

Evaluation of Microbial Flora and Antibiotic Sensitivities in Orofacial Space Infections of Odontogenic Origin

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ABSTRACT

Objectives: The study was designed to isolate the microbial flora in various odontogenic space infections and evaluate antibiotic sensitivity of the Microbial flora in odontogenic infections

Materials and Methods: A total of 40 patients with orofacial space infections were considered. Study was carried out in the department of Oral Medicine & Radiology, pus samples were collected with aseptic precautions and examined in the department of microbiology for culture and antibiotic sensitivity.

Results: Micro-organisms were highly sensitive to Amoxicillin+Clavulanic acid (100%), Cefixime (100%), Ofloxacin (100%), Erythromycin (67.5%) and Metronidazole (80%) and resistance observed Erythromycin (34.22%) and Metronidazole (21.06%)

Conclusion: The microorganisms isolated were Staphylococcus aureus (47.5%) is predominantly found followed by Streptococcus Viridans (42.5%) and Enterococcus (10%) respectively. Submandibular space is predominantly involved compared to buccal, canine, submental, pteryomandibular and masseteric space infections. Site of infection present in maxillary region has less compared to mandibular region. Amoxicillin+clavulanic acid, Cefixime and Ofloxacin were most effective antibiotics

Keywords: Odontogenic infections, Staphylococcus aureus, Streptococcus viridians, Amoxicillin+Clavulanic acid, Cefixime

INTRODUCTION

The human oral cavity is a biological system that contains many species of microorganisms. When these microorganisms penetrate into deeper tissues or in case of compromised host resistance and bacterial infections they manifest as diseases. [1] This ability has been shown over the past decade in the number and variety of emerging infections not previously recognized in humans and also in the reemergence of disease, sometimes in slightly different forms, caused by well-

known microorganisms such as Staphylococci, Streptococci and Escherichia coli.

Harold Neu suggested that “Bacteria are more clever than Men”. They have adapted to every environmental niche on the planet and are assimilating to surroundings saturated with antibiotics. [2,3]

The facial spaces of head and neck represents major pathways for the spread of deep infections, conceptually the facial planes of the head and neck may be visualized as a series of conduits. Infections

in the orofacial region are commonly known to be of dental origin. Odontogenic infections range from simple periapical abscesses to severe infections involving superficial and deep facial spaces in the head and neck often leading to septicemia. [4]

The increased prevalence of antibiotic resistance is an outcome of evolution. To combat penicillin resistance, synthetic antibiotics have subsequently been synthesized; however resistance has also developed to these newer synthetic drugs. [5]

The aim of the present study is to assess the causative microorganisms responsible for orofacial space infections of odontogenic origin and which antibiotics should be prescribed in first place to these patients and to establish whether differ antibiotic regimens are indicated according to the orofacial spaces.

MATERIALS AND METHODS

This study was carried out in the department of Oral Medicine & Radiology, CKS Theja institute of dental sciences and research. A total of 40 patients clinically

diagnosed as orofacial infections of odontogenic origin will be enrolled in this study. A structured proforma shall be used to collect relevant information from each patient. Informed consent will be taken from each patient before enrolment of patient into the study. Inclusion criteria were patients of all age groups with odontogenic space infection and patients receiving antibiotic therapy more than 24 hours prior to reporting to outpatient department. Exclusion criteria to be patients having a recent history of major illness and patients with history of compromised immunity.

Collection of the pus samples from the selected patients presenting with orofacial infections of odontogenic origin. The site of specimen collection will be disinfected with povidone- iodine prior to specimen collection. For Bacteriology examination, the pus sample shall be collected by aspiration from the abscess site with a 18 or 22 gauge needle and syringe or by swab method. The specimens were inoculated on to Blood agar and MacConkey's agar incubated aerobically at 37° C for 18 to 24 hours. [Fig-1]

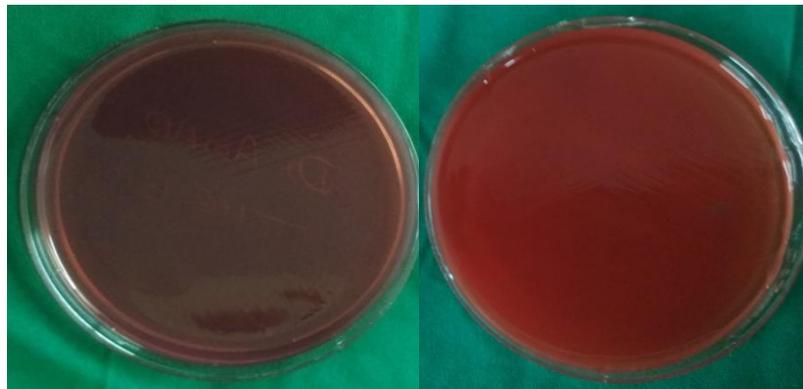


Fig-1: Blood agar and MacConkey's agar plates

Antibiotic Sensitivity Test:

Procedure: Dip a sterile cotton swab into the bacterial suspension. To remove excess liquid, rotate the swab several times with a firm pressure on the inside wall of the tube above the fluid level. Using the swab, streak the Mueller-Hinton agar plate to form a bacterial lawn. To obtain uniform growth,

streak the plate with the swab in one direction, rotate the plate 90° and streak the plate again in that direction. Allow the plate to dry for approximately 5 minutes. Use an Antibiotic Disc Dispenser to dispense disks containing specific antibiotics onto the plate.[Fig-2]

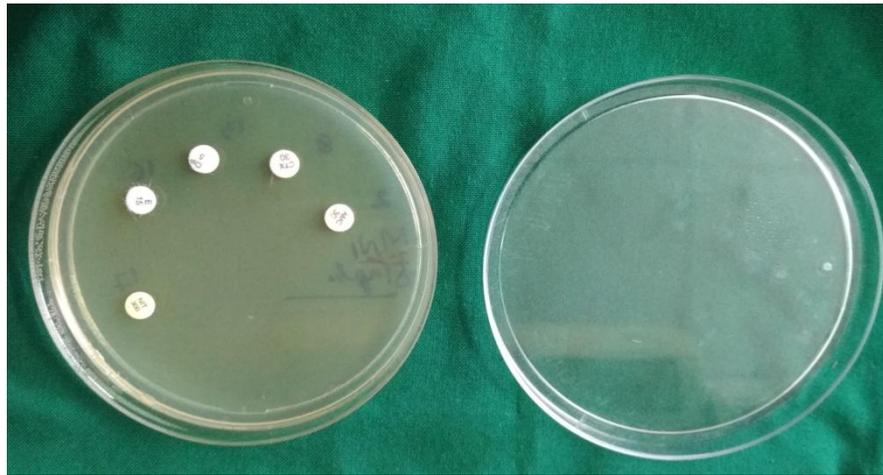


Fig-2: Antibiotic Disks placement

By using sterile sticks or loops, gently press each disc to the agar to ensure that the disc is attached to the agar. Plates should be incubated overnight at an incubation temperature of 37°C.

Data was analyzed using SPSS version 23. Descriptive statistics, frequencies were assessed to isolate the microbial flora in various odontogenic space infections and to evaluate antibiotic sensitivity of the Microbial flora in odontogenic infections.

RESULTS

In the present study 40 patients with orofacial odontogenic space infection were considered.

Frequency distribution of organisms isolated:

The bacteria were found to be Staphylococcus aureus 19 (47.5%), Streptococcus Viridans 17 (42.5%) and Enterococcus 4 (10%). The predominantly isolated microorganisms were Staphylococcus aureus in 19 patients (47.5%) [Table-1].

Table 1: frequency distribution of organisms isolated

Type	Frequency	Percent
Enterococcus	4	10.0
Staphylococcus	19	47.5
Streptococcus	17	42.5
Total	40	100.0

Distribution according to type of space involved:

The Submandibular space was most frequently found in 12 patients (30%) followed by Buccal space in 11 patients (27.5%), Canine in 9 patients (22.5%), Submental space in 4 patients (10%), Pteryomandibular space in 2 patients (5%) and Massteric space in 2 patients (5%) [Table-2].

Table 2: Distribution according to type of space involved

Type of space involved	Frequency	Percent
Buccal	11	27.5
Canine	9	22.5
Massteric	2	5.0
Pteryomandibular	2	5.0
Sub mental	4	10.0
Submandibular	12	30.0
Total	40	100.0

Distribution according to Antibiotic sensitivity pattern:

Antibiotic sensitive was observed Amoxicillin+Clavulanic acid (100%), Cefixime (100%), Ofloxacin (100%), Erythromycin (67.5%) and Metronidazole (80%). Antibiotic resistance was observed Erythromycin (34.22%) and Metronidazole (21.06%) [Table-3].

Table 3: Antibiotic sensitivity pattern

Drug	Sensitivity		Resistant	
	N	%	N	%
Amoxicillin + Clavulanic acid	40	100	0	0
Cefixime	40	100	0	0
Ofloxacin	40	100	0	0
Erythromycin	27	67.5	13	34.22
Metronidazole	32	80	8	21.06

Distribution according to side and site of lesion:

In present study, Maxillary region total 15 patients present left side has 5 patients (33.3%) and right side has 10 patients (66.7%). In mandibular region total 25 patients present left side has 13 patients (52%) and right side has 12 patients (22%). [Table- 4].

