ORIGINAL RESEARCH PAPER

Dental Science

MICROBIOLOGICAL SPECTRUM OF OROFACIAL INFECTION AND ITS SENSITIVITY TO ROUTINE ANTIBIOTICS

KEY WORDS: orofacial Infection, Aerobes, Anaerobes, Amoxicllin, Cefotaxime, Metronidazole

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ABSTRACT

BACKGROUND: The aim of the study was to analyze the current status of frequency and antibiotics susceptibilities of bacteria associated with orofacial infection.

MATERIAL AND METHODS: The study included 100 patients with orofacial infection visited to Dept of Oral Medicine and Radiology at Kalka Dental College, Meerut. The pus samples were collected by closed syringe technique and subjected to culture and sensitivity test.The clinical efficacies of antibiotics were analyzed.

RESULTS: The orofacial infection was found polymicrobial in nature. Both aerobic and anaerobic spectrums of microorganisms were demonstrated. The most common aerobic microorganisms were streptococcus viridians, staphylococcus aureus and the anaerobics were peptostreptococcus and bacteroids melaninogenicus. The complete microbial flora of the orofacial infection showed highest percentage of sensitivity to cefotaxime followed by amoxicillin, penicillin and gentamycin.

CONCLUSION: The results suggested that the primary empirical drug therapy for orofacial infection is recommended to be amoxicllin, supplemented with metronidazole to take care of anaerobes. Cefotaxime should be reserved as a second choice of drug if amoxicllin remains ineffective or the infection is rapidly spreading.

INTRODUCTION:-

Infection has long been the bane of the surgeons. Since pre-recorded history, oro-facial infection has plagued humankind. Infection is the successful invasion of the tissue by pathogenic microorganisms, characterized by their multiplication in the body of host, to produce disease. Oro-facial infections are commonly odontogenic ranging from periapical abscess to superficial and deep infections in the neck. The infection generally spreads into continuous fascial planes. It may cause life threatening complications such as airway obstructions, infection of carotid sheath, sinusitis, septicemia, meningitis and mediastinitis.

Common oral microbial flora cause infection with their increased virulence, or decreased host resistance. These bacteria may be either aerobes or anaerobes or mostly mixed one. Infection caused by anaerobes bacteria are increasing and are more prevalent than previously suspected. Alexander Fleming (1929) introduced penicillin as the "miracle drug", Innumerate lives have been saved from such scourges as bacteraemia, pnemococcal pneumonia and wound sepsis. Oral and Maxillofacial Surgeons benefited greatly from the discovery of penicillin because most of orofacial infection were caused by penicillin sensitive micro organisms.

It soon became evident that the antibiotic usage had considerable risk like allergy, toxicity and superinfection. Finally the development of antibiotic resistance was noted. Penicilinase producing staphylococci were described early and became a major problem. The widespread use of penicillin resulted in recognition of "new" disease caused resistance species. The problem of resistance bacteria is an ecological one. The microbiological environment has been polluted with bacteria that are resistance to many antibiotics. This alteration in antibiotic sensitivity is now the expected result of antibiotic administration. The risk for an individual patient with his single prescription of penicillin is small, but altered bacterial flora represents a present and future risk to the community in general. Despite the problems associated with antibiotic usages, antibiotics are tremendously useful weapons against infection.

Recently with improved microbiological techniques, the knowledge of bacteria involved in maxillofacial infections has broadened. The culture and sensitivity determination provides definitive information about the causative organisms and their antibiotic susceptibility that assist the clinician to prescribe an effective antibiotic which hasten the healing. With the continuous use of antibiotics coupled with a high mobility in human population and rapid modes of travel, the type of bacteria that cause infection and the antibiotics susceptibility of these pathogens may change. Therefore, continuous monitoring of these changing patterns is essential for clinicians to formulate effective antibiotic regimes. Keeping in view, this study is planned to identify anaerobes and aerobes of orofacial infection and their antibiotic susceptibility for the contemporary management.

MATERIAL AND METHODS:-

Hundred patients aged between 12-65 years with orofacial infections, presenting in the Dept of Oral Medicine and Radiology at Kalka Dental College, Meerut were enrolled in this study. Pus samples were collected by closed syringe technique from intact mucosa or skin overlying the abscess under aseptic precautions to prevent contamination of samples. Cases were limited to acute fluctuant localized abscesses of the orofacial region which led themselves to aspiration of 1 ml or more pus. Then the syringe is sealed and subjected to aerobic and anaerobic culture and antibiotic sensitivity test. The clinical efficacies of antibiotics were analyzed. Patient who had taken prior antibiotic therapy were not included in this study. All the patients in this study underwent surgical incision and drainage in the operating room.

RESULTS:-

Out of hundred cases, the maximum number of orofacial abscesses were submandibular abscesses (23%) followed by periodontal (14%), lateral pharyngeal (12%) and canine (12%) space abscesses. In most of the cases the cause was the odontogenic one (Table 1). Out of 100 cases of orofacial infection, microorganisms were isolated in 97 cases and three cases yielded negative culture. 12% cases demonstrated only aerobes, while only anaerobes were isolated in 15% cases. 70 % cases are accounted for polymicrobial infection (Table 2).

