

Incidence of Single and Multiple Facial Spaces (Primary and Secondary) Involvement in Orofacial Infection of Odontogenic Origin

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ABSTRACT

Aims of study: Determine most common single or multiple facial spaces involved in oro-facial infections.

Materials and methods: 45 patients with different forms of orofacial infections, data regarding age, gender, facial space involvement, presenting signs were collected through history, clinical examination and radiographs; the treatment has been completed for all patients.

Results: Patients with orofacial infections showed a male to female ratio of 1:1.25. The mean age was 33 years. Most of the patients were in the 4th decade 27% of life. The most common single facial space involved was submandibular space (65%), then canine space (22%), while most common multiple spaces involved were (Submandibular submental) (40%) equally with (Retropharyngeal, parapharyngeal, submandibular submassetric and buccal)(40%).

Conclusion: Orofacial infections were more common in females, in the third and fourth decade of life, the most common single facial space involved was submandibular space, while most common multiple spaces involved were (Submandibular and submental).

INTRODUCTION

Dental disease is the underlying reason of most of inflammatory swellings which occurs either in or around the jaws. Inflammation may commence either at the root apices or gingival margins of erupted teeth, or in the soft tissues which surround and overlie the crown of an un-erupted or partially erupted tooth. Inflammation around the apices of tooth root may result in the creation of pus. The pus tracks along the line of least resistance and perforates the bone at the site where it is thinnest and weakest and involves the surrounding soft tissues. Once the infection enters the tissues it may resolve, become localized or spread. These infections may range from superficial to deep neck infections [1]. Most orofacial infections are considered to be odontogenic in origin, whereas others are self-limiting in nature. Many of these cases product from neglected dental caries; these infections can progress to facial cellulitis and systemic toxicity if untreated. Odontogenic infections are polymicrobial, with anaerobic and mixed aerobic bacteria [2]. In pediatric facial infections, disease can develop quickly, producing significant systemic symptoms, including fever, dehydration, and airway compromise. Because of the possibility of progression to systemic disease, early management and detection of orofacial infections in children is necessary [3]. Facial spaces are potential spaces that are separated into primary and secondary on the basis of direct and indirect involvement from the original focus. The primary spaces related with the

maxilla are the canine, buccal and infratemporal spaces while those with the mandible are the submental, sublingual, submandibular and buccal spaces [4], failure to control the infections may cause them to spread to secondary spaces including temporal, masseteric, pterygo-mandibular, lateral pharyngeal, retropharyngeal, and pre-vertebral spaces [5]. Odontogenic infections of bacterial or inflammatory source penetrate primarily into the soft and bony oromaxillofacial tissues to generate submucosal infiltrates and abscesses. Often taking a mild course, these infections may also produce life-threatening complications, depending on a patient's immunocompetence and the site of the inflammatory process. These infections are typically polymicrobial, and anaerobic bacteria are thought to play an essential etiologic role [6]. There are two routes of infection in the oral and maxillofacial area: one is the route by means of the root apex, and the other is the route via the deep periodontal pocket. Failure to run the infections may cause them to spread to secondary spaces including temporal, masseteric, pterygo-mandibular, lateral pharyngeal, retropharyngeal, and pre-vertebral spaces [6]. It is difficult to treat patients who have these space infections without drainage of purulent exudates, as those are connected to primary spaces and are surrounded by connective tissues that have poor blood supply [5]. Spreading odontogenic infections are the commonest kind of serious orofacial infection encountered by oral and maxillofacial surgeons. Even though the incidence of these infections has decreased over the past few decades, they do still happen and expeditious early management is required to prevent or minimize the development of potentially serious complications such as airway obstruction [7]. There have been comparatively few studies of the factors contributing to the spread of odontogenic infections, but local, systemic and social factors are supposed to play a role. Although there is a considerable understanding of the power of local factors, such as the anatomic location of teeth and the surrounding facial planes, there is limited literature on the contribution of other factors such as poverty, deprivation, smoking and substance abuse, which may all play contributory roles in the development and severity of such infections. Moreover, there is also a limited literature on the role of systemic factors in the spread of odontogenic infections. Among these factors was the presence of co-existing major systemic disease systemic conditions that get in the way with normal healing processes and hemostasis were highlighted as risk factors, including diabetes mellitus, bleeding dyscrasias, steroid therapy, immune suppression and malnutrition. It is also recognized that patients with pre-existing medical conditions often experience more serious and have an increased length of hospital stay [7].

