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Case Report,

Microbiological Spectrum, Clinic And Treatment Of Patients With Phlegmons Of The Mouth Floor

Yanko Georgiev Yankov*[1,2], Iliana Dimitrova Mechkarova[3]

[1]Clinic of Maxillofacial Surgery at the University General Hospital "Sveta Marina" - Varna city, Bulgaria
[2]Department of General and Operative Surgery at the Medical University 'Prof. Dr. Paraskev Stoyanov" - Varna city, Bulgaria
[3]Clinic of Maxillofacial Surgery at the University General Hospital "Sveta Marina" - Varna city, Bulgaria
Email Address: yanko_1989@abv.bg

Abstract:

Introduction: For the occurrence of inflammatory diseases in the maxillofacial region, as well as abscesses and their diffuse forms, called phlegmons, the presence of factors of a general and local nature is necessary. An obligatory factor of a local nature is the inflammatory process – an infection caused by microorganisms, usually commensals, which are part of the permanent oral microbiome, such as the three pathogens isolated in the patients presented by us – Streptococcus *anginosus*, *Staphylococcus epidermidis* and *Candida albicans*.

Materials and methods:
In the second half of 2021, 81 patients with abscesses and phlegmons of the head and neck were treated by us. We present three of the studied patients - men, with an average age of 52 (42-70) years with phlegmons of the mouth floor of odontogenic origin and involvement of the three distinguished lodges under the mylohyoid.

Results and discussion:
Judging by the number of days spent in hospital for the three patients, the one aged 70, in whom the isolated causative agent was *Candida albicans*, is the one with the most severe relapse.
The oldest patient, in whom the isolated pathogen is *Candida albicans* and who presents with the greatest number of comorbidities, is the one in whom phlegmon disease of the floor of the mouth is the most severe.
All three paraclinical blood indicators (CRP, WBC and Neutr) had the highest numerical dimensions in the youngest of the patients (aged 42 years), in whom the isolated pathogen was *Streptococcus anginosus*.
The DNI value in the 45-year-old patient with an isolated pathogen *Staphylococcus epidermidis*, has the highest level.

Conclusion:
Candida albicans occurs in older patients and in those with a greater number of comorbidities and proceeds most protracted. *Streptococcus anginosus* is the pathogen that occurs in the youngest patient and leads to the most significant increase in paraclinical indicators. *Staphylococcus epidermidis* is the pathogen that also occurs in young individuals, with few comorbidities and leads to the shortest stay of patients in hospital clinics.

Keywords: abscess, Candida albicans, head and neck surgery, maxillofacial surgery, phlegmon, Staphylococcus epidermidis, Streptococcus anginosus

Introduction:

Inflammation is the body's defense mechanism to remove harmful stimuluses, including bacterial pathogens, as well as initiate a process of healing and repair of damaged body tissues (1). There are five local signs characterizing the inflammatory

reaction - swelling, redness, increased local temperature, pain and impaired function (2, 3). For the occurrence of inflammatory diseases in the maxillofacial region, as well as abscesses and their diffuse forms, called phlegmons, the presence of factors of a general and local nature is necessary. An obligatory factor of a local nature is the inflammatory process – an infection caused by microorganisms, usually commensals, which are part of the permanent oral microbiome, such as the three pathogens isolated in the patients presented by us. The specific reactivity of the organism under the influence of disease-causing microorganisms and their endo- and exotoxins is counted among the factors of a general nature (4).

Materials and methods:

In the second half of 2021, 81 patients with abscesses and phlegmons of the head and neck - 50 of them of odontogenic origin and 31 of non-odontogenic origin, were treated in the Clinic of Maxillofacial Surgery at the University General Hospital (UGH) "Sveta Marina" – Varna city, Bulgaria. Of these, a total of 5 men were diagnosed with phlegmons (3 with odontogenic origin and 2 with non-odontogenic origin), the rest were diagnosed with "abscess" (Figure 1).

We present three of the studied patients - men, with an average age of 52 (42-70) years with phlegmons of the floor of the oral cavity (phlegmons of the mouth floor) of odontogenic origin (in all three the causative tooth is from the 3rd quadrant) and involvement of the three distinguished lodges under the mylohyoid muscle - the right submandibular space, the submental region and the left submandibular space. All three patients were hospitalized in the Clinic of maxillofacial surgery and underwent emergency surgery. Their diagnosis was confirmed both by performing a head and neck computed tomography (CT) and during the operative treatment itself (incision, lavage, drainage), during which the available purulent exudate was evacuated. From the latter, as a routine procedure in all of them, a microbiological sample was taken for examination. The result of the latter was different in all three patients, as the isolate showed the following micropathogens as the causative agents of the three monoinfections – *Streptococcus anginosus*, *Staphylococcus epidermidis* and *Candida albicans*.

