Original Article

Maxillofacial Surgery

Risk Factors in Spreading Odontogenic Infection

1. Sabir Ali 2. Qadeer-ul-Hassan 3. Kashif Ali Channar 4. Suneel Kumar 5. Abdul Bari Memon 6. Waheed Murad Dahri

1. Lecturer 2. Assoc. Prof. 3. Asstt. Prof. 4. Asstt. Prof. 5 & 6. Dept. of Oral and Maxillofacial Surgery, Institute of Dentistry. LUMHS Jamshoro

ABSTRACT

Introduction: Spreading odontogenic infection is the extension of infection from its original site and can create potential life threatening situations. There are several risk factor reported for spreading odontogenic infection in literature including systemic health, virulence of organism and anatomical site. Apart from these factors odentogenic infection also observed in normal individuals.

Objective: The objective of this study is to identify Risk factors in spreading odontogenic infection.

Study Design: Descriptive Case Series Study

Place and Duration of Study: This study was conducted in Department of Oral and Maxillofacial Surgery, Institute of Dentistry, LUMHS from January 2011 to February 2012.

Patients and Methods: A descriptive case series study on 60 patients of spreading odontogenic infection was conducted.

Results: Male female ratio was 2.3:1, 2nd and 3rd decade was common presentation. The most frequent clinical findings were pain, swelling, trimus. The Buccal space was the most frequent location for a single space infection (53.3%), followed by Submandibular space (35%), Canine space (5%). Three patients presented with multi space involvement (6.6%). The most common involved tooth was mandibular third molar 26 (43.3%).The most common cause of the infection was periapical infection followed by pericronitis. 83.3% patient were healthy patients with no co morbid, only 16.7% patients werewith co morbid like DM ,hypertension and pregnancy. There was also no difference for mean WBC count.

Conclusion: This study shows that lowermolars were the most common involved teeth and buccal space was frequent space to be involved. The site of infection is important risk factors. We observed Odentognic infection in common in healthy individual than non-healthyindividuals.

Key Words: Odontogenic Infection, Spreading Odontogenic Infection, Risk Factors, Life Threatening Infection.

INTRODUCTION

Odontogenic infection refers to an infection that starts from tooth or tooth bearing structure of the oral cavity.[1] Odontogenic infection is the most commonly found condition in oral and maxillofacial region and its significance in health trouble is reflected by the fact that 12% of antibiotics are used for odontogenic infection.[2,3]

Odontogenic infection presents wide variety of the clinical appearance, the most frequent of which are Pulpitis, Gingivitis, Periodontitis, and Pericronitis.[4,5] The result of an infection originating from different sites of the oral cavity can vary considerably.[6,7] Most of them are self limiting and cureunexpectedly, but rarely in addition to pain, bleeding gum, inflammation and esthetic fault the localized infection also likely to progress toward more distant area, either direct along with periodontium down to the apex involving periapical bone, or through lymphatic and venous spread.[1,8,9]Spreading odontogenic infection (SOI) is a serious illness and potential to create the life menacing situation like air way compromised by cellulitis, Cavernous sinus thrombosis, Meningitis, Orbital Cellulitis, Descending necrotizing mediastinitis.[4,9]

In pre-antibiotic era odontogenic infection were associated with significant death rate in the range of 10-40 %.[5] With the advent of antibiotics, odontogenic infection along with the other infection became considered as easily managed condition.[5]However in the last 10 to 15 year there has been a progressive return of serious antibiotic confrontation and this is injudicious fordistribution odontogenic infection to be dismissed in hospital practice as a simple dental problem. [3,4,5,10,11]The conditions or factors that influence the spread of infection is depend on patient related condition, microorganism and regional anatomy.[1,5,7] Patient circumstances consist of certain systemic factors that impaired patient immune system such as Diabetes Mellitus, hematological disorders, neoplasm, malnutrition, alcoholism and steroid therapy.[1,5,7,8,12,13] Microorganism that are liable for spreading odontogenic infection are basically endogenous flora and typically polymicrobial in nature.[1,4,10] The virulence of organisms depends upon their quality and quantity and it is the one of microbiological condition that influence the spread of infection.[1]

