European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 11 , 2020

Odontogenic Maxillofacial Space Infection – A twelve year Retrospective Study

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Conflict of interest and source of funding:
The authors declare they have no conflict of interest.

Abstract

Aim: The aim of the study was to review the clinical characteristics, management, and outcome of odontogenic maxillofacial space infections and to identify the potential risk factors associated with increasing hospital length of stay in patients with odontogenic maxillofacial space infections.

Methods: A retrospective chart review of all patients treated for odontogenic maxillofacial space infections was conducted.

Results: Out of 141 patients identified, 59.57% were females and the mean age of the study group was 36.81 years. 9.93% of the patients were diabetic, and the most common space involved was the buccal space. The mean WBC count was 12329.93 cells/cu.mm, and the most common bacteria isolated were Staphylococcus aureus. Average length of hospital stay was 6.06 days. Space involvement (p= 0.0095), WBC count (p=0.0124) were found to significantly increase the length of hospital stay.

Conclusion: Maxillofacial Space infections of Odontogenic origin are important due to their high rate of mortality and morbidity. The formulation of best treatment regimen requires a multi-factorial approach. If not treated at an early stage they may rapidly evolve

and spread to adjacent anatomical structures, leading to life threatening complications, and occasionally to death, despite skillful management.

Keywords: Odontogenic infection, maxillofacial spaces, length of hospital stay.

Introduction

The term maxillofacial space infection refers to infections in the potential spaces and fascial planes of the maxillofacial region, a region with complex anatomy. The main causes of maxillofacial space infection are odontogenic infection, lymphadenitis, and trauma.[1] Maxillofacial infections of odontogenic origin are among the most incident infections, they generally respond to antimicrobial chemotherapy and surgical intervention, however if not diagnosed and treated appropriately, these infections progresses rapidly and are associated with high morbidity and mortality. [2, 3]

There are numerous published reports of odontogenic infections spreading to the cavernous sinus, deep musculofascial spaces and other vital structures leading to serious complications like airway obstruction, mediastinitis, cavernous sinus thrombosis, jugular vein thrombosis, pulmonary septic embolism, carotid artery erosion, and shock and occasionally to death.[2-4] Septic shock is associated with 40-50% mortality rate. Pleural and pericardiac effusion may accompany this condition; frequently leading to cardiac tamponade. Descending necrotizing mediastinitis is the most feared complication resulting from retropharyngeal extension of infection into posterior mediastinum;[5] so such type of infection can be considered a major public health concern.

Infections can be related to anatomic variation, limited access to care, neglect or complex medical illnesses that expose patients to increased risk. Predisposing factors such as immunosuppression, uncontrolled diabetes mellitus, and multiple underlying medical conditions are reported to increase the risk of odontogenic infection. [6] Studying past infections, their spatial distribution and course of treatment will help us deal with future space infections effectively.[7] Due to high variability, unpredictable course of maxillofacial infections and sparse literature available, additional studies to evaluate the variables affecting the length of hospital stay are necessary. [8-10] This improves patient care and discharge planning .[9]

As there are differences between institutions, our study is limited to one hospital with the specific etiology being of odontogenic origin. Paying particular attention to the variables that lead to longer hospital stay could be very important in formulating the treatment plan and reducing complications.

Materials and Methods

Source of data: Records/Case files of the patients admitted with a diagnosis of odontogenic maxillofacial space infection over a period of 12 years.

Method of collection of data:

A retrospective medical chart review was performed of patients with a diagnosis of odontogenic MSI who were treated in the department. Clinical charts and investigations reports were reviewed. The following variables were recorded: demographic data (age, sex), pathogenesis (spaces involved, medical conditions), results of investigations (white blood cell (WBC) count on admission, blood sugar levels, pus culture) treatment regimen (antibiotics and drainage) and outcomes (length of hospital stay (LOS) and complications)

Inclusion Criteria:

All Patients admitted for treatment of an odontogenic maxillofacial space infection only.

Exclusion criteria:

Localized dental abscess without space involvement were excluded.

Non –odontogenic space infections were not included.

Patients with incomplete data were excluded.

Sample size: A total of 141 patients were included.

Statistical Analysis: The data was entered and analyzed using the Statistical Package for Social Sciences (SPSS) for Windows 26.0. (SPSS, Inc. Chicago, Illinois) Confidence intervals were set at 95%, and a p-value ≤ of 0.05 was considered as statistically significant. Descriptive statistics was applied in the form of numbers and percentages. Karl Pearson's correlation coefficient between number of days stay in hospital with different parameters. Multiple liner regression analysis of number of days stays in hospital by different parameters.

Results

A total of 141 patients with odontogenic maxillofacial space infections were enrolled for this study. The mean age of the study subjects was 36.81 years. Female consisted of 59.5% and male consisted of 40.4% of the subjects. The majority of the patients were found to be healthy making up 82.27% of the sample. Predisposing factors were reported for 17.73% of the patients. The distributions of the infections were fairly similar between the single (46.81%) and multiple groups. (53.19%) The most common space involved was buccal (19.86%), followed by submandibular. (16.31%) The WBC count ranged from 2100 cells/cu.mm to 37600 cells/cu.mm. Of 141 patients, culture was performed in 35 cases (24.82%) and Negative cultures were recorded in 13 cases. (9.22%) All 141 patients underwent a protocol for treatment. Extraction was done in all cases followed by empirical antibiotic therapy. The mean length of hospital stay was 6.06 days.