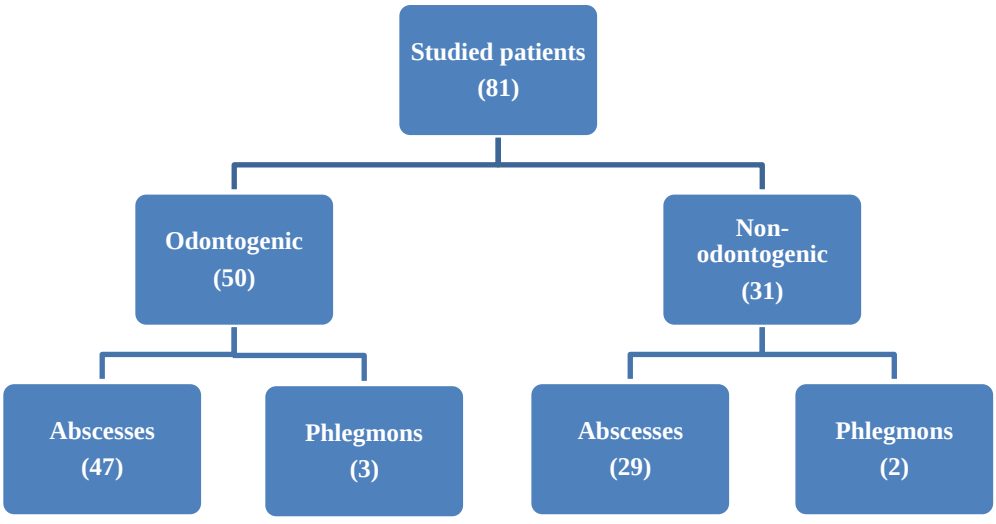

Figure1. Distribution of studied patients with inflammatory diseases

Results and discussion:

The phlegmon is the more widespread, more massive form of the abscess and almost always proceeds with more pronounced clinical symptoms, more protracted and with a more unfavorable prognosis. On the other hand, phlegmonous patients require more care, often stay in intensive care clinics and departments and

are a greater "burden" from an economic point of view for the health care system.

The clinical manifestation of phlegmon of the floor of the mouth depends on the tooth causing the infection, but in most cases it begins as a limited purulent inflammation in one of the cell spaces - alveolingual sulcus or submandibular triangle, after which it relatively quickly spreads to the surrounding soft tissue spaces. In some patients, it is limited to one half of the neck, and in others it covers the tissues of both halves (5). A large edema is formed, which is highly pronounced extraorally. The skin above it is stretched, shiny, red and very painful, which is the reason for limited mobility of the neck. It is impossible to feel the edge of the lower jaw. The mouth is open; the tongue is raised and does not fit in the mouth, but protrudes from between the teeth. Intraorally, there is drainage and reddened mucosa in the subligual region. The sublingual folds are swollen, greatly enlarged and painful, covered with a whitish fibrinous plaque. There is foetor ex ore (6). Hypersalivation and dehydration are observed. Collateral edema covers the lips, neck, larynx. Enlarged and painful regional cervical lymph nodes are common (7). Swallowing is painful, speech is difficult, and the voice is hoarse and sometimes unintelligible. The appearance of the patient is restless and frightened (5-7). Breathing is difficult and rapid. The general condition is severe, with a well-expressed clinic of a general inflammatory syndrome - accelerated pulse; elevated body temperature up to 39-40°C and more, the patient is agitated (8). The face is puffy, the lips and skin are pale and cyanotic (4).

The etiology of phlegmon of the floor of the mouth, depending on the entrance door of the infection, can be conditionally divided into that of odontogenic and non-odontogenic origin.

In the case of odontogenic origin, an infection can occur in any single tooth from the dentition of the lower jaw, through which the infectious pathogen can enter the mandibular bone and from there the infection can pass into the soft tissues around it.

In case of non-odontogenic origin of exudative inflammations, the infectious agent most often enters the soft tissues through various traumas of the mucous membrane of the oral cavity and the adjacent skin. The pathogen is less likely to move by lymphatics from adjacent areas to the soft tissues of the floor of the oral cavity.