Anatomical factor play a key role in spreading odontogenic infection. Infection tends to follow the

least resistance, which is dictated by bone, periosteum, muscle and fascia.[5]

Furthermore scientific evidence has revealed a relationship between some serious oral infection and systemic disease like cardiovascular, lung and endocrine problems and pregnancy. Moreover low socioeconomic status, illiteracy, habits like negligence of oral hygiene using of betal nut and other related stuff, lack of awareness and the lack of primary health care reported an important risk factor.[3, 10, 14, 15]The influence of local factors such as the anatomic location and surrounding facial plane is well understood as a contribution in the development of spreading odontogenic infection but there have been relatively few studies that examine the contribution of host and environmental factors in the development of spreading odontogenic infection. This study is design to evaluate the risk factors that involve in the spread of odontogenic infection.

PATIENTS AND METHODS

This study was prospective descriptive case seriesstudy, carried out in Oral & Maxillofacial Surgery Department of Liaquat Medical University Hospital Hyderabad from January 2011 to February 2012. 60 patients of spreading odontogenic infection were selected.

The Inclusion criteria were Patients presenting with spreading odontogenic infection related to untreated tooth and Patients with spreading odontogenic infection with complains of pain and swelling following dental treatment. The Exclusion criteria werePatients suffering from malignancy or having facial space infection after facial trauma.

Data recorded on pre design Performa including Demographic variables , Clinical findings, Treatment prior to presentation, Preexisting medical problem, Site of infection and tooth involvement.The data were analysis by SPSS 17 version.Age and gender of patient were evaluated as descriptive statistics.Mean and standard deviation of age group and percentage of gender were performed.Clinical findings presented as percentage in the three groups and frequency of percentage of each group recorded.Correlations of clinical features with gender were also evaluated. Common sites and tooth involvement and systemic illness were also performed as percentage.

RESULTS

Sixty cases of spreading odentogenic infection were analysized,42 were male and 18were female. The age range was 6 year to 45 year with a mean age was 23.57 S.D $\pm$ 1.90. (Figure No.I) .Age group were divided in five groups, 11-20 age group was most frequently affected in infection followed by 21-30. (Figure No. 2).The Buccal space was the most frequent location for a single space infection (53.3%), followed by Submandibular space (35%), Canine space (5%). Three patients were presented with multi space involvement (6.6%) (Figure No. 3)

The most frequent clinical findings presented with patiens divided into three groups, Group1 (pain, swelling, trimus) 65%. Group 2 (swelling) 20%. Group 3 (pain, trismus, draining sinus) 15.0% (Figure No. 4). The most common involved tooth was mandibular third molar 43.3% followed by mandibular first molar 30%, mandibular second molar 23.3% and maxillary canine 3.3%. The most common cause of the infection was periapical infection followed by pericronitis (Table No.I).Past medical and surgical history was insignificant in 50 out of 60 patients. 83.4% patient were healthy patient with no co morbid, only 16.6% patient was with co morbid like DM,hypertension and pregnancy, out of 83.4% patient only 11.6% patients having raised TLC count without any other clinical condition.(Table No. 2)