Discussion

In the present study, most the patients were adults between 31-50 years with significant higher prevalence of the disease among women (59.5%).This result diverges from those published by other researches who describe no gender preference [2, 4, 11,12] or a predominance of affected males[2-4, 6] except the one by Augusto et al[8] , who also reported higher prevalence among females. (64.7%)

We recorded relatively low prevalence of systemic diseases 17.73% of the overall sample, of which 10% were diabetic. Suggestive that it is the most common predisposing factor, favoring infection spread by compromising local circulation, leading to delayed response to infection.[11-15] The lower molars were found to be the most common source of infection affecting mainly submandibular, sublingual and buccal spaces [3,6,11] In contrast to previous literature which suggests submandibular space to be the most common,[3,4,11,12] In our study buccal space (19.86%) was the most commonly involved followed by submandibular space (16.31%). A similar pattern was observed by Bridgeman et al.[16]

In our study (46.81%) of cases had single space involvement and (53.19%) had multiple space involvement, indicating that most head and neck anatomic spaces are inter connected, which can spread rapidly and impose great risk to the patients.[3,4,6 ,11,12] Dodson et al[9] examined records of 105 children and concluded that patients 5 years old or older who presented with an odontogenic infection and elevated WBC were likely to have an unfavourable outcome; unfavourable outcome was defined as length of hospital stay greater than 4 days.

Standard Treatment Protocol comprising removal of teeth, antibiotic therapy and abscess drainage and surgical drain placement was followed, as suggested by Fabio et al.[3,17] Empirical intravenous antibiotic therapy with amoxicillin with clavunate potassium, or cephalosporins and metronidazole were prescribed for majority of cases, with exception of severe and nonresponding infections, where amikacin was added. Treatment also included analgesics, fluid therapy and mouth opening exercises. Specimen culture was performed in 35 patients only, results showing negative cultures in 13 cases (9.22%). Despite which all patients responded well to empirical antibiotic therapy. The length of hospital stay showed a high positive correlation ($p=0.0095$) with spaces involved and medical condition ($p=0.0803$) at 10% level of significance. This was also the consistent finding with the literature given by Zamiri et al[18] and Peters et al.[13]

The WBC count correlated positively ($p=0.0124$) to the length of hospital stay, and may be useful as a predictor of length of hospital stay.[2] Storoe et al[17], GC Mathew et al[16] identified that patients with total WBC count $\geq 15\times10^9$ tends to develop complications during treatment. Hence deducing that length of hospital stay is multifactorial.

Conclusion

Overall data generated by this retrospective study in our region are similar to those reported by other researchers. Conversely we found a higher prevalence of the disease among women, and the common space involved was buccal space, in disagreement with previously published reports. Such a kind of study may improve our knowledge relative to the disease and also reveal the regional scenario regarding severe odontogenic infections. Thus, it contributes to the designing of strategies for efficient oral health care system and ultimately prevent severe outcomes of the disease.

Conflict of Interest: None

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Tables

Table 1: Distribution of cases by bacteriological findings

Bacteriological findings	No. of cases	Percentage (%)
No culture	106	75.18
No growth	13	9.22
Staphylococcus aureus	11	7.80
Kleibsiella species	5	3.55
Escherichia coli	2	1.42
Citrobacter freundi	1	0.71
Citrobacter freundi& stap. aureus	1	0.71
Gram positive bacilli	1	0.71
Staph. Aureus & Kleibsiella	1	0.71
Total	141	100.00

Table 2: Distribution Of Cases By Treatment Regimen

Treatment Regimen	No. of cases	Percentage (%)
Antibiotics only	28	19.86
Intra-oral I & D	52	36.88
Extra-oral I & D	61	43.26
Total	141	100.00

Table 3: Distribution of cases by length of hospital stay

Length of hospital stay	No. of cases	Percentage
1-3 days	22	15.60
4-5 days	41	29.08
6-7 days	44	31.21
>7 days	34	24.11
Total	141	100.00

Table 4: Karl Pearson's correlation coefficient between number of days stay in hospital with different parameters

Independent variables	r-value	t-value	p-value
Age	0.0693	0.8172	0.4141
Sex	0.0067	0.0787	0.9374
Spaces involved	0.2372	2.7957	0.0029*
Medical conditions	0.0996	1.1737	0.1212
WBC	0.1747	2.0591	0.0206*

*p<0.05 Statistically Significant

Table 5: Multiple liner regression analysis of number of days stayed in hospital by different parameters

Independent variables	**Regression coefficient**	**SE of reg Coefficient**	**t-value**	**p-value**
Age	0.0174	0.0158	1.0971	0.2745
Sex	0.0721	0.5159	0.1398	0.8890
Spaces involved	1.3197	0.5014	2.6318	0.0095*
Medical conditions	0.5881	0.3315	1.7742	0.0803
WBC count	0.0040	0.0019	2.0924	0.0124*
R=0.2770, F(5,135)=2.2545 p<0.05, Std.Error of estimate: 2.8961				

*p<0.05 Statistically significant