and 4 and Graph 2.

If we compare the two samples of each patient, taken from the alveoli of the extracted teeth and the pathologically altered mucosa of the maxillary sinus, we get the following results – compared to the frequency distribution we can see in the following table, we get a match in 88,9% of all cases and in just over 11% of cases there is no match between the samples. Visually, the results can be seen in the graph at the end (Table 5 and Graph 3).

### Discussion

In the maxillofacial area, cone beam computer tomography is considered to be the golden standard to investigate the pathology. There are a number of publications that examine the relationship between the processes, present in the periodontium and the maxillary sinus using CBCT (3, 5, 7, 8). Melek Tassoker (6) in a study with a cone beam tomography scan showed that the frequency of the inflammatory process in the maxillary sinus is higher in the presence of residual bone below 3 mm. But in practice, what is important is not only the paraclinical examination, but also the one, done during the operative process. The cited publication unequivocally demonstrates the direct connection and the possible ascending probability of the inflammatory process when the available bone between the inflamed periodontal tissues and the floor of the maxillary sinus is below 3 mm – the authors found 88.89% identical pathogenic flora in both the foci and maxillary sinus.

**Table 2.**

Проба от алвеола					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Staphylococcus CNS	5	18,5	18,5	18,5
	Fusobacterium spp.	4	14,8	14,8	33,3
	Peptostreptococcus	5	18,5	18,5	51,9
	Prevotella sp.	5	18,5	18,5	70,4
	алфа-хемолитичния стрептокок	4	14,8	14,8	85,2
	Porphyromonas sp.	4	14,8	14,8	100,0
	Total	27	100,0	100,0	

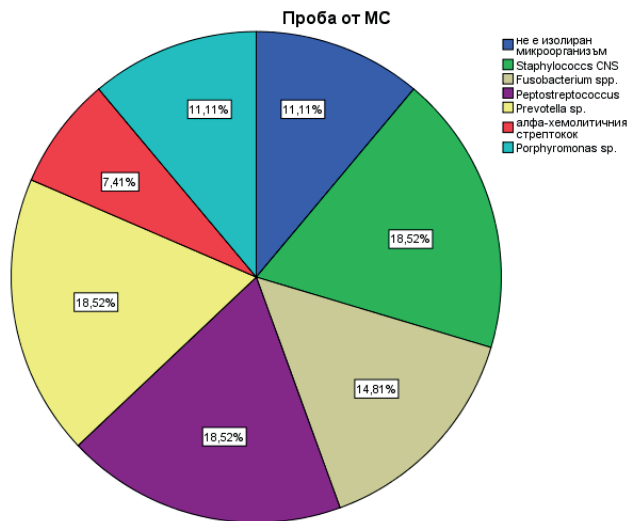
**Table 3.**

Statistics		
Проба от MC		
N	Valid	27
	Missing	0
Mode		1 <sup>a</sup>
Std. Deviation		1,861

a. Multiple modes exist. The smallest value is shown

**Table 4**

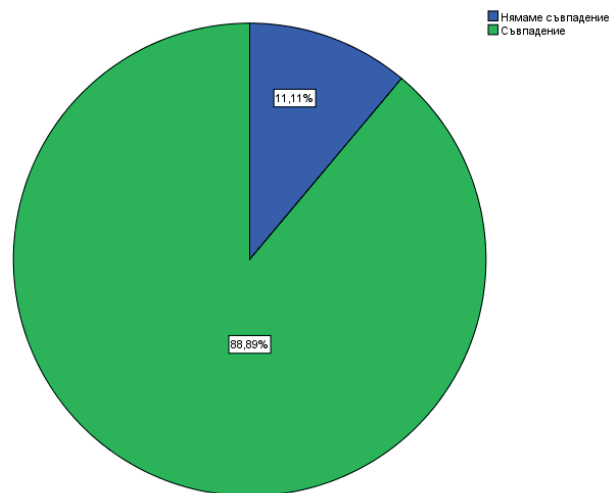
Проба от MC					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	не е изолиран микроорганизъм	3	11,1	11,1	11,1
	Staphylococcus CNS	5	18,5	18,5	29,6
	Fusobacterium spp.	4	14,8	14,8	44,4
	Peptostreptococcus	5	18,5	18,5	63,0
	Prevotella sp.	5	18,5	18,5	81,5
	алфа-хемолитичния стрептокок	2	7,4	7,4	88,9
	Porphyromonas sp.	3	11,1	11,1	100,0
	Total	27	100,0	100,0	



**Graph 2.**

**Table 5**
**VAR00001**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Нямаме съвпадение	3	11,1	11,1	11,1
	Съвпадение	24	88,9	88,9	100,0
	Total	27	100,0	100,0	


**Graph 3**

## Conclusions

When the height of the available bone in the distal parts of the upper jaw between the apexes of the teeth and the floor of the maxillary sinus is below 3 mm, the risk of ascending of the inflammatory process from the periodontal tissues to the maxillary sinus is quite high – 88.89%.

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