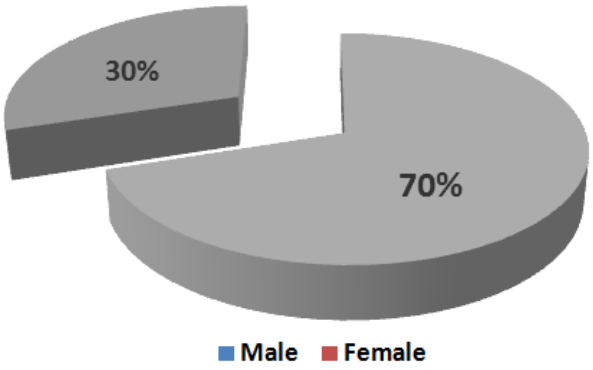

Figure No.I:Pie Graph Showing the Sex Distribution

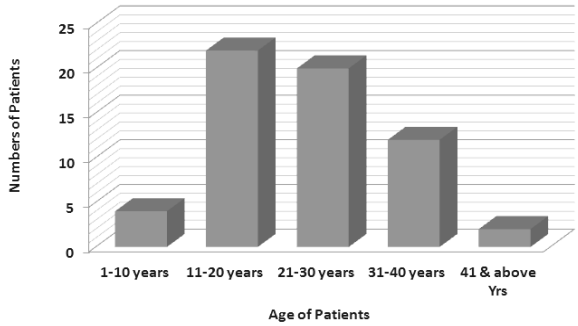

Figure No. 2:Distributions according to age

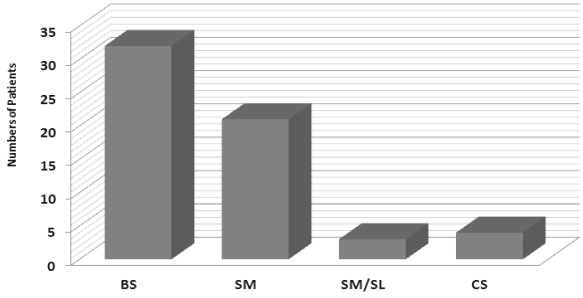

Figure No.3:Distribution according to Space

BS = Buccal space, SM = Submandibular space, SL = Sublingual space CS = Canine Space (Infraorbital space)

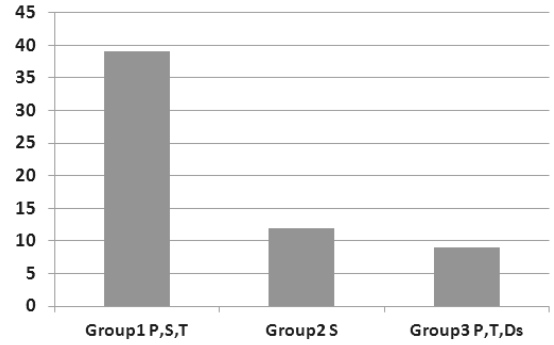

Figure No.4:Distribution according to clinical findings

P = pain, S = swelling, T = trismus, Ds = Draining sinus

Table no I. Tooth involvement * Anatomical space crosstabulation

Tooth involvement	Frequency	Disease	Anatomic space
Lower third molar	26 (43.3%)	Pericronitis (20%)	BS (20%)
		Periradicular (23.3%)	SM (23.3%)
Lower second molar	14 (23.3%)	Periradicular (23.3%)	BS (6.6%)
			SM (16%)
Lower first molar	18 (30%)	Periradicular (26.6%)	BS (26.6%)
			SM, SL (3.3%)
Upper canine	2 (3.3%)	Periradicular (3.3%)	CS (3.3%)

BS = Buccal space, SM = Submandibular space, SL = Sublingual space CS = Canine Space (Infraorbital space)

Table No. 2: Odentogenic infection with Underline Medical condition as risk factor

Co morbid	Healthy individuals	P value
16.7% 10	83.3% 50	0.01

Statistically significant

DISCUSSION

Spreading odontogenic infection is an infection that extends from tooth or from its supporting structure. It is generally caused by odontogenic ailment like pulpitis, periodontitis and pericronitis. If SOI no treated earlier it can build life threatening condition through airway compromise, cavernous sinus thrombosis or mediastinitis. There are numerous factors reported which develop the severity of the infection including anatomical location, depressed immunity and virulence of microorganism. The treatment of spreading odontogenic infection includeselimination of causative tooth as rapidly as possible and incision and drainage of involved space. Forceful antibiotic use asaadjuvant not as sole remedy. Penicillin stills the drug of choice, Clindamycinis a appropriateexchange for penicillin allergic patient. Metronidazole issuggested in addition to penicillin due to increasing resistance among oral anaerobes especially Bacteroides species.[16-18]Surgical drainage improves the resolution of odontogenic infections by lessen the hydrostatic pressure, and the beginning of superficial mucosal flora is factors that aid to decline the spread of the invading pathogens.[18]

