

Retrospective analysis of cellulitis of the floor of the mouth

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SUMMARY

Objectives. To analyze clinical data of patients treated for mouth floor cellulitis during 2003-2006 years at the Department of Maxillofacial Surgery, Vilnius University Hospital Zalgiris Clinic and to compare the results with existing data.

Material and methods. Patient's gender, age, social insurance, demographic profile, preference of first visit, previous treatment, origin of inflammation, symptoms of disease, treatment protocol and outcomes were evaluated from 240 clinical records.

Results. The male-female ratio was 1.3:1. The mean age of patients was 43.18 ± 7.56 years. 65% of patients were from urban. 47% of patients were employed, 15% retirees, 22% unemployed, 10% children, 2% students and 4% handicapped people. In 65% of cases primary diagnosis was incorrect. Majority of patients appealed to doctor on the first five days from the beginning of the disease. 93.7% of mouth floor cellulites were odontogenic origin. In 32.9% of the patients at the time of first examination the extension of inflammation into parapharyngeal, pterygomandibular spaces or neck together with mouth floor cellulitis was diagnosed. In 1.7% (in 4 out of 240) of cases infection extended into the neck and parapharyngeal spaces despite treatment. In 2% (in 5 out of 240) of cases infection extended to mediastinum.

Conclusions. Despite the aggressive treatment serious complications still are possible. Delayed treatment procedures might determine poor prognosis.

Key words: cellulites, floor of the mouth, antibiotics, mediastinitis, odontogenic.

INTRODUCTION

Cellulitis is an infectious inflammation of the cellular adipose tissue located in the aponeurotic spaces (1). Mouth floor cellulitis is determined as an infection of the cellular adipose tissue located in submandibular, submental and sublingual spaces (2, 3, 4, 5). It has a historical term and is also known as Ludwig's angina first described by Wilhelm Frederick von Ludwig in 1836 as a potentially fatal, rapidly spreading soft tissue infection of the neck and floor of the mouth (2). The main causative factors of mouth floor cellulitis are dental infections including apical and marginal periodontitis, pericoronitis or complications during dental treatment procedures and infection of upper airway (3, 6).

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These infections can develop into life threatening events (7). Scientific evidence of the last ten years showed only isolated cases of mortality owing to mouth floor cellulitis (7, 8, 9). Therefore, some authors reported that a mortality rate for acute diffuse cellulitis is 50% and it still remains a dangerous surgical condition that can cause severe airway compromise and death (10, 11). Prophylaxis, early diagnostics and adequate treatment procedures of the mouth floor cellulitis are important factors which guarantee patients safety.

The aim of the present study was to analyze clinical data related with patients treated for cellulitis of the floor of the mouth during 2003-2006 years at the Department of Maxillofacial Surgery, Vilnius University Hospital Zalgiris Clinic (VUHZC) and to compare the results with existing data.

MATERIAL AND METHODS

Clinical records of all patients with clinical diagnosis of cellulitis of the floor of the mouth treated at the Department of Maxillofacial Surgery, Vilnius University Hospital, Zalgiris Clinic (VUHZC) from 2003 to 2006

