Original Article

Pattern of Odontogenic Infections at a Tertiary Hospital in Tehran, Iran: A 10-Year Retrospective Study of 310 Patients

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Abstract

Objective: To retrospectively evaluate the treated cases with odontogenic abscess and identify the outcome of odontogenic infections, their characteristics and treatment modalities.

Materials and Methods: This retrospective study was performed by collecting data from 310 patient records at the oral and maxillofacial surgery department of Taleghani hospital, Tehran, Iran from January 2001 to January 2011. The variables were age, gender, affected teeth, affected facial spaces, type of bacterial source, type of antibiotic therapy, previous medication, hospital stay, body temperature on admission and past medical history.

Results: The patients' ages were between 2 and 84 years and 62.6% of the patients with odontogenic infection were younger than 35 years old. Most of the patients had a body temperature of 37-37.5˚C. The most involved teeth were mandibular third molar. Deciduous teeth contained 6.4% of the involved teeth, among which mandibular molars were the most involved. 24.3% of the patients were hospitalized for 4 days. Streptococci were the most detected bacterial strain. The most involved anatomic space was the buccal space and 22.5% of the cases had multi space involvement and 17 cases had Ludwig's angina. The most common used antibiotic regimens were penicillin G and metronidazole or cefazolin and metronidazole. The mortality rate was 1%, all of whom had Ludwig's angina.

Conclusion: The main affected facial spaces were buccal and submandibular spaces. The most common used antibiotic was penicillin, proving its effectiveness in the treatment of jaw infections. Odontogenic abscesses are mostly related to the eruption of mandibular molars.

Key Words: Infection; Abscess; Antibiotics

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INTRODUCTION

Maxillofacial infections of the odontogenic origin are among the most incident infections and are very important due to their high rate of morbidity and probable mortality [1]. In spite of the improvement in the socioeconomic

status of people's lives and advents in antibiotic therapy, there are still numerous cases of odontogenic infections in patients referred to tertiary hospitals. The high numbers of connecting spaces in the head and neck region help fast spread of inflammation in case of late or improper treatment of these infections. This can cause serious complications such as respiratory tract and mediastinum involvement, and sepsis that are all life threatening [2-4]. Therefore, these infections should be diagnosed rapidly and treated by antibiotic therapy, and if necessary, they should undergo proper surgical intervention. Previous studies have reported that the most common etiologic factor for odontogenic infection is semi-erupted mandibular third molar, and the submandibular space is the most common place of involvement. The most important bacteria causing the infection in these studies were staphylococcus epidermis, streptococcus α hemolyticus and streptococcus hemolyticus [5-9].

Oral and maxillofacial surgeons usually encounter various forms of maxillofacial infections of odontogenic origin.

The treatment of odontogenic infections in primary stages is performed empirically [10-12]. Although most of them are treated as outpatients in the dental office; proper management of hospitalized patients still has a challenge for any clinician who works on maxillofacial infections.

The literature has well documented epidemiological studies on odontogenic infections in different parts of the globe. To the best of our knowledge, there is no report of such study from Iran. Therefore, the present study was designed to retrospectively evaluate all patients with orofacial infections who were presented to our center over a 120-month period at Taleghani Oral and Maxillofacial Surgery Center, Shahid Beheshti University of Medical Sciences-Tehran-Iran. The aim of this study was to identify the outcome of odontogenic infections, their characteristics and treatment modalities.

MATHERIALS AND METHODS

This retrospective study was carried out by collecting data from patient records at the department of oral and maxillofacial surgery of Taleghani hospital, Shahid Beheshti University of Medical Sciences-Tehran-Iran. The period of analysis was from January 2001 to January 2011. Inclusion criteria were odontogenic infections needing hospitalization (temperature > 101˚F, dehydration, threat to the airway or vital structures, moderate or severe infection in anatomic spaces, need for general anesthesia and need for inpatient control of the systemic disease). There were 427 patient records with the diagnosis of maxillofacial infection among which 117 records were excluded because they had nonodontogenic origins such as salivary gland infection, orbital infection, peritonsilar infection, facial bone fracture infection and infection following pathologic lesions. This study was approved by the hospital's ethics committee and all patients gave their informed consent for participating in the study. The study variables were age, gender, affected teeth, affected facial spaces, type of bacterial source, type of antibiotic therapy, previous medication, hospital stay, temperature on admission and past medical history. The SPSS software was applied for analysis of the collected data.