In this study, 60 consecutive cases of spreading odontogenic infection were recorded. Males constitute 70% of cases and 130% were females. Male female ratio was 2.3:1. Mean age was 23.57 with SD± 1.90. These findings were consistent with other studies that show a predominance of male patients and 2nd and 3rd decade is common presenting age [3, 5, 12, 14, 19-21.]

In the present study the most repeated clinical findings were pain, swelling and trimus (76.7%) followed by swelling (13.3%) and pain, trismus, draining sinus (10.0%). Similar findings have been observed in literature.[5, 20, 23]

Odontogenic soft tissue infection usually spreads from the structures supporting the affected tooth along the planes of least resistance to the fascial spaces in the locality. Many investigators reported submandibular space as a mainly frequent involve single space followed by buccal space, masticator space and canine space.[3,9,12,15,19,20,22,]However some authors reported pterygo-mandibular and LP space as a most frequent space.[19,23,] The likely explanation of this inconsistency may be gathering of patients in different department. Commonly Oral & Maxillofacial department receives the patents of facial swelling while neck swelling patients are generally referred to Otolaryngology department. This study identified slightly unrelated order of frequency. In this study Buccal space was the most frequent location for a single space infection (53.3%), followed by submandibular space (40%), canine space (3.3%) related sequence of space involvement was also noted by Seppanen et al[15] and Sato et al[24] in their studies. These reports support the Obayashi et al[25] that suggested buccal space is most frequently involved by molar infection. It is also reported that buccal space was a additional common space in single space infection where is the submandibular space is more frequently found condition in multiple space infection.[15] Moreover, Wang et al[12]reported that young children were more probable to have buccal infection whereas adult have more submandibular infection.

In this study the most commonly involved tooth was the mandibular third molar followed by mandibular first molar, mandibular second molar and maxillary canine.Other authors have also reported the mandibular molars as the most frequently involved teeth in odontogenic infections [3,9,15,13].This report confirms these previous studies.

The 90% patients were known to have had treatment prior to presentation. Of these 76.6% had received both antibiotic and analgesic and 13.3% received analgesics only, 10% patients did not received any medication before presentation. This data regarding prior medication is higher than reported study.[5,24] The deviation of this study may be due to self medication of patients, it is observed that at our region patients have pain or swelling first contact to pharmacist and if problem not resolved than get in touch with doctor, but in developed countries patient not permitted to take medicine devoid of prescription.[26]

Surprisingly we observed majority of patients with odentoginc infection were healthy,very less numberhaving systemic disease. This data of the present study deviated from literature. Majority of the authors described underlying disease such as Diabetic Mellitus, hematological neoplasm, malnutrition, alcoholism and steroid therapy as predisposing factor in spreading odontogenic infection.[5, 9,15,27,28]This variation may be because of limited sample size. However, Ylijoki et al[6] reported difference between patient with or without the need for intensive care due to odontogenic infection. They reported underlying disease more common in Non-ICU patients than in the ICU patients. Furthermore, Lee et al[19] reported, three mortalities of Diabetic mellitus (DM) patients from spreading odontogenic infection, two of three had more than two space involvement. They also reported good recovery of six DM patients had single space involvement, indicating mortality due to increased number of space involvement rather than DM. Thomas R et al[11] noticed, immune system compromise was not significantly associated with length of stay at hospital. Consistently Uluibau et al reported two patients died of in teaching hospitals by odontogenicinfections; both died a few hours post operative from acute upper airway obstruction. Both had reintubation and tracheostomies performed by experienced resuscitation team in a hospital environment and were young and fit with no contributing medical problems. They also reported that two patients had presented to their local private dentist with a swollen face and trismus and were not seen immediately. One patient was advised by reception staff that the dentist was busy and would not be able to see the patient for over one week. Two days later the patient was in intensive care[5.] Furthermore Otasowie D et al reported in there review study 17.1% had underlying systemic disease in facial space infection.[21]