MATERIALS AND METHODS

This study included (45) patients who attended Oral and Maxillofacial Unit at Ghazi AL-Hariry Hospital in Medical City Baghdad. The patients complained from acute or chronic swelling that involved one or more of fascial spaces in the head and neck region. This swelling was associated with one or more of the following signs and symptoms: fever, redness of skin, tenderness, or limitation of mouth opening. The age of the patients ranged between (4-80) years, patients were (20) males and (25) with different social and education levels, Fourteen patients were treated in maxillofacial consultation clinic and (31) admitted to the ward, For every patient a verbal consent was taken from the patient himself or their parents or guardians if they are child or disabled. Approval from scientific and ethical committee of College of Dentistry, University of Mosul, Iraq was taken, then a standard case sheet was filled, this concentrated on demographic information, history, investigation, diagnosis, treatment, and postoperative follow up. Selection of the patients for this study was done randomly and irrespective of the cause of infection, at admission, demographic data, social and past medical histories were obtained, without any leading answers. History taking was the prime object to select the patient for the study, thorough clinical examination was carried out Which include extraoral examination by inspection and palpation of the swelling to detect site, size, the redness of skin, extension of the swelling and presence of breathing difficulties, sinus or discharge in the head, neck, and face. Palpation of the lymph nodes for any lymphadenopathy in the head and neck lymph nodes and detailed intraoral examination of the oral cavity, dentition and oropharynx was done by using diagnostic set. With inspection, palpation of the causative factor (exposed bone, exposed plate, sequestra...etc.) or the offending tooth if it is carious or fractured, percussion and vitality test for the tooth were done. Then radiographic request form was filled to obtain the radiographic view of offending region which are intra-oral film (Periapical), extra-oral film (Orthopantomography), C.T. (Computerized Tomography). Preoperative investigations included (hemoglobin level, blood sugar, blood urea, serum creatinine, blood pressure and chest x-ray). Consultation of other specialties were obtained when patients had systemic diseases like (diabetes mellitus, chemo and radiotherapy, kidney disorders or transplantation, patient taking cortisone, hypertension, cardiac problem or bleeding disorder or when there was airway compromise due to infection and tracheostomy) was deemed necessary to secure airway. Postoperative follow up: During the follow up of the patient for pus discharge after 24 h, 72 h was assessed if there was no discharge the drain was removed if not the drain was replaced by another one with dressing, pain measured by Wong-Baker faces rating scale for children, and number scale from (0-10) for adult after 24 h, 72 h, 1 week and 2 weeks was done.

STATISTICAL ANALYSIS

Statistical analysis included descriptive statistics for the collected data in addition to Chi-square test to determine the significance of difference among different groups; the level of significance was set at $P < 0.05$.

RESULTS

A total of 45 patients were recruited in the study. Females having orofacial infections comprised (25) 56% while (20) 44% of the sample were males, with a male to female ratio of 1:1.25. The age of patients ranged from 4 to 80 years with the mean age of 32.84 years. The frequency of orofacial infections was the highest in the 4th decade 27% followed by 3rd decade 24% and 5th decade 16% and 2nd decades 16% equally respectively. Sex distribution shows a higher incidence in female than in male, the difference between females and males was statistically not significant at $P \leq 0.05$ (X^2 Value is 0.556. The P-Value is 0.456).

Odontogenic Infections

Among the fascial space infection, the most common single space was submandibular space as shown in **Table 1**. The least frequently involved spaces were Infratemporal, submental and buccal spaces.

Table 1. Distribution of the single spaces of odontogenic infection.

Odontogenic infection (single space)	Number of patients	%
Canine space	5	21.73%
Submandibular	15	65.21%
Infra temporal	1	4.34%
Submental	1	4.34%
Buccal space	1	4.34%
Total	23	100%

More than One Fascial Space Infections

The most common combined fascial space infections were (Submandibular and submental) (Retropharyngeal, parapharyngeal, submandibular submasseteric and buccal) as in **Table 2**.

Pain Scale

The pain degree associated with the infection through the period of 2 weeks, at (24 h, 72 h, 1 week, 2 weeks) at 24 h. The pain degree (6) shows the greatest percentage (35.55%) which is decreased gradually to reach (2.22%) at 2 weeks while the degree (0) increased at 2 weeks to become the greatest percentage (51.11%) as in **Table 3**.

Table 2. Distribution of combined facial space infections.

More than one space	Number of Patients	%
Submandibular and submental	2	40%
Retropharyngeal, parapharyngeal, submandibular, submasseteric and buccal	2	40%
Ludwig's angina	1	20%
Total	5	100%

Table 3. Pain scale.