RESULTS

According to the collected data, 427 patients were admitted to Taleghani hospital and treated for maxillofacial infections from 2001 to 2011. Of these, 310 cases were involved with an odontogenic origin, the remaining 117 were excluded from this study for non-odontogenic sources. The patients' ages were between 2 and 84 years. The most frequent age group was 20-35 years old (44.8%) and the least frequent was in the range of 1-5 years (1%); 62.6% of the patients with odontogenic infection were younger than 35 years old. Although the number of men was a little higher than the women, the difference was not statis-

tically significant. Most of the patients (46.6%) had a body temperature of 37-37.5˚C. The previous treatment was antibiotic therapy for most of the patients (91%), and a few of the patients (2.9%) had undergone incision and drainage (Table 1).

The most involved teeth were mandibular third molars (34.5%), mandibular first molars (29.5%), and mandibular second molars (24.3%), respectively; and the least involved were the mandibular central incisors (0.8%). Deciduous teeth contained 6.4% of the involved teeth, among which mandibular molars were the most involved deciduous teeth (4.4%) (Table 2).

The longest hospital stay was 18 days and the shortest was 1 day. Most of the patients (45.9%) were hospitalized for 4-6 days. The average admission time was 9.2 days (Table 3).

Medium results were available in 46 patients. The mediums in 60% of the patients were polymicrobial with a variety of gram-positive and gram-negative organisms. Ten bacterial strains were diagnosed in the patients. Streptococci were the most detected bacterial strain (Fig 1).

The most involved anatomic space was the buccal space, and the submandibular space was in the second grade. Seventeen cases (5.48%) had Ludwig's angina and 70 patients (22.5%) had involvement of more than 2 anatomic spaces, called 'multi space' involvement (Table 4).

Table 1. Patient Characteristics

Characteristic	n (%)
Sex	
Female	133(42.9%)
Male	177(57.1%)
Age	
1-5	3(1.0%)
6-12	26(8.4%)
13-19	26(8.4%)
20-35	139(44.8%)
35+	116(37.4%)
Temperature	
37-37.5	104(46.6%)
37.6-38	75(33.6%)
38.1-38.5	27(12.1%)
38.5+	17(7.7%)
Previous treatment	
Ab	218(91.0%)
I & D	1(0.4%)
I & D with Ab	6(2.5%)
Ext	4(1.7%)
Ext with Ab	3(1.2%)
RCT	3(1.2%)
RCT with Ab	2(0.8%)
Corticosteroid therapy(dexamethasone)	3(1.2%)

Table 2. Affected Teeth

Maxillary Permanent Teeth	
1	4(4.3%)
2	7(7.5%)
3	18(19.4%)
4	15(16.1%)
5	9(9.7%)
6	17(18.3%)
7	6(6.5%)
8	17(18.2%)
Mandibular Permanent Teeth	
1	2(0.8%)
2	3(1.3%)
3	7(2.8%)
4	5(2.1%)
5	11(4.7%)
6	69(29.5%)
7	57(24.3%)
8	81(34.5%)
Deciduous Teeth	
A (maxillary)	1(0.3%)
B (maxillary)	2(0.6%)
C (maxillary)	2(0.6%)
D (maxillary)	1(0.3%)
D (mandibular)	7(2.2%)
E (mandibular)	7(2.2%)

Table 3. Length of Hospital Stay

Duration (days)	n (%)
1-3	91(30.6%)
4-6	136(45.9%)
7-9	46(15.5%)
10-12	14(4.6%)
13-15	4(13%)
17-18	3(0.9%)