We also noted two patients (3.3%) with history of pregnancy. Similarly D Wong et al reported their series of 346 female patients with severe odontogenic infection only 1.4% had history of pregnancy.[29]These finding supported the current study that there is little role of underlying systemic condition in spreading odontogenic infection as a risk factor. The site and early management are very important factor for spreading odontogenic infection which can immediately cause airway embarrassment and create life threatening to the patient. Thus all patients with infection related trismus should be carefully evaluated for sign of upper airway embarrassment, tongue elevation, stridor, and difficulty in swallowing saliva and decreased air way intake. This medical emergency should be treated immediately regardless of the medical condition.

Most of patients were of low socioeconomic status. Similarly it is reported that the incidence of dental abscess found mostly amongst the poorer people and lack of primary health care facilities are an important factors that contribute to a high incidence of maxillofacial infection in developing countries.[14,15]

Acute bacterial infection triggers a neutrophils release from the bone marrow, and thus an increase in thesecells in peripheral blood is a useful indicator of infection.[3]Heimdal et al concluded that the WBC count is of minor importance when judging the severity of an odontogenic infection. Perhaps the WBC count is most useful in assessing improvement or regression of a patient's response to therapy, rather than as a predictor of an actual patient status. Similarly in this study there was no significant difference in mean WBC count.[10]

CONCLUSION

This study shows that lower molars were the most common involved teeth and buccal space was frequent space to be involved. The site of infection is important risk factors. We observed Odentognic infection is more frequent in healthy person than non-healthy persons.

REFERENCES

1. Jimenez Y, Bagan JV, Murillo J, et al. Odontogenic infection, complication, systemic manifestation. Med Oral Patol Oral Cir Bucal 2004;9:139-47.
2. Lopez-Piriz R, Aguilar L, Gimenez MJ. Management of odontogenic infection of pulpal and periodontal origin. Med Oral Patrol Oral Cir Bucal 2007; 12:154-9.
3. Basconies A, Aguirre JM, Bermejo A. Consensus statement on antimicrobial treatment of odontogenic infections. Med Oral Patrol Oral Cir Bucal 2004;9:363-76.
4. Maestre Vera JR. Treatment options in odontogenic infection. Med Oral Patrol Oral Cir Bucal 2004;9:19-31.
5. Uluibau IC, Jaunay T, Goss AN. Severe odontogenic infections. Aust Dent J 2005;50(2): 74-81.
6. Ylijoki S, Suuronen R, Jousimies-Somer H, et al. Difference between patients with or without the need for intensive care due to severe odontogenic infections. J Oral Maxillofacial Surg 2001;59: 867-872.