Streptococcus anginosus is a gram-positive facultative anaerobic bacterium and is part of the normal human bacterial flora of the oropharynx and gastrointestinal tract (9). Under certain circumstances, it can cause various diseases, including brain abscesses (10). It is highly virulent and can cause invasive pyogenic infection requiring urgent surgical treatment. Streptococci are ovoid or spherical microorganisms whose host environment is the digestive tract and respiratory tract in humans and animals, being most numerous in the oral cavity, nose, colon, throat, vagina in women and urethra (9, 10). The symptoms of infection with this microorganism are angina, dysphagia, headache, the formation of purulent plaques on the tonsils, general malaise and general weakness of the infected organism, hyperthermia, diarrhea, vomiting, dehydration. Streptococcal bacteria are the cause of the following diseases: pharyngitis, tonsillitis, bronchitis, tracheitis, pneumonia, rhinitis, sinusitis, upper otitis media, ethmoiditis, sphenoiditis, frontal sinusitis, scarlet fever, lymphadenitis, meningitis and endocarditis. The source of infection is the sick person. Asymptomatic carriage can also be detected (11). The sensitivity of streptococci to antibiotic drugs is a major factor in successful treatment. Considerable susceptibility to penicillins and cephalosporins of the I and II generations has been established, which may vary among individuals (12).

The first clinical case reviewed was of a 42-year-old man who was free of comorbidities. After staying in the clinic for 8 days and successfully performed one operation (incision, lavage and drainage), together with parenteral administration of the antibacterial preparations Cefazolin (3x2 g), Gentamicin (2x0.08 g) and Metronidazole (3x0.5 g) for the entire stay of hospitalization was discharged in good general condition and with stable vital signs. The pathogen isolated from his wound discharge was *Streptococcus anginosus* (Table 1). Paraclinical tests in this patient have the following values: WBC (white blood cells) – 27.87.10^9/L; Neutr (neutrophils) – 11.45.10^9/L; CRP (C-reactive protein) – 504.99 mg/l; PCT (procalcitonin) – 0.27 ng/mL; DNI (delta neutrophil index) – 3.1% (Table 2).

Staphylococcus epidermidis is a gram-positive facultative anaerobic bacterium. They occur more often in the skin and not so much in the mucosal flora. An increased risk of developing infections is found in patients with a weaken immune system (13). One of the main causes of more than 80% of

purulent-inflammatory diseases, food poisoning, and especially nosocomial infections, is the staphylococcal invasion of the body. *Staphylococcus epidermidis* is characterized by its rapid and persistent colonization and biofilm formation on artificial surfaces. This makes people with urethral catheters and various types of implants particularly vulnerable and prone to different types of infections (14). Staphylococcal infections tend to lead to complications in some organs and systems, such as: endocarditis, osteomyelitis, septic arthritis, pneumonia, bacteremia, septicemia (13, 14). Some strains of *Staphylococcus epidermidis* are resistant to antibiotics, including fluoroquinolones, macrolides and sulfonamides. A particular resistance to hospital isolates has been described to methicillin – up to 90% (15). It is appropriate to proceed to treatment with antibacterial drugs only after an antibiogram has been performed, in order to determine with great accuracy which medicines (or a combination of such medicines) would have the greatest effect on the life cycle of staphylococci. The source of infection is the sick person and the healthy infectious agents. In healthy infections, bacterial foci are located mostly in the area of the nostrils, the mucous membrane of the oral cavity and the moist areas of the skin (13, 15).

The second clinical case reviewed was a 45-year-old man who reported the presence of a high-grade glial brain tumor as comorbidity. After being hospitalized for 3 days and successfully performed one operation (incision, lavage, drainage) with intravenous administration of Cefazolin (3x2 g), Gentamicin (2x0.08 g) and Metronidazole (3x0.5 g) for the entire hospital stay, was discharged in good general condition and with stable vital signs. The pathogen isolated from his wound secretion was *Staphylococcus epidermidis* (Table 1). Paraclinical tests in this patient have the following values: WBC – 6.37.10^9/L; Neutr – 5.72.10^9/L; CRP – 194.54 mg/l; PCT – 3.08 ng/mL; DNI – 7.4% (Table 2).

Candida albicans is a type of yeast and is the most common type of Candida in the oral cavity. Their presence is considered part of the normal flora in the oral cavity, as they are a harmless member of the oral microbiome in humans. Their most common localization is on the back of the tongue (16). With excessive development of this type of yeast in the oral cavity, various forms of oral candidiasis are observed. Oral candidiasis is usually due to systemic disease or excessive topical or systemic antibiotic use (17). The following groups of drugs are effective in *Candida albicans* infection: azoles, allylamines, polyene antibiotics, flucytosine and caspofungin. Other drugs are often used to treat candidiasis, mainly for symptomatic relief (17, 18).