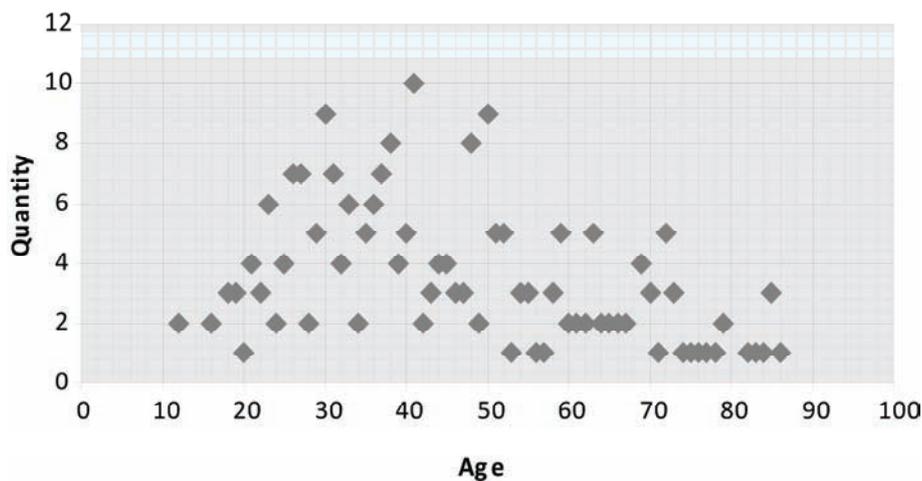


Fig. 1. Age distribution of patients with cellulitis of the mouth of the floor

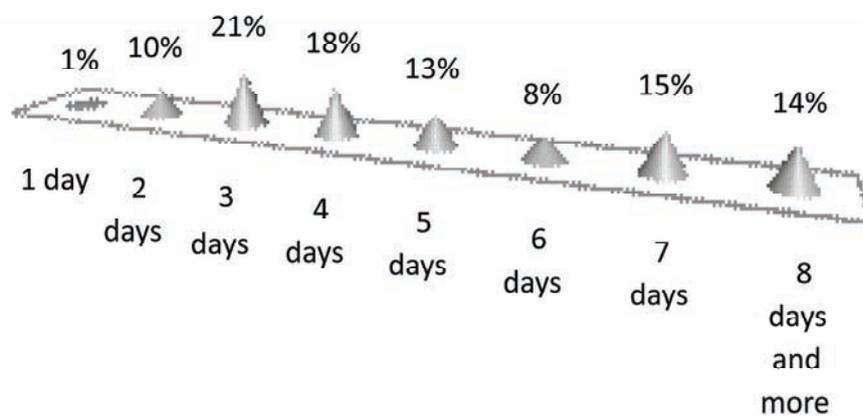


Fig. 2. Time from the onset of symptoms to the appointment with doctor

were examined retrospectively. Patient's gender, age, social insurance, demographic profile, preference of first visit, previous treatment, origin of inflammation, location and symptoms of disease, general health status, results of examination and treatment protocol, also outcomes were evaluated. Results of blood and bacteriological tests, radiographic findings were also taken into consideration.

RESULTS

There were 240 patients with mouth floor cellulitis treated in VUHZC. Fifty seven percent of patients were males and 43% females. The male-female ratio was 1.3:1. The mean age of patients was 43.18 ± 17.56 years (range 8-86 years). Patient's age distribution is shown in Figure 1.

Almost 65% of patients were from urban and 35% from rural areas. Forty seven percent of patients were employed, 15% retirees, 22% unemployed, 10% children, 2% students and 4% handicapped people.

For 58.8% of patients their first appointment was in primary health centre, 30% came directly to VUHZC, 4.6% were brought by ambulance service, 4.2% patients

were referred from private clinics and 5.4% were moved from other hospitals. Even in 65% of the cases primary diagnosis was incorrect, due to this the treatment was inadequate. Majority of patients appealed to doctor on the first five days from the beginning of the disease (Fig. 2). Three patients came to the specialist after 21 days from the onset of the disease symptoms, with extensive inflammation and complications. Twenty-four hours from the disease onset was the shortest period prior specialist consultation and only 2 patients (0.83%) of 240 during this period were looking for the specialist consultation.

Often the unemployed patients and retirees were the ones to delay the specialist consultation, but there was no statistically significant difference ($p > 0.05$).

Majority cases (93.7%) of the treated cellulites of the mouth floor were odontogenic origin. In almost of 79% of the cases the pathology was related to the infection process associated with the second and third lower molars, in 6.7% – with premolars and in 7.9% – with incisors or canines. The infection due to the lymphadenitis, sialoadenitis or fracture of the mandible constituted 6.3% of all treated cases of the mouth floor cellulitis.

During the first examination the main patient's complaints were severe pain, tumefaction, troublesome and painful mouth opening, swallowing, swelling of facial tissue, tooth pain and fever (Fig. 3).

