Anaerobes – Their Role in Pericoronal Infections of Mandibular Third Molars and their Sensitivity to Antibiotics

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The role of anaerobic organisms in pericoronal infection has been assessed in this perspective study. Sixtyfive cases ofpericoronitis were evaluated from a clinical and bacteriological point of view. Specimen were taken in swab sticks and sent for aerobic and anaerobic culture and sensitivity to Lincomycin, Ampicillin and Metronidazole. The results showed that anaerobic organisms have a much greater importance in the etiology of pericoronal infections than was previously believed and that Metronidazole was the most effective antimicrobial in treating these cases. Therefore, Metronidazole should be routinely added to all the cases of pericoronitis in addition to Ampicillin which would take care of the aerobic organisms.

Key Words:- Anaerobes, Infection, Pericoronitis

Inflammatory lesions of the soft tissues covering erupting and partially erupted tooth are a common problem in routine dental practice. The normal mode of treatment in such infections runs a gamut from very conservative to slightly radical local irrigation, antibiotics and removal of the opposing tooth, reduction of an opposing cusp, removal of the involved soft tissue of the involved tooth, or a combination of these. Inspite of the fact that pericoronal Infections are one of the most common infections, in depth studies are still required to know the exact etiology and the bacterias involved in such conditions. These infections are caused by a variety of bacteria. Therefore it becomes imperative upon us to know the exact organisms most commonly involved in such infections and to know the best antibiotic for use against these organisms. After knowing the realization of anaerobic bacteria and their potential to cause severe fulminating infections in man, it was decided to get an insight in the bacteriology of pericoronal infections especially the anaerobic.

Since only getting to know the type of organisms without knowing bacterial sensitivity is not of much clinical importance, it was decided also to test the sensitivity of anaerobic bacterias to certain antibiotics commonly used against anaerobic organisms and test their clinical efficacy. Therefore the present study was undertaken to study the role of anaerobic organism in pericoronal infections with special reference to the sensitivity of these organisms to lincomycin, ampicillin and metronidazole.

MATERIALS AND METHODS

In the present study 65 cases of pericoronitis were examined clinically and selected from Out Patient Department of Oral and Maxillofacial surgery , Govt .Dental College and Hospital, Nagpur, Maharashtra, India . Their age ranged from 16 to 42.The commonest age group was 20 to 25 years out of which 40 were males and 25 were females. Most of the cases were having complaint of pain and swelling around the involved tooth and others were having the complaint of difficulty in opening of mouth and pus discharge. Patients who had taken prior antibiotic therapy was not included in the study.

Swab sticks were used for collecting the specimen (Fig 1). After the area was superficially cleaned with the sterile dry cotton a swab stick was gently inserted into the pericoronal flap and pressure was applied over the area so that pericoronal exudates and pus was absorbed in the swab. The swab was immediately put in a test tube containing Stuart's

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Fig. 1: Swab being taken from pericoronal area.

media, which was previously heated and cooled before use to drive off dissolved oxygen. The specimen was immediately transported to the laboratory for processing (Fig 2).



Fig. 2: Specimen being transported in Thioglycollate Media.

Culture Method[1]

Use of steel wool in anaerobiasis – The commercial steel wool is soaked in dilute solution of copper sulphate (0.25%) and then placed in Mc –Intosh fields jar and further soaked in dil. Acetic acid. Irregular deposition of metallic copper occurs on the steel wool treated in this manner and the couples so formed are subject to rapid oxidation. The use of steel wool along with cell catalyst produces meticulous anaerobiasis.[41] (Fig 3)

The presence of oxygen in the anaerobic jar was detected by use of Mc Intosh fields indicator.

Media used for culture and identification were:- Nutrient agar, Blood agar,Neomycin menadione blood agar (NMBA), Thioglycollate broth, Sugar fermentation medium, Nutrient gelatin and Stuarts media.

Examination and Identification of anaerobes were done by primary and secondary test for the presumptive identification of gram negative anaerobic bacilli.Primary tests were- Growth strictly anaerobic, colonies alpha or beta haemolytic on blood agar, oxidase test, catalase test, penicillin sensitivity, rifampicin sensitivity, gelatinase activity and sugar fermentation (glucose-lactose,sucrose,maltose).