The third clinical case examined is that of a 70-year-old man with co-morbidities of diabetes mellitus type II, arterial hypertension and cerebrovascular disease, who had an ischemic stroke in the past. After surgical treatment (incision, lavage, drainage) the patient was transferred to the Clinic for anesthesiology and intensive care in the same University hospital and put on mechanical ventilation. He spent a total of 17 days in the two clinics - 3 days in the Clinic of maxillofacial surgery and 14 days in the Clinic of anesthesiology and intensive care, where he was intubated and put on mechanical ventilation. During this time, he was on intravenous administration of the following antimicrobial preparations: Ciprofloxacin (2x0.4 g), Amikacin (1x0.5 g), Meronem (3x1 g) and Metronidazole (3x0.5 g), as well as antifungal medication Fluconazole (1x0.4 g), after which he was discharged in good general condition and with stable vital signs. The pathogen isolated from his wound discharge was *Candida albicans* (Table 1). Paraclinical tests in this patient have the following values: WBC (leukocytes) – 11.7.10^9/L; Neutr (neutrophils) – 9.23.10^9/L; CRP (C-reactive protein) – 334.97 mg/l; PCT (procalcitonin) – 4.34 ng/mL; DNI (delta neutrophil index) – 4.6% (Table 2).

Table 1. Characteristics of the studied patients and type of isolated microorganisms

Patient	Age (years)	Gender	Isolated pathogen	Days of hospitalization	Number of operative interventions	Accompanying diseases
1	42	M	*Streptococcus anginosus*	8	1	–
2	45	M	*Staphylococcus epidermidis*	3	1	high-grade glial tumor

3	70	M	*Candida albicans*	17	1	- diabetes mellitus; - arterial hypertension; - cerebrovascular disease

Table2. Indications of the studied paraclinical markers in the studied patients

Patient	CRP (mg/l)	WBC (x10^3/L)	Neutr (x10^3/L)	PCT (ng/ml)	DNI (%)
1	504,99	27,87	11,45	0,27	3,1
2	194,54	6,37	5,72	3,08	7,4
3	334,97	11,7	9,23	4,34	4,6

Judging by the number of days spent in hospital for the three patients, the one aged 70 made a full recovery and was discharged in good general condition and with stable vital signs after 17 days of treatment, unlike the other two patients (aged 42 and 45), who stayed in the clinic significantly shorter (8 and 3 days). If we take bedridden days as a criterion, we can claim that the oldest patient (70 years old), in whom the isolated causative agent was *Candida albicans*, is the one with the most severe relapse (Table 1).

Unlike the other two, he has the highest number of comorbidities - diabetes mellitus, arterial hypertension, and cerebrovascular disease, while the 42-year-old has no comorbidities and the 45-year-old has a glial brain tumor. I.e. we can again conclude that the oldest patient in whom the isolated pathogen is *Candida albicans* and who presents with the greatest number of comorbidities is the one in whom phlegmon disease of the floor of the mouth is the most severe (Table 1).

We reach the same conclusion when we analyze the PCT values in the three patients, in which the serum concentration is significantly higher than the accepted norm of 0.5 ng/ml and the cut-off value of 0.225 ng/ml in the patients with odontogenic and non-odontogenic head and neck abscesses (19-23). In the oldest patient (aged 70 years), in whom *Candida albicans* was isolated, the blood plasma PCT concentration was 4.34 ng/ml, while in the other two patients it was 3.08 ng/ml in the 45-year-old and 0.27 ng/ml at the age of 42 (Table 2).

Comparing the values of the other paraclinical blood indicators - CRP, WBC and Neutr, we find that they are significantly higher than the normal values of the indicators (CRP - 5 mg/l, WBC - up to 10.5x103/L, Neutr - up to 7.5x103/L) and from their derived cut-off values for inflammatory purulent diseases of the head and neck (CRP – 5 mg/l, WBC – up to 8.32x103/L, Neutr – up to 4.69x103/L) (19 , 21, 22). All three had the highest numerical dimensions in the youngest of the patients (aged 42 years), in whom the isolated pathogen was *Streptococcus anginosus* (Table 2).

The DNI value in all three studied patients was higher than the accepted reference value of 0% and the derived cut-off value of 0.15% in patients with abscesses and phlegmons of the head and neck (20, 22-24). The only value of the indicators we compare, which is highest in the 45-year-old patient with an isolated pathogen *Staphylococcus epidermidis*, is the DNI. In him, the calculated DNI value was 7.4%, while in the other two patients it was 4.6% in the 70-year-old patient and 3.1% in the 42-year-old (Table 2).

Conclusion:

From the study conducted in the three patients with phlegmons of the mouth floor and the comparison of the results of their paraclinical studies, it is found that *Candida albicans* is the pathogen that occurs in older patients and in those with a greater number of comorbidities and proceeds most protracted, *Streptococcus anginosus* is the pathogen that occurs in the youngest patient and leads to the most significant increase in paraclinical indicators, and *Staphylococcus epidermidis* is the pathogen that also occurs in young individuals, with few comorbidities and leads to the shortest stay of patients in hospital clinics.

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