Clinical examination revealed extraoral and intraoral edema and infiltration of the mouth floor tissue, painful palpation of affected zone, collateral edema of neck, and related facial regions, skin flush, painful and limited mouth opening, untreated teeth with caries lesions, periodontal pathology or empty alveolar socket after tooth extraction. Bilateral swelling was found in 18.8%, unilaterally right and left sides were affected almost equally (respectively 40.8% and 40.4% of cases) ($p > 0.05$).

Radiographic examination showed apical or marginal bone radiolucency near causative tooth, untreated root canals, caries lesions with pulpal exposure, or empty alveolar socket of extracted tooth (Fig. 4). Only in 5% of patient's teeth were treated endodontically, others

were decayed or extracted (Table 1).

Even in 32.9% of the patients at the time of first examination the extension of inflammation into parapharyngeal, pterygomandibular spaces or neck together with mouth floor cellulitis was diagnosed.

At the time of first examination in 13.3% of cases the body temperature was normal. Temperature measures are shown in Figure 5.

Increase of white blood cells was found in blood samples in 82.9% of patients, lymphocytes of 5.8%, lowered numbers of lymphocytes of 64.1% of patients.

Patients with mouth floor cellulitis were treated by incision and drainage of affected area. Generally systemic antibiotic therapy and anti-inflammatory, non steroidal drugs were used. In some cases systemic antibiotic therapy was combined with steroidal drugs. The submandibular, submental, sublingual spaces were drained extraorally in 50% of cases, intraorally in 20% of cases and combination of these method was used in 30% of cases. Considering the outspread of inflammation, the procedure was done in general (27% of patients) or local anesthesia (73% of patients). Surgical drainage was performed within the first 6 hours after hospitalization in all patients.

Microbiological sampling was undertaken during the surgical procedure in all cases. In 34.6% growth of the microorgan-



Fig. 3. A case of patient with cellulitis of the floor of the mouth (extraoral and intraoral swelling and infiltration, painful mouth opening)

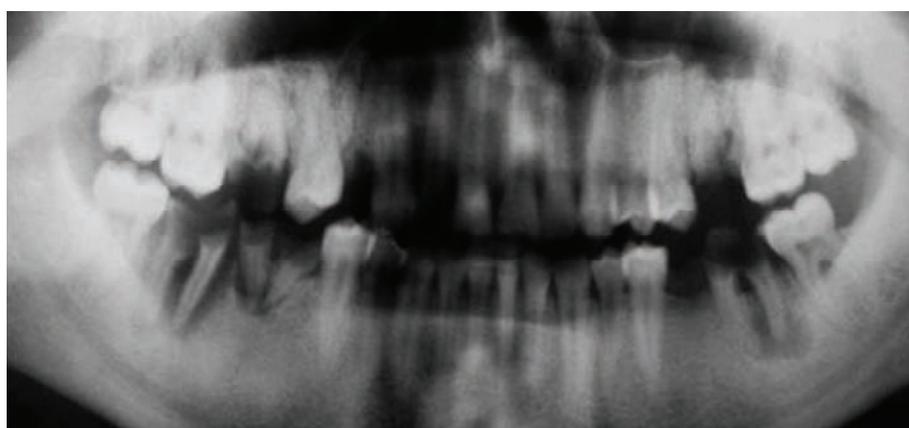


Fig. 4. Radiological findings (in OPG) of one case of cellulitis of the floor of the mouth

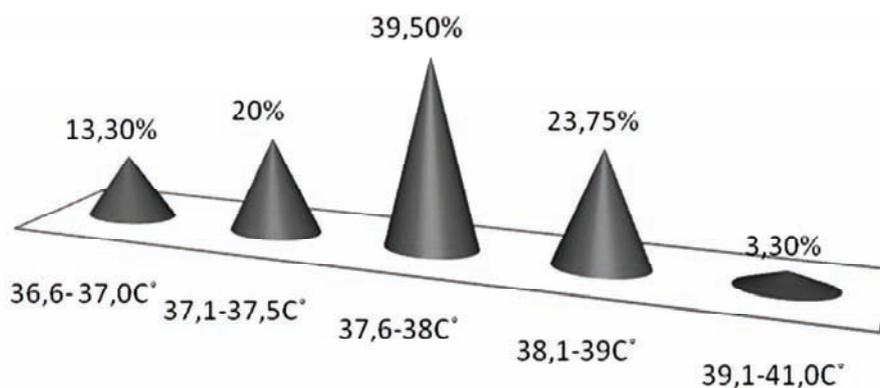


Fig. 5. Variations of the body temperature

Table 1. Status of the causal teeth (from OPG and anamnesis)