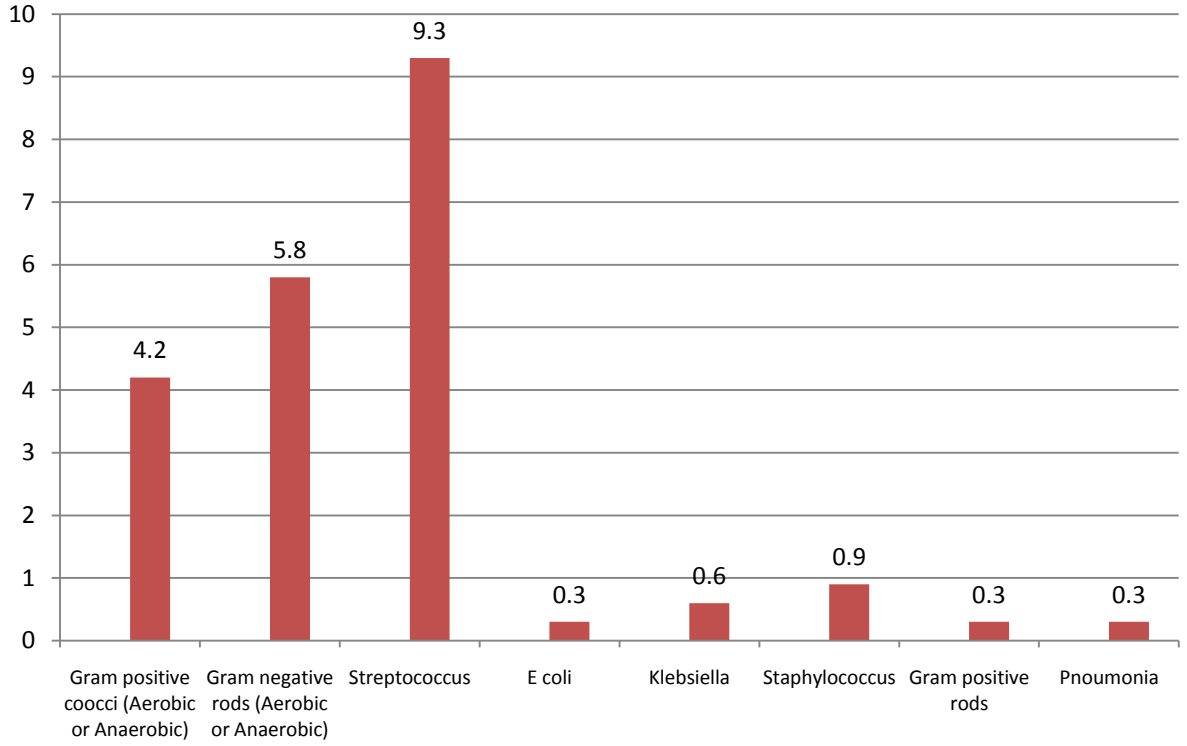

Fig 1. Distribution of bacterial etiology

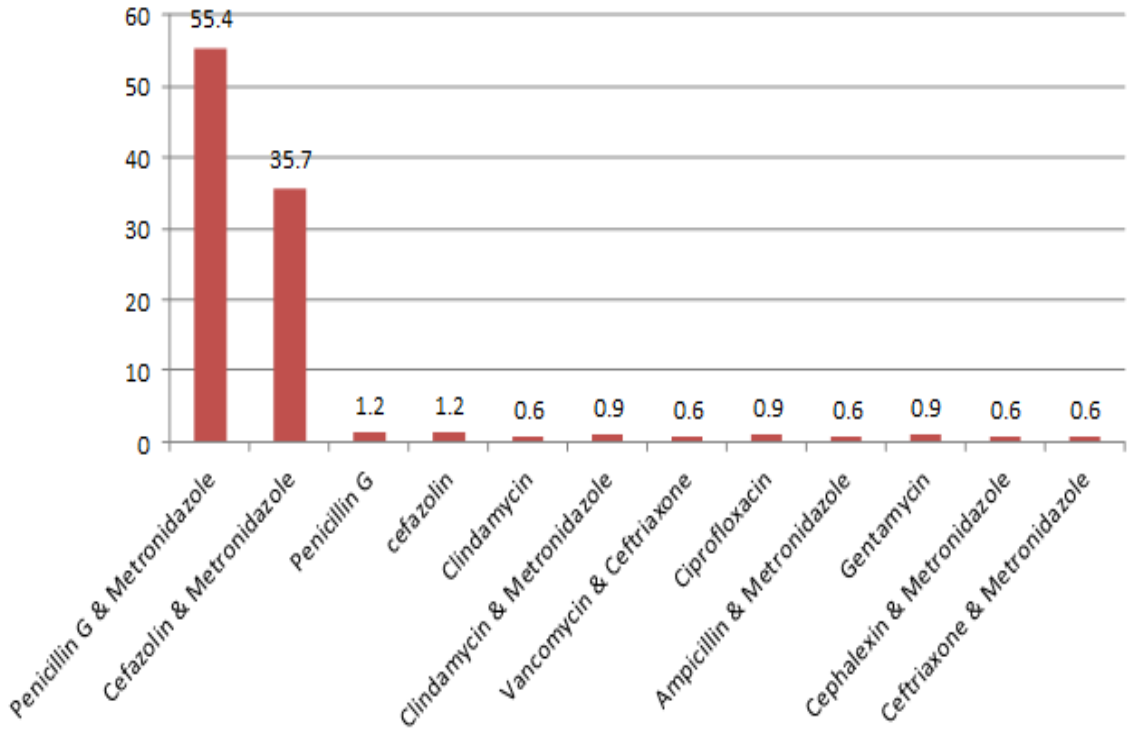

Fig 2. Antibiotic therapy used by the Department of Oral and Maxillofacial Surgery of Taleghani hospital, Tehran, Iran

Table 4. Affected Facial Spaces

Facial Space	n(%)
Vestibular abscess	12(4.6%)
Submandibular	24(7.74%)
Buccal	64(20.6%)
Submental	7(2.25%)
Temporal	1(0.3%)
Lateral pharyngeal	1(0.3%)
Canine	22(7.0%)
Submassetric	3(0.9%)
Pterygomandibular	8(2.4%)
Multi Space	70(22.5%)
Submandibular &Pterygomandibular	23(7.4%)
Submandibular & Lateral pharyngeal	2(0.6%)
Submandibular &Submental	4(1.2%)
Submandible & Sublingual	3(0.9%)
Submandibular &Submassetrice	6(1.8%)
Submandibular &Buccal	15(4.5%)
Pterygomandibular&Buccal	3(0.9%)
Buccal& Canine	10(3%)
Pterygomandibular & Temporal	1(0.3%)
Temporal & Submandibular	3(0.9%)
Buccal & Submasseteric	3(0.9%)
Pterygomandibular & Submasseteric	1(0.3%)
Buccal & Temporal	2(0.6%)
Lateral pharengeal&Pterygomandibular	3(0.9%)
Submassetric & Submental	1(0.3%)
Submasseteric & Sublingual	1(0.3)
Submental & Sublingial	4(1.2%)

Table 5. Distribution of Systemic Diseases

Past Medical History of Disease	n (%)
Diabetes	27(87.2%)
Spelenectomy	1(3.2%)
Kidney graft	1(3.2%)
Lymphoma	1(3.2%)
Arteritis	1(3.2%)
	Total = 31(100.0%)

Ten antibiotics were effective in the treatment of the patients. The most antibiotic regimens used were penicillin G and metronidazole or cefazolin and metronidazole (Fig 2).

Systemic diseases were present in 10% of the patients. The most prevalent systemic disease (87.2%) was diabetes (Table 5).

Complications during treatment were minimal and the mortality rate was 1% (three patients) and these patients had Ludwig's angina and systemic diseases (two cases had diabetes and one case had lymphoma). The systemic condition led to death.

DISCUSSION

The results of the present study indicated that the odontogenic abscesses became more prevalent with an increase in age to 35 years, and the highest prevalence was seen in 20 to 35-year-old patients. This can be due to eruption of third molar teeth, and poor oral hygiene. Therefore, attention should be paid to the periodontal tissues and teeth, especially mandibular third molars in this age range. Results of this study are compatible with those previously found in the literature in which the mean age of patients was 20-30 years old [9-11].

Mandibular third molars are usually semi-erupted and their surrounding soft tissues are a suitable environment for bacterial growth; therefore, most of dental abscesses are caused by these teeth. Mandibular first and second molars impart an important role in mastication and have usually more caries and periodontal diseases. The infection caused by these teeth spreads into deep spaces such as submandibular and submasseter spaces, and surgical treatment is not simply possible in dental clinics by general dentists. Mandibular anterior teeth are the least responsible teeth for odontogenic abscesses because they seldom become carious [5, 13, 14].