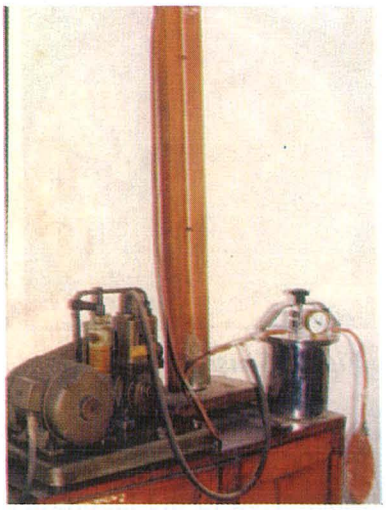


Fig. 3: Anaerobic jar.



Fig. 4: Culture plate showing growth.

Secondary tests were:- Black pigmentation produced, pitting growth on agar media, iodole production, H_2S production.(Fig 4)

The sensitivity of the organisms which were thus cultured and identified was tested for Ampicillin, Lincomycin and Metronidazole.(Fig 5)

Results and Observations

The present study was undertaken to study the role of anaerobic organisms in pericoronitis with special reference to the sensitivity of these organisms to lincomycin, ampicillin and metronidazole. For this study 65 cases of pericoronitis belonging to different age groups (ranged from 16 to 42) and having different clinical parameters were selected. The commonest age range was 20 to 25 yrs (46%) for the 65 cases studied. Total number of males selected was 40 (62%) and females were 25 (38%). Most of the cases in the present study were having the complaint of pain and



Fig. 5: Sensitivity disc with zone of inhibition.

swelling around the involved tooth. About 10 to 15% of the cases had either complaint such as difficulty in opening the mouth and pus discharge.

Swab sticks were used for collecting the specimen. The specimens were immediately transported to the laboratory for processing. The culture from the pericoronal area yielded aerobes as well as anaerobes. Out of 65 patients studied the number of aerobic isolates was 32 (52%) and that of anaerobic isolates was 65(98%). A variety of aerobic organisms were cultured from the specimen. The aerobes cultured were streptococci (39%), staphylococci(26%), kliebslella (8%) and niesseria (5%). The average number of aerobic organism per specimen was one.Amongst aerobes, 18 cases out of 24 isolates of streptococci(75%) were sensitive to Lincomycin,and 23 cases(96%) were sensitive to Ampicillin and 0% were sensitive to Metronidazole. Out of 16 isolates of Staphylococci 13(81%) cases were sensitive to Lincomycin, 13 (81%) cases were sensitive to Ampicillin,and 0% were sensitive to Metronidazole. Out of 5 isolates of Klebsiella 3(60%) cases was sensitive to Lincomycin, 3(60%) cases was sensitive to Ampicillin and 0% were sensitive to Metronidazole .Out of 3 isolates of Niesseria, 3 cases (100%) were sensitive to Lincomycin 1 cases (33%) were sensitive to Ampicillin and 0 cases (0%) were sensitive to Metronidazole. (Table 2). The average number of anaerobic species per specimen was 2. The varieties of bacteriodes isolated were B.melaninogenicus, B.oralis, B.corridence, B.unidentified. Amongst the anaerobes, Bacteriodes were cultured in 41(67%) cases, Peptostreptococci in 26(43%) cases (Fig 6), Peptococci in 19(31%) cases (Fig7), Fusiform Bacilli in 8 (13%) cases and Actinomycoses in 3 (5%) cases.

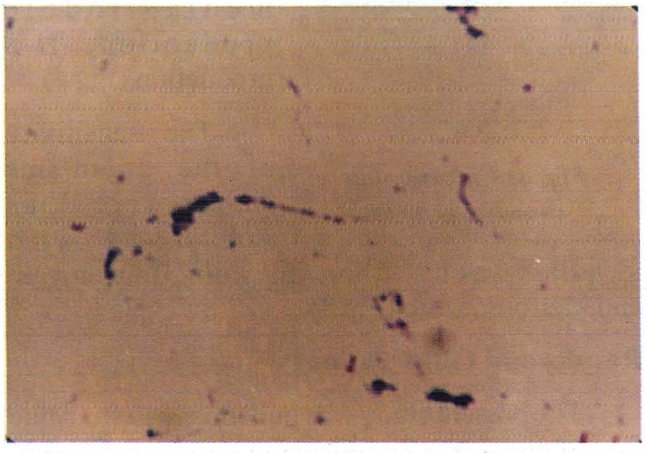