Status of tooth	n (cases)	% of cases
Endodontically treated	12	5
Untreated endodontically	136	56.7
Extracted teeth (empty alveolar socket)	65	28.8
Treatment in progress	8	3.3
Non odontogenic	15	6.2
Total	240	100

Table 2. Microorganism in bacterial infections

Microorganism	n	%
Not found	83	34.6
Streptococcus α haemolyticus	59	24.6
Streptococcus spp.	48	19.9
Streptococcus β haemolyticus	22	9.2
Staphylococcus coagulase	16	6.7
Bacteroides	8	3.3
Staphylococcus aureus	4	1.7
Total	240	100

isms in microbiological samples was not observed. Streptococci were the main isolates from the bacteriological material and constituted 82.2% of positive tests (Table 2). The monoinfection was detected in 73.9% cases, two microbes were found in 26.1% positive tests cases ($p < 0.05$).

At the start of treatment the penicillin (1-2 millions IU every 4 or 6 hours) alone or in combination with gentamycin (240 mg par day) was administered for 73.7% of patients (Table 3). Treatment with antibiotics was changed according to microbiological tests results only in 6.7% of cases.

The mean duration of hospitalization was 9.5 days (range 1 – 39 days).

In 1.7% (in 4 out of 240) of cases infection extended into the neck and parapharyngeal spaces despite treatment. In 2% (in 5 out of 240) of cases infection extended to mediastinum, those patients were moved to other hospitals for further treatment.

DISCUSSION

The unique anatomy of the mouth floor plays an important role in the development and extension of intraoral infections. Deep neck (parapharyngeal, pterygomandibular and other neck) and mouth floor infections have potentially fatal complications (9, 12; 13; 14). In untreated cases the mortality is close to 100%, both from the acute sepsis and from airway obstruction. Antibiotics and aggressive surgical treatment have significantly lowered mortality (15). Some studies reported that complications rate is still remaining very high 18-28% of treated cases (16, 17). In the present study even in 32.9% of cases at the time of the first examination the spreading of infection in to the parapharyngeal, pterygomandibular or neck spaces was diagnosed. Despite this complication rate was quite low – only 3.7%. This can be assessed as a good result. It could be due to the short period between the patient's hospitalization to the VUHZK and surgical procedure all surgical procedures were performed within the first 6 hours after hospitalization. It is stated, that early surgical drainage and adequate antimicrobial treatment remains the main method in treatment of deep

neck abscesses (6, 14, 18). This is especially important in the cases of anaerobic infection. For example Bross-Soriano with co-authors reported twice longer time (12 hours) from hospitalization prior to surgery and bigger rate of complications (28%) (17).

There are two main common causes of the mouth floor cellulitis - odontogenic infection and upper airway infection (6). In our study dental infection from the mandibular molars as causative factor of the mouth floor cellulitis constituted 93.7%. These findings correlate with the results from other studies (17, 19, 20).

Oral health care is still a subject to be neglected by the part of Lithuanian population. This could be one of the reasons for the high rate of the mouth floor cellulitis. Another reason could be the high prevalence of apical (70%) and marginal periodontitis in Lithuanian population (21). Also high costs of endodontic treatment, lack of specialists and quality of endodontic treatment may also be the reasons for the odontogenic infections and inflammation in facial region. Maybe due to the dental treatment fear many of patients try to perform the self-treatment during the initial phase of pathology. It often includes: use of antibiotics without prescription, spirituous application on the swelling place or waiting till the self termination of the process. They are waiting till the state of general health becomes critical and swallowing starts to be difficult or impossible. It might be supposed that through such negligence the complications are more common, the healing period is much longer and the recovery process is longer and less predictable. Also it should be noted that if the reason of cellulitis is odontogenic in nature the general dentists must be able to recognize the first signs of it and identify the patients who maybe at risk (13). Early prescription of the parenteral antibiotics can prevent mortality and morbidity (5). According to our study, in 65% of the cases primary diagnosis was incorrect and initially treatment was inadequate. This lead to spread of infection in the floor of the mouth and prolong the treatment time. The mean of hospitalization time of patients treated in VUHZC was 9.5 days. In the study Bross-Soriano with co-authors hospitalization time was 6 days or less (17).