Table 4: Distribution according to side and site of lesion

Side	Maxilla		Mandible		Total	
	N	%	N	%	N	%
Left	5	33.3	13	52.0	18	45
Right	10	66.7	12	48.0	22	55
Total	15	100.0	25	100.0	40	100

DISCUSSION

The oral cavity is a cradle for various types of microorganisms. The conducive environment present in the oral cavity helps in growing and nurturing of these microorganisms, but when these microorganisms penetrate into deeper tissues or in case of compromised host resistance and bacterial infections. Humans are subject to various infections; some are mild, others severe. Although infections often are self-limiting, many require the attention of the clinician, who first must make a diagnosis and then prescribe treatment. In establishing the presence of an infection, interaction occurs among three factors: the host, the environment, and the organism. In a state of homeostasis, a balance exists among these three. Disease occurs when an imbalance exists. [6]

Space is derived from Latin word “spatium”. According to Shapivo space is defined as “facial spaces are potential spaces between the layers of fascia”. These spaces are normally filled with loose connective tissue and various structures like arteries, glands, lymph nodes etc. [7]

Submandibular space is the most commonly seen in multiple space infections, followed by the buccal space and submental space. Involvement of the submandibular space causes severe symptoms such as neck rigidity, trismus, dysphagia, respiratory distress, sialorrhea and pyrexia.

Moreover, the submandibular space is regarded as a space through which inflammation spreads to the parapharyngeal

space. If the infection spreads into the parapharyngeal space, rapid and critical airway obstruction may occur.

In the present study, microorganisms were isolated found to be Staphylococcus aureus 19 (47.5%), Streptococcus Viridan 17 (42.5%) and Enterococcus 4 (10%). The predominantly isolated microorganisms were Staphylococcus aureus in 19 patients (45%). This result is also in concordance with studies done by Kuriyama et al, [8] Abdulla et al, [9] Patankar et al, [4] Ahmad et al [10] and Nils Heim et al. [11] Other studies like Robertson et al, [12] Dipesh D. Rao et al [13] and Nitin Suresh et al [7] shows Streptococcus Viridans has highest predominance.

Present study spaces involved in Submandibular space was most frequently found in 12 patients (30%) followed by Buccal space in 11 patients (27.5%), Canine in 9 patients (22.5%), Submental space in 4 patients (10%), Pteryomandibular space in 2 patients (5%) and Massteric space in 2 patients (5%). This result is also in similar with studies done by Nitin Suresh et al, Prakash et al. [14] Other studies like Robertson et al, Dipesh D. Rao et al, [13] Amod Patankar et al [4] and Ahmad et al [10] shows Buccal spaces has highest predominance.

In the present study different panel of drugs were used against aerobic isolates microorganisms. Amoxicillin+Clavulanic acid shows 100% sensitivity, which has similar to Cefixime (100%), and Ofloxacin (100%), whereas Erythromycin shows 67.5% and Metronidazole shows 80% sensitivity. The study reveals are in concordance with the other studies done by Salinas et al, [15] Samir Farmahan et al, [16] Santhosh et al, [17] Masto Narita et al [18] and Nils Heim et al. [11] Other studies like Emad H Abdulla et al, [9] Ahtesham Ahmad et al [10] has Erythromycin shows maximum sensitivity. This finding not coincided with present study. Here, Erythromycin shows 65.78% sensitivity only and 34.22% resistance has similarly Metronidazole

shows 78.94% sensitivity and 21.06% resistance.

In present study, Maxillary region total 15 patients present left side has 5 patients (33.3%) and right side has 10 patients (66.7%). In mandibular region total 25 patients present left side has 13 patients (52%) and right side has 12 patients (22%). Site of infection present in maxillary region has less compared to mandibular region.

Penicillin still remains the empirical drug of choice for odontogenic infections because of its effectiveness, minimal side effects, low cost, patient tolerability, and ready availability. Alternative regimens of antimicrobial therapy have been proposed for patients such as Nitroimidazole, Cephalosporins, Fluoroquinolones and Erythromycin.

CONCLUSION

In the present study, Staphylococcus aureus (47.5%) is predominantly found followed by Streptococcus Viridans (42.5%) and Enterococcus (10%) respectively.

In the present study space infections, Submandibular space is predominantly involved compared to buccal, canine, submental, pterygomandibular and masseteric space infections. Whereas, site of lesion present in maxillary region has less compared to mandibular region.

The bacteria were more sensitive to Amoxicillin+Clavulanic acid (100%), Cefixime (100%), Ofloxacin (100%) followed by less sensitive to Erythromycin (67.5%) and Metronidazole (80%). Antibiotic resistance was observed in Erythromycin (34.22%) and Metronidazole (21.06%).

Therefore, the causative organisms and their antibiotic sensitivities are thus determined by the present study.

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