Deciduous molars were the most involved deciduous teeth; however, in accordance with some previous studies, odontogenic abscesses were of little prevalence in children [15].

In mandibular involvement, duration of hospital stay was 1.1 times longer than maxillary involvement. Gravity, which is an aid in drainage of maxillary abscesses, and also the better blood supply of the maxilla, might be the reasons for longer duration of mandibular involvement. This is consistent with the results of a study conducted by Dvori et al. [16].

Body temperature of most patients was in the range of 37-37.5°C and there was a decline in the number of patients with an increased body temperature. Establishing a significant relationship between body temperature and the type of bacterial strain responsible for the infection and also the involved space, requires a comprehensive prospective study.

Contrary to the results of some studies, in patients with involvement of only one space, the buccal space was the most involved (20.6%) and the submandibular space was in the second grade (7.74%), but in patients with multi space involvement, the submandibular space was the most affected facial space (17.3%) and the buccal space was the second affected facial space (9.9%). However, considering the total cases of single and multi-space involvements, buccal (30.5%) and submandibular (25.04%) spaces were the most affected facial spaces [13, 17, 18]. This difference in results can be attributed to the higher involvement of premolar teeth in the present study.

Odontogenic abscesses usually involve more than one anatomic space (46.6%), indicating that most anatomic spaces in the head and neck are interconnected, and odontogenic infections can spread rapidly and impose great risk to the patients.

The results of the present study demonstrated that diabetes mellitus is the most common systemic disease playing role in odontogenic abscesses. Therefore, control and treatment of the infection is of great importance in these patients and carious and periodontally involved teeth should be treated with precise attention in diabetic patients.

As stated in other reports, infections of odontogenic origin are always more frequent than non-odontogenic infections [11, 13, 17, 19]. Considering all the strains of streptococcus, streptococci are the most responsible bacteria for odontogenic abscess (9.3%) [5, 12, 20-22]. Treatment for infections that affected the maxillofacial complex was a classic protocol which basically comprised elimination of the source, incision and drainage, and antibiotic therapy.

In the present study, the most prescribed antibiotics were penicillin G/metronidazole (55.4%) and cephalosporin/metronidazole (35.7%). This is in agreement with the study performed by Wang et al. [9].

Penicillin is the drug of choice for odontogenic infections because it is effective against micro-organisms of the oral cavity and presents minimal side effects (except allergic reaction), and the cost is low in comparison with other antibiotics. There are, however, reports of resistance against this group of antibiotics [12, 23-25]. Metronidazole is very effective, and its action is exclusive to anaerobic organisms. The adopted antibiotic therapy was mostly cephalexin, amoxicillin, and metronidazole. Metronidazole was always used in association with amoxicillin, cephalexin, or other antibiotics [11, 26, 27]. Clindamycin is a useful broad spectrum antibiotic, with fewer allergic reactions for odontogenic infections and penetrates into the bone, periodontium, necrotic tissues, and pus. When penicillin cannot be prescribed because of possible allergic reactions, clindamycin is recommended. It has excellent action against aerobic and anaerobic bacteria, and is not susceptible to the action of beta-lactamases [28].

Although penicillins and cephalosporins are effective in the treatment of odontogenic infections; amoxicillin/clavulanate, clindamycin, fourth-generation cephalosporins, cefexime, and newer antibiotics such as imipenem are more efficient against β-lactamase-producing organisms [29, 30].

Within the limitations of the present study, we may conclude that:

1. Odontogenic infections were the major etiology of jaw infections.
2. Infected patients were basically younger than 35 years old and gender did not significantly affect predisposition.
3. The main affected facial spaces were the buccal and submandibular spaces.
4. The most commonly used antibiotic was penicillin and its effectiveness has been proven in the treatment of jaw infections. Although penicillin is an old antibiotic, it is still one of the first choices for the treatment of odontogenic infections.
5. Although incision and drainage is an important stage in the treatment of abscesses, only a few general dentists accomplish this treatment.
6. Odontogenic abscesses are mostly related to eruption of mandibular molars, especially mandibular third molar; and strict attention to these teeth has an important role in the prevention of odontogenic abscess.

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