The male-female ratio of treated patients in the present study was 1.3:1. In Lithuania male-female ratio was 1:1.14 in the 2003-2006 y (22). It might be stated that cellulites of the floor of the mouth more often affect men. It could be related to the fact that men take much less care about their health than female.

In scientific literature it was stated that cellulitis of the floor of the mouth more often affects individuals of lower socioeconomic status (23). Due to the limitations of the present retrospective study it was impossible to determine socioeconomic status of treated patients. It was only noted that 22% of patients were unemployed.

Table 3. Antibiotics variations

Antibiotic	n	%
Penicillin	80	33.3
Penicillin+gentamicin	97	40.4
Cefuroxime and other cephalosporins	25	10.4
Lincomycins	10	4.2
Other penicillins	15	6.3
Gentamicin	5	2.1
Penicillin+gentamicin+metronidazol	2	0.8
Cefuroxime+metronidazol	4	1.7
Cefuroxime+gentamicin	2	0.8
Total	240	100

According to the data from Lithuanian Statistical Department, in the 2003-2006 years 35% of population lived in rural areas (22). The present study showed that 34.6% patients were from rural areas. The ratio between treated patients from urban and rural areas was the same as ratio of inhabitants of urban and rural areas. There were no statistically significant data, that people from rural regions had more complications or were late. The late arrival to the doctor was noted in unemployed patient and retirees, but without statistically significant difference ($p > 0.05$).

Treatment protocol in other and the present study was almost the same. It's including early surgical incision and drainage, removal of the cause of infection via teeth extraction and prolonged antibiotic course. Intravenous dexamethasone given for 48 hours has been beneficial in reducing edema, which helps to maintain airway integrity and enhances antibiotic penetration (24). In VUHZC dexamethasone was given intramuscular for 48 hours twice a day – 4-12 mg according to patient's weight. It has been reported that early infections, first three days of symptoms, are primarily caused by aerobic streptococci which are sensitive to penicillin. In late infections, more than three days of symptoms, the majority of microorganisms are anaerobes, predominantly *Peptostreptococcus*, *Fusobacterium* or *Bacteroides* that

are mostly resistant to penicillin (1; 24). However, the present study showed that in 82% of positive microbiological samples streptococci were found. Therefore the penicillin (1-2 millions IU every 4 or 6 hours), sometimes used in combination with an antistaphylococcal drug (gentamycin) or metronidazol, was decided as the appropriate and adequate antibiotics.

The role of oral anaerobes in these infections is increasingly being realized. An empirical antibiotic therapy should always be taken in account the possibility of anaerobic involvement (25). The present study revealed, that only 42% of 124 sampled (or 21.7% of all 240 cases) microorganisms were sensitive to metronidazol. For penicillin-allergic patients lincomycin was prescribed, while clindamycin for this purpose in others studies was used (24).

CONCLUSIONS

The most common reason of cellulitis of the floor of the mouth is odontogenic infection. Despite the aggressive treatment serious complications still are possible. Delayed treatment procedures might determine poor prognosis. Further studies analyzing and comparing recent and presented data are needed.