Table 1: Location wise distribution of 100 orofacial abscesses

Location	Number
Submandibuar abscess	23

Periodontal abscess	14
Lateral pharyngeal abscess	12
Canine space abscess	12
Parotid abscess	11
Buccal space abscess	11
Masticatory space abscess	09
Infected cyst	04
Submental abscess	03
Temporal abscess	01

Table 2: Type of bacterial growth observed on culturing from orofacial abscesses

Type of growth	Number
Mixed anaerobic bacteria	70
Pure anaerobic	15
Pure aerobic	12
No growth	03
Total	100

Table 3 (a): Aerobic bacteria found in 100 patients

Aerobes	No. of isolates
Streptococcus viridians	55
Staphylococcus aureus	17
Escherichia coli	10
Pseudomonas	08
Proteus	05
Staphylococcus epidermididis	05
Beta-streptococci	04
Enterococci	04
Pneumococci	03
Klebsiella	02
Total	113

Table 3 (b):- Anaerobic bacteria found in 100 patients

Anaerobes	No. of Isolates
Peptostreptococcus	32
B.melaninogenicus	29
Fusiform bacilli	15
Unidentified bacteroides	13
Peptococci	09
Actinomyces	03
B.fragils	02
Lactobacilli	02
Clostridia	02
Total	107

Table 4(a):- Antibiotic sensitivity of aerobic strains of bacteria

Micro organisms	Penicillin (%)	Ampicillin (%)	Amoxicllin (%)	Cloxacillin (%)	Gentamicin (%)	Erythromycin (%)	Cefotaxime (%)
Streptococcus viridans (55)	40 (72.7)	19 (34.5)	52 (94.5)	15 (27.3)	30 (54.5)	26 (47.3)	55 (100)
Staphylococcus aureus (17)	6 (35.3)	7 (41.2)	16 (94.1)	16 (94.1)	8 (47)	9 (52.9)	17 (100)
Escherichia coli (10)	4 (20)	1 (10)	8 (80)	1 (10)	6 (60)	2 (20)	10 (100)
Pseudomonas (8)	2 (25)	-	7 (87.5)	1 (12.5)	7 (87.5)	5 (62.5)	8 (100)
Proteus (5)	-	-	5 (100)	-	4 (80)	5 (100)	5 (100)
Staphylococcus epidermididis (5)	4 (80)	4 (80)	5 (100)	5 (100)	2 (40)	3 (60)	5 (100)
Beta-streptococci (4)	4 (100)	2 (50)	4 (100)	1 (25)	4 (100)	3 (75)	4 (100)
Enterococci (4)	1 (25)	2 (50)	4 (100)	1 (25)	2 (50)	2 (50)	4 (100)
Pneumococci (3)	3 (100)	3 (100)	3 (100)	3 (100)	2 (66.6)	3 (100)	3 (100)
Klebsiella (2)	1 (50)	-	1 (50)	-	-	1 (50)	2 (100)
Total Aerobics (113)	65 (57.5)	38 (33.6)	105 (92.9)	43(38.1)	65 (57.5)	59 (52.2)	113 (100)

Table 4(b):- Antibiotic sensitivity of anaerobic strains of bacteria

Micro organisms	Penicillin (%)	Ampicillin (%)	Amoxicllin (%)	Gentamicin (%)	Erythromycin (%)	Cefotaxime (%)	Metronidazole (%)
Peptostreptococci (32)	12(37.5)	8 (25)	8 (25)	26 (18.2)	9 (28.1)	30 (93.7)	32 (100)
B.Melaninogenicus (29)	17 (58.6)	4 (13.8)	4 (13.8)	7 (24.1)	9 (31)	27 (93.1)	29 (100)
Fusoform bacili(13)	10 (66.6)	2 (13.3)	2 (13.3)	2 (13.3)	4 (26.6)	15 (100)	15 (100)
Unidentified bacteroids (13)	6 (46.1)	-	-	3 (23)	3 (23)	13 (100)	13 (100)
Peptococci (9)	3 (33.3)	2 (22.2)	2 (22.2)	2 (22.2)	2 (22.2)	9 (100)	9 (100)
Actinomyces (3)	1 (33.3)	-	-	1 (33.3)	1 (33.3)	3 (100)	3 (100)
B.Fragilis (2)	1(50)	-	-	-	-	1 (50)	2 (100)
Lactobacilli (2	2 (100)	1(50)	1(50)	-	-	2 (100)	2 (100)
Clostridia (2	1(50)	-	-	-	1(50)	2 (100)	2 (100)
Total anaerobics 107	52 (48.5)	17 (15.9)	17 (15.9)	41 (38.3)	29 (27.1)	102 (95.3)	107 (100)
Total Microbes (Aerobic + Anaerobic (220)	117 (53.1)	55 (25)	122 (53.8)	106 (48.1)	88 (40)	215 (97.7)	-

DISCUSSION:-

Orofacial infections have protean manifestation and are largely dictated anatomic routes of spread. Complication such as retropharyngeal spread, suppurative mediastinitis, airway obstruction, intracranial extension, pleura-pulmonary involvement and haematogenous dissemination indicate the potentially serious nature of these infections. The rational selection of an appropriate antibiotic, as a part of the successful treatment of orofacial infections, is largely dependent on microbial culturing and antibiotic susce ptibility testing. Patient needs to be covered with empirical therapy till culture and sensitivity report is obtained. The objective of this study was to assess the current status of the frequency and antibiotic susceptibilities of bacteria associated with orofacial infection. So as to help clinician to select antibiotic till the sensitivity is confirmed.