Pain (degree)	24 h	%	72 h	%	1 week	%	2 weeks	%
10	1	2.22	0	0	0	0	0	0**
8	14	31.11	5	11.11	2	4.44	1	2.22*
6	16	35.55	14	31.11	4	8.88	1	2.22**

4	12	26.66	10	22.22	14	31.1 1	7	15.55*
2	2	4.44	15	33.33	9	20	13	28.88*
0	0	0	1	2.22	16	35.5 5	23	51.11**
*P<0.05 Significant								
**P>0.05 Non-significant								

DISCUSSION

The term maxillofacial facial space infection refers to infections in the potential spaces and facial planes of the maxillofacial area, a region with a complex anatomy [8]. Infections in the head and neck region, which commonly arise from odontogenic tissues, should be handled with every sense of urgency; otherwise, within a short time, they will consequence in acute emergencies. This is because of the many interrelated spaces, which enhances the fast spread of inflammation in the region [9]. The incidence of maxillofacial facial space infections has decreased considerably following the widespread use of broad-spectrum antibiotics and improved dental care. However, these infections remain potentially lethal because of the possibility of life-threatening complications e.g. respiratory obstruction, necrotizing fasciitis, descending mediastinitis, pericarditis, artery rupture, brain abscess and sepsis [6]. The study shows that orofacial infections affect patients in their 3rd and 4th decade of life, this finding is similar to the earlier observation reported by Bahl et al. [9] who stated that “the age of the patients ranged from 14 to 60 years. Individuals of odontogenic infections were seen more in the patients of the third and fourth decade age groups”, in contrast to Richard Kityamuwesi et al. [10] who reported that “In the present study, the mean age of the patients was 29.5 years which is lower than values recorded in other studies, most patients (73.1%) were younger than 35 years”. This prospective study revealed a higher frequency of the females than males 56% female to 44.4% male so the male to female ratio is about 1:1.25. However, the difference was not significant indicating that gender may not be considered as a determinant factor in the prevalence of orofacial infections and this accepted with Akinbami et al. [8] recently reported a female preponderance in their study, the cause may be due to female has high pain threshold, socioeconomic reasons and cultural restrictions where people have reservation to take their female patients to the dentist in this part of world, males were more commonly involved than females in the study of Mamta et al. [11] and Marina et al. [12] who stated that “There was no significant gender difference for clinic visit rate”. The spread of odontogenic infections through fascial spaces can result in significant morbidity and risk of mortality if clinical management is improper. An understanding of the infection process, risk factors and the microbiology of these infections is of importance if efficient clinical protocols are to be developed [13]. The most common fascial space infection was submandibular space infection this is probably because the lower molars, primarily second and third molars have roots which are below the attachment of mylohyoid muscle, and the lingual cortical plate is thinner as compared to buccal cortical plate. Odontogenic infections from these teeth will perforate the lingual cortical plate in most cases, resulting in submandibular facial space infection. So we agree with Ismi et al. [14] who stated that “The second and third mandibular molar teeth are important sources of Deep Neck Infections, because their roots extend to the junction of the mylohyoid muscle with the mandibular corpus adjacent to the submandibular and parapharyngeal spaces, making the submandibular space the most commonly involved area in Deep Neck Infections” and Bahl et al. [9] who reported that “The submandibular space was the most frequently involved fascial space both in single fascial space infections and multiple fascial space infections. As far as the anatomic distribution of single fascial space infection is concerned, the submandibular space was the most frequently involved fascial space in 20 patients, followed by the pterygomandibular and buccal spaces in 15 patients each and the sub masseteric space in 10 patients. The infratemporal space was involved in only five patients” and Walia et al. [15] who reported that “the most common space involved was the submandibular space. Infection also can involve more than single space”. In our study we found that the most common combined fascial space infections were (Submandibular and submental), this keeping with Chunduri [16] who mentioned that “the present study data deviated from this trend with more submental spaces than lateral pharyngeal spaces on presentation of multiple space infections”. This may be due to anatomical connections of these to spaces so the infection directly spread from submandibular to submental space.

All patients had pain and swelling on presentation, which corroborates with A Read-Fuller et al. [17] who reported that “Rapidly-worsening swelling, dysphagia, pain, and trismus are the most common presenting symptoms, The pain observed for all patients throughout the follow up period reveal that pain score at the first 24 h was degree (6) according to Wong Baker faces pain scale the most prominent (36%) as this study include patients with postoperative infections and most of them presented with history of mild to moderate pain and some of them had only burning sensation at the site of infection, after 72 h was degree (6) slightly decreased (31.11%), this is mostly due to that the females had high prevalence in this study than male as described earlier and pain varies from male to female which is higher in female

because it influenced by hormonal changes occur in female during their life. Roger B. Fillingim et al. [18] who concluded that the prevalence of most common forms of pain is higher among women than men and women report greater pain after invasive procedures than men, which is for mechanical, thermal, and ischemic muscle pain were higher during the follicular phase of the menstrual cycle. While pain score degree (2) was increased (33%) as the most of patient with post-operative infections had slight pain or only burning sensation at the site of the operation or they had sinus discharge which decrease the degree of pain. Two weeks later the pain disappears completely as degree (0) from half of patients (51%) as the rapid and accurate management has been completed for all patients.

CONCLUSION

Orofacial infections were more common in females, in the third and fourth decade of life, the most common single facial space involved was submandibular space, while most common multiple spaces involved were (Submandibular and submental).

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