7. Sandar GKB, Low DE, Judd PL. Antimicrobial treatment option in the management of odontogenic infections. CDA-ADC Journal
8. Riggio MP, Aga H, Murray CA, et al. Identification of bacteria associated with spreading odontogenic infections by 16S rRNA gene sequencing. Oral Surg Oral Med Oral Pathol Oral RadiolEndod 2007;103:610-7.
9. Opeyemi O, Daramola MD, Carrie E, et al. Diagnosis and treatment of deep neck space abscesses. Otolaryngology-Head and Neck Surg 2009;141:123-130.
10. Heimdal A, Konow LV, Satoh T, et al. Clinical appearance of Orofacial infection of odontogenic origin in relation to Microbiological findings. J Clin Microbiol 1985;22:299-302.
11. Flynn TR. Microbiology and Antibiotic Therapy of Oral and Maxillofacial Infections. J Oral Maxillofac Surg 2006;8:126
12. Wang JA, Ahani MA, Pogrel. A five-year retrospective study of odontogenic maxillofacial infections in a large urban public hospital. Int J Maxillofac Surg 2005;34:646–649.
13. Seppanen A, Lauhio A, Lindqvist C, et al. Analysis of systemic and local odontogenic infection complications requiring hospital care. J Infect 2008;57:116-122.
14. Agarwal AK, Sethi A, Sethi D. Role of socioeconomic factors in deep neck abscess: A prospective study of 120 patients. Br J Oral Maxillofac Surg 2007;45: 553–5.
15. Sappan L, Rautemaa R, Lindqvis C, et al.Changing clinical feature of odntogenic maxillofacial infections. Clin Oral Invest DOI 10.1007/00784-009-0281-5.
16. Ariji Y, Gotoh M, Kimura Y, et al. Odontogenic infection pathway to the submandibular imaging assessment. Int J Oral Maxillofac Surg 2002;31: 165–169.
17. Larawin V, Naipao J, Dubey SP, et al. Head and Neck infections. Otolaryngol Head Neck Surg 2006; 135:889-893.
18. Soriano DB, Gomez JR, Calleros HP et al. Management of Ludwig's angina with small neck incisions: 18 years experience. Otolaryngol Head Neck Surg 2004;130:712-7.
19. Lee JK, Kim HD, Lim SC. Predisposing factors of complicated deep neck infection: An analysis of 158 cases. Yonsei Med J2007; 48:55-62.
20. Fonseca RJ. Oral and Maxillofacial surgery, Surgical Pathology, Head and Neck infection. 1st ed. WB Sunders Company; 2000.p.77-117.
21. Osunde OD, Akhiwu BI, Efunkoya AA. Management of Fascial space infection in a Nigerian teaching hospital: A 4-year review. Niger Med J 2012;53(1): 12–15.
22. Rega AJ, Aziz SR, Vincent B. Microbiology and Antibiotic Sensitivities of Head and Neck Space Infections of Odontogenic Origin. J Oral Maxillofac Surg 2006;64:1377-1380.
23. Flynn TR, Shanti RM, Levi MH, et al. Severe Odontogenic Infections, Part 1: Prospective Report. J Oral Maxillofac Surg 2006;64:1093-1103.
24. Sato FRL, Hajala FAC, Filho FWVF, et al. Eight-Year Retrospective Study of Odontogenic Origin Infections in a Postgraduation Program on Oral and Maxillofacial Surgery. J Oral and Maxillofacial Surg 2009;67:1092-1097.
25. Obayashi N, Ariji Y, Goto M. Spread of odontogenic infection originating in the maxillary teeth: Computerized tomographic assessment. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2004; 98:223-31.
26. Kuriyama T, Nakagawa K, Karasawa T, et al. Past administration of β-lactam antibiotics and increase in the emergence of β-lactamase–producing bacteria in patients with orofacialodontogenic infections. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2000;89:186-92.
27. Huang TT, Tseng FY, Liu TC, et al. Deep neck infection in diabetic patients: Comparison of clinical picture and out comes with nondiabetic patients. Otolaryngol Head and Neck Surg 2005; 132:943-7.
28. Hirai T, Kimura S, Mori N. Head and neck infections caused by Streptococcus milleri group: An analysis of 17 cases. Auris Nasus Larynx 2005;32:55-58.
29. Wong D, Cheng A, Kunchur R, et al. Management of severodontogenic infection in pregnancy. Australian Dental J 2012;57:498-503.

Address for Corresponding Author:
Dr. Sabir Ali
Lecturer,
Dept. of Oral and Maxillofacial Surgery
Institute of Dentistry,
LUMHS Jamshoro
Phone No .0300-3071590
Sab_skh@yahoo.com, kashif_omfs@yahoo.com