The study conducted by Greenberg[1] and Kannangara[2]

revealed that in orofacial infection, there was a polymicrobial flora including both aerobic and anaerobic bacteria. Similar findings were also observed in present study. The spectrum of bacterial species isolated in present study was similar to that described by Sabiston[3] and William[4]. Anaerobes to aerobes ratio in Goldberg[5] study was noted as 2:1 while in present study it was 1:1.1. Peptostreptococci, anaerobic gram positive cocci accounted for the largest group among the anaerobic organisms. Bacteroides Melaninogenicus, anaerobic gram negative bacilli presented as the second largest group. This data coincides with the finding of Sabiston[3].

In present study, bacteroides fragilis were isolated in three cases. It is of particular importance because of its display of resistance to most of the antibiotics. On the other hand, pneumococci which were also isolated in three cases, but showed sensitivity to all the tested antibiotics except in one case, showed resistance to gentamycin. After discussing the organisms, we now consider the agents more propitious for the destruction. First to reiterate, antibiotics should be used in dental surgery clinics mainly as an adjunct to eradication of the source of infection. Having stressed the importance of directing antibiotic therapy, we are confronted with the problem of deciding which of the combination of bacteria are most damaging and what should be the empirical therapy. To date, the pathogenic role of individual organism is not established except few. Hence, no selective antibiotic can be used. Primarily successful treatment depends having upon changing the environment through debridement and /or incision and drainage. If pus remains, antibiotics are often ineffective despite the presence of susceptible organism. They are either unable to reach the site of the infection because of the poor vascular supply in the walls of an abscess or are inactivated by either pus or enzyme degradation by the microbes. Debridement alters the ability to sustain anaerobic growth by moving hypoxic tissue. Proper antimicrobial decisions are particularly important with certain type of life threatening space infections such as Ludwig's angina, parapharyngeal space infection and jugular venous thrombophlebitis with septicemia etc Increasing number of microbes found in the orofacial infections exhibited remarkable resistance to penicillin which was once the drug of choice. This led to use of other drugs from penicillin group. Clinical failure with penicillin therapy caused by beta-lactamase producing bacteroides strains has been reported.

Lewis et al recommended the use of amoxicllin because of its bactericidal action, reliable absorption after oral administration and prolonged serum level. High level of this drug can be achieved in localized abscess.[6] It has been used successfully in a short course high dose form of therapy. In our study also, amoxicllin was effective against Streptococcus viridans and most of the other aerobes but the anaerobes displayed resistance: and thus, metronidazole is added to the therapy. Hence amoxicllin is considered as a first drug of choice against orofacial infection, not suspected to be anaerobic. Epstein et al recommended ampicillin to be highly potent antibiotic but our study showed that it was much less effective than penicillin.[7] This may be due to common use of ampicillin for various diseases in this region. Since Cloxacillin is primary useful in treating infections caused by penicilinase-producing organisms, its use should be reserved until the result of microbial sensitivity test is obtained. In our study, cloxacillin proved to be highly effective against staphylococcus species. Erythromycin, as reported by Greenberg[1] and Quayle[8] was found to be infective in our series of antibiotic susceptibility testing. Gentamycin was found to be much more effective against Pseudomonas, Proteus and E. Coli.

As reported by Moenning[9] efficacy of third generation cephalosporin, cefotaxime is credited to its resistance degradation by the Beta-lactamase. Thus, it has greater therapeutic implications in acute infection. Our study showed that cefotaxime was the most effective antibiotics against aerobic as well as anaerobic microorganisms. So it considered to be the most potential drug for treatment of orofacial infections. Administration of metronidazole in orofacial infection is recommended by Gill and Schully[10] and Ingham and Sisson [11], as it has 100% activities against anaerobes. Our study has also shown the similar observation. Ultimately the choice of initial treatment of an infection is based on clinical evidence. The offending organisms and their sensitivity can only be determined after the bacteri ological investigations. Therefore, a degree of emipiricism is inevitable in the initial choice of antibiotics.

If, we define the preferred primary antibiotic agent, as the one that has high degree of efficacy, low degree of adverse systemic manifestation, with proven history of success and cost of effectiveness, then the amoxicllin clearly surpasses other antibiotics. Metronidazole should be given due consideration, as now the role of anaerobes in orofacial infection is well established. Cefotaxime can be used as second choice of drug, as it is higher antibiotic with more cost. The major limitation of these recommendations is the high level of penicillin resistance of microbial flora within the community.

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