Common Bacteria and Their Antibiotic Sensitivities Involved in Complex Fascial Space Infections of Odontogenic Origin

Yasir Rehman Khattak[1], Anjum Iqbal[2], Ajmal Khan[3], Tariq Sardar[4], Umer Ullah[5], Muhammad Mushtaq[1]

ABSTRACT

Objective: To evaluate the frequency of common bacteria and their antibiotic sensitivities in complex fascial space infections of odontogenic origin.

Methodology: In this descriptive, multicentral cross-sectional study 131 patients were conveniently recruited having complex fascial space infections of odontogenic origin from October 2012 to September 2019. Pus aspirates were sent for culture and sensitivity testing to identify the bacteria involved and their antibiotic sensitivities. The qualitative variables like gender, age, facial spaces, and bacteria involved were defined by frequencies and percentages.

Results: The most common bacteria found were Viridians Streptococci (39.7%), followed by Prevotella (29.8%), Pepto streptococcus (18.3%), staphylococcus Aureus (9.2%) and Haemophilus (3.1%). Viridans were sensitive to Co-amoxiclav and ceftriaxone in 100% cases. The sensitivity of Staphylococcus Aureus to Clindamycin and Gentamycin was 75 %each.

Conclusion: Viridans Streptococci and Prevotella were the most common microbes isolated in fascial space infections having odontogenic origin. Ceftriaxone and Co-amoxiclave were the most effective antibiotics against the Virdans and Ceftriaxone, Ciprofloxacin, and Ofloxacin were most effective against Staphylococcus Aureus.

Keywords: Odontogenic fascial space infections, Anti biotic Sensitivity.

INTRODUCTION

Fascial spaces are potential regions that are present in between the deep cervical fasciae and the organs and tissues present beneath. These regions communicate to each other in such a manner to form avenues in which infection spread from one region of head and neck to other[1].

1. Oral and Maxillofacial Surgery, Hayatabad Medical Complex, Peshawar, Pakistan
2. RHC Tordher, Swabi, Pakistan
3. Oral and Maxillofacial Surgery, Saidu Medical College, Swat, Pakistan
4. Oral and Maxillofacial Surgery, KMU-Institute of Dental Sciences, Kohat, Pakistan
5. Oral and Maxillofacial Surgery, Rehman College of Dentistry, Peshawar, Pakistan

Address for Correspondence:
Prof. Dr. Muhammad Mushtaq
Professor Department of Oral and Maxillofacial Surgery, Hayatabad Medical Complex, Peshawar, Pakistan
meetmeshi@yahoo.com
00923005669116

The origin of majority of the fascial space infections is odontogenic typically due to the injury to teeth and related structures, dental caries, side-effects of dental procedures and perodontitis. Fascial spaces can also get Infection from various additional sources like pharyngeal, tonsillar, nasal, audiologic, three salivary glands, dermal infections and even trauma.[2, 3] Molars seem to be the frequently involved locations for pyogenic infections. According to a study[4] the mandibular molars are cause of odotogenic fascial space infection and 47.7% and maxillary molars 20.5% cases involved and several studies also suggested that submandibular space is the mostly targeted area for the single space and polyspace pyogenic odontogenic infections. [5, 6] These fascial space infections are frequently encountered, yet the information about the causative organism is insufficient and conflicting.[4] The available data indicate that most cases are polymicrobial in origin, secondary to a mixture of aerobes, facultative anaerobes and strict anaerobes.[3,7] According to a study of Rega etal, the common aerobic bacteria isolated were Viridans Streptococci (28.9%), Staphylococcus aureus (8.9%) and Haemophilus (4.1%) and the common anaerobic bacteria were Prevotella (21.2%)

and Peptostreptoccus (4.8%)6 in patients with odontogenic infections. In another study, aerobes were isolated in 68.2% of cases as compared to pure anaerobes 9.1% and mixed flora in 13.6% cases.[5] The purpose of the current study was to evaluate the frequency of common causative bacteria and their antibiotic sensitivities of fascial space infections of odontogenic origin.

MATERIALS AND METHODS

This was a descriptive cross-sectional study. Patients were conveniently recruited having odontogenic fascial space infections. Data were obtained from Oral and Maxillofacial Surgery Department Khyber College Dentistry Peshawar, Hayatabad medical Complex Peshawar, and four private clinics, after approval from the hospital Ethical Review Board, from October 2012 to September 2019. Sample size was calculated using WHO calculator keeping 21.2% proportion of Provotella, confidence interval being 95% and margin of error 7%. Demographic data of the participants including gender, age and the fascial spaces involved was collected. Participants presenting with fascial space infection having non-odontogenic origin like nasal, otologic, pharynx or tonsillar and salivary glands and study subjects with prior use of antibiotics in the preceding one week, history of intake of steroids, having concurrent infections and immunocompromised status and those whose culture and sensitivity yielded no growth were excluded. The objective, procedural risks and beneficial details were explained to the participants, and informed consent was obtained. Pus aspirates were obtained for culture and sensitivity. The laboratory investigations were done by a single experienced microbiologist. The qualitative variables like gender, bacteria involved in fascial space infections were defined by frequencies and percentages, while the quantitative variables like age were described by mean and standard deviations. Statistical analysis was done using SPSS 20.

RESULTS

A total of 131 patients were recruited in the study. Females having odontogenic fascial space infections were 53.4% (n=70) while males presented with odontogenic infections were 46.6% (n=61) with male to female ratio of 1:1.5.

The age of patients varied from 6 to 70 years with the mean age 29.6 ±13.03 years. The frequency of odontogenic fascial space infections was high in the 3rd decade (32.1%) followed by 2nd and 4th decade (22.1% each) and 5th decade (11.5%) respectively.

Viridans Streptococci was found in 39.7%, Prevotella in 29.8%, Peptostreptococcus in 18.3%, Staphylococcus aureus in 9.2% and Haemophilus in 3.1%. Sensitivities are detailed in table 1-6.

In the present study, most resistance was found against Penicillin (22.9%), followed by Erythromycin (19.8%) and Cephradine (17.5%). Ciprofloxacin and Ofloxacin were very effective against all bacteria, with a resistance of 3.8% each. Metronidazole was very effective against the anaerobic bacteria with a resistance of only 3.2%.

Table 1: Sensitivity to Co-amoxiclav

Common Bacteria	n		%
	Sensitive	Resistant	
Viridans Streptococci	52	0	100
Staphylococcus Aureus	6	6	50
Haemophilus	4	0	100
Prevotella	32	7	82.1
Peptostreptococcus	22	2	91.7

Table 2: Sensitivity to Clindamycin

Common Bacteria	n		%
	Sensitive	Resistant	
Viridans Streptococci	45	7	86.5
Staphylococcus Aureus	9	3	75
Haemophilus	4	0	100
Prevotella	37	2	94.8
Peptostreptococcus	22	2	91.7

Table 3: Sensitivity to Gentamicin

Common Bacteria	n		%
	Sensitive	Resistant	
Viridans Streptococci	42	10	80.7
Staphylococcus Aureus	9	3	75
Haemophilus	4	0	100
Prevotella	36	3	92.3
Peptostreptococcus	20	4	83.3

Table 4: Sensitivity to Ceftriaxone

Common Bacteria	n		%
	Sensitive	Resistant	
Viridans Streptococci	52	0	100
Staphylococcus Aureus	7	5	58.3
Haemophilus	4	0	100
Prevotella	39	0	100
Peptostreptococcus	24	0	100

Table 5: Sensitivity to Ciprofloxacin

Common Bacteria	n		%
	Sensitive	Resistant	
Viridans Streptococci	50	2	96.2
Staphylococcus Aureus	9	3	75
Haemophilus	4	0	100
Prevotella	39	0	100
Peptostreptococcus	24	0	100

Table 6: Sensitivity to Ofloxacin

Common Bacteria	n		%
	Sensitive	Resistant	
Viridans Streptococci	50	2	96.2
Staphylococcus Aureus	9	3	75
Haemophilus	4	0	100
Prevotella	39	0	100
Peptostreptococcus	24	0	100

Table 7: Sensitivity to Metronidazole

Common Bacteria	n		%
	Sensitive	Resistant	
Prevotella	37	2	94.8
Peptostreptococcus	24	24	100

DISCUSSION

Odontogenic infections if remain untreated, can cause major serious complications and can be life threatening in some cases. There is much importance of these infections due to their high incidence rate and morbidity. The current study investigated common bacteria and their antibiotic sensitivities in patients having fascial space infections.

In the present study, out of a total of 131 patients with odontogenic fascial space infections, (53.4%) were female, while (46.6%) were male patients, with a male to female ratio 1:1.15. Whereas in other study[9] showed male predominance, reporting 62.5% males and 37.5% females with a male to female ratio of 1.66:1. Another study[10] reported male predominance while some other studies[11, 12] reported an equal distribution among both genders. Similar results to the current study were obtained in a study[13] showing that 65.16% of female patients had facial space infection.

The current study illustrated the polymicrobial characteristics of fascial space infections that is in accordance with the previous studies.[10, 14, 15, 16] The study also reported high prevalence of aerobic over anaerobic isolated species. Out of all the microbes, Viridans Streptococci were isolated in 39.7% cases, followed by Prevotella 29.8%, Peptostreptococcus 18.3%, Staphylococcus aureus 9.2% and Hemophilus 3.1%. These results are similar to a study[5]

concluding that cultures show greater percentage of aerobic (65.7%) growth than anaerobic.

The predominant aerobes were Streptococci and staph aureus, with very few isolates of Hemophilus. The high incidence of streptococci was in accordance with other studies.[5, 14, 17, 18] In the current study staph aureus was the second most common aerobe (9.2%) similar to a study[5], while two other studiesreported 4.7%[14] and 7.4%[19] incidence of staphylococcus aureus. The high incidence of staph in the current study can be due to contamination of cultures from skin or it was likely due to actual finding. Haemophilus were cultured only from 3.1% of the isolates, which is consistent with two studies.[5, 10]

The predominant anaerobes isolated in this study are Prevotella 29.8% and Peptostreptococcus 18.3%. A study[14] found similar number of isolates of Prevotella (26.1%). The results of this study are also consistent with other two studies[5, 20] reporting Prevotella to be 32.1% and Peptostreptococcus 22.6%. The current study carried out the antibiotic sensitivity tests for isolated microbes. The Streptococcus viridians were found to be 100% sensitive to co-amoxiclave and ceftriaxone followed by ciprofloxacin, amoxicillin, ofloxacin, cephradine, clindamycin, gentamicin, erythromycin and penicillin. The susceptibility of streptococci against penicillin has depicted a tendency to decrease. Other studies also showed the increasing tendency of resistance of oral streptococci towards penicillin[21, 22].

The sensitivity of Staphylococcus aureus was found to be highest to gentamycin, clindamycin, ciprofloxacin and ofloxacin followed by cefriaxone, cephradine, erythromycin, co amxiclave and amoxicillin. The lowest sensitivity was towards penicillin. A study[23] also found a high resistance of Staphylococcus aureus to Penicillin (60%) and Amoxicillin (37.3%). Another study[24] also showed similar results. It is now known that similar to Viridans Streptococci, hardly any isolates of Staphylococci are now predisposed to penicillin.[24]

Haemophillus was found to be 100% susceptible to co-amoxiclave, erythromycin, clindamycin, gentamicin, cephradine, ceftriaxone, ciprofloxacin and ofloxacin while lower susceptibility was found towards penicillin and amoxicillin. These results are similar to a study[16] where hemophillus was found to be resistant to ampicillin (19%), azithromycin (6.8%) and chloramphenicol (3.7%), while ciprofloxacin was found to be 100% effective against it.

Among anaerobes, the antibiotic sensitivity of Prevotella was 100% towards ciprofloxacin, oflxacin and ceftriaxone followed by metronidazole, clindamycin, gentamicin and erythromycin. These results are consistent with a previous study.[17]A sensitivity of 76% to penicillin in this study is consistent with a previous evidence[18] which showed 80% sensitivity of Prevotella to Penicillin. Resistance to penicillin is often found in Prevotella species and the mechanism is reported to be due to beta lactamase production. In a study[19] the resistant strains of Prevotella were found susceptible to cefoxatin, clindamycin and metronidazole.

Peptosteptococcus, a gram-positive anaerobe was found to be 100 percent sensitive to metronidazole, ciprofloxacin, ceftriaxone and ofloxacin followed by other antibiotics while the lowest sensitivity was found towards penicillin. According to a study[20], the peptostreptococcus was found to be susceptible to amoxicillin, amoxicillin-clavulanic acid, cefoxitin, ertapenem, clindamycin, metronidazole, and moxifloxacin.

The known susceptibility of anaerobes to metronidazole is well reflected from this study. The results regarding the susceptibility of the Prevotella and Peptostreptococcus isolates to cefoxitin, clindamycin and metronidazole were similar to those obtained by a previous study.[19] However, some studies[20,21] have indicated resistance of some gram-negative bacilli against metronidazole. An evidence[18] thus recommends the combination of penicillin, clindamycin and metronidazole in infections produced by these bacteria.

CONCLUSION

From the current study it was concluded that odontogenic fascial space infections were more common in females and in 2nd, 3rd and 4th decades of life. Viridans Streptococci were the most common aerobic microbes and Prevotella were the most common anaerobes isolated in odontogenic fascial space infections. There was a high resistance towards penicillin and Staphylococcus aureus were the most resistant microbes isolated. Co-amoxiclave and ceftriaxone were the most effective antibiotics against the aerobes isolated. Ceftriaxone, ciprofloxacin, ofloxacin and metronidazole were most effective against the anaerobes isolated.

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