REFERENCES

- de-Vicente-Rodríguez JC. Maxillofacial cellulitis. *Med Oral Patol Oral Cir Bucal* 2004;9 Suppl:133-8; 126-33.
- Wasson J, Hopkins C, Bowdler D. Did Ludwig's angina kill Ludwig? *J Laryngol Otol* 2006;120:363-5.
- Bertolai R, Acocella A, Sacco R, Agostini T. Submandibular cellulitis (Ludwig's angina) associated to a complex odontoma erupted into the oral cavity. Case report and literature review. *Minerva Stomatol* 2007;56:639-47.
- Kinzer S, Pfeiffer J, Becker S, Ridder GJ. Severe deep neck space infections and mediastinitis of odontogenic origin: clinical relevance and implications for diagnosis and treatment. *Acta Otolaryngol* 2009;129:62-70.
- Marcus BJ, Kaplan J, Collins KA. A case of Ludwig angina: a case report and review of the literature. *Am J Forensic Med Pathol* 2008;29:255-9.
- Huang TT, Liu TC, Chen PR, Tseng FY, Yeh TH, Chen YS. Deep neck infection: analysis of 185 cases. *Head Neck* 2004;26:854-60.
- Green AW, Flower EA, New N E. Mortality associated with odontogenic infection. *Br Dent J* 2001;190:529-30.
- Regueiro Villarrón S, Vizquez Barro JC, Herranz González-Botas J. Deep neck infections: etiology, bacteriology and treatment. *Acta Otorrinolaringol Esp* 2006;57:324-8.
- Bottin R, Marioni G, Rinaldi R, Boninsegna M, Salvadori L, Staffieri A. Deep neck infection: a present-day complication. A retrospective review of 83 cases (1998-2001). *Eur Arch Otorhinolaryngol* 2003;260:576-9.
- Scheffer P, Ouazzani A, Esteban J, Lerondeau JC. Serious cervicofacial infections of dental origin. *Rev Stomatol Chir Maxillofac* 1989;90:115-8.
- Greenberg SL, Huang J, Chang RS, Ananda SN. Surgical management of Ludwig's angina. *ANZ J Surg* 2007;77:540-3.
- Abramowicz S, Abramowicz JS, Franklin M. Severe Life Threatening Maxillofacial Infection in Pregnancy Presented as Ludwig's Angina. *Infect Dis Obstet Gynecol* 2006;2006:51931.
- Furst IM, Ersil P, Caminiti M. A rare complication of tooth abscess—Ludwig's angina and mediastinitis. *J Can Dent Assoc* 2001;67:324-7.
- Carter L, Lewis E. Death from overwhelming odontogenic sepsis: a case report *Br Dent J* 2007;203:241-2.
- Kremer MJ, Blair T. Ludwig angina: forewarned is forearmed. *AANA J* 2006; 74:445-51.
- Boscolo-Rizzo P, Marchiori C, Montolli F, Vaglia A, Da Mosto MC. Deep neck infections: a constant challenge. *ORL J Otorhinolaryngol Relat Spec* 2006;68:259-65.
- Bross-Soriano D, Arrieta-Gómez JR, Prado-Calleros H, Schimelmitz-Idi J, Jorba-Basave S. Division Management of Ludwig's angina with small neck incisions: 18 years experience *Otolaryngol Head Neck Surg* 2004;130:712-7.
- Gill Y, Scully C. Orofacial odontogenic infections: review of microbiology and current treatment. *Oral Surg Oral Med Oral Pathol* 1990;70:155-8.
- Marioni G, Rinaldi R, Staffieri C, Marchese-Ragona R, Saia G, Stramare R, et al. Deep neck infection with dental origin: analysis of 85 consecutive cases (2000-2006). *Acta Otolaryngol* 2008;128:201-6.
- Srirompong S, Art-Smart T. Ludwig's angina: a clinical review. *Eur Arch Otorhinolaryngol* 2003;260:401-3.
- Peciuliene V, Rimkuvienė J, Maneliene R, Ivanauskaitė D. Apical periodontitis in root filled teeth associated with the quality of root fillings. *Stomatologija. Baltic Dent Maxillofac J* 2006;8:122-6.
- Statistikos departamentas prie Lietuvos Respublikos vyriausybės. Prieiga per internet! < www.stat.gov.lt >.
- Agarwal AK, Sethi A, Sethi D, Mrig S, Chpra S. Role of socioeconomic factors in deep neck abscess: A prospective study of 120 patients. *Br J Oral Maxillofacial Surg* 2007;45:553-5.
- Hartmann RW Jr. Ludwig's angina in children. *Am Fam Physician* 1999;60:109-12.
- Holbrook WP. Bacterial infections of oral soft tissues. *Curr Opin Dent* 1991;1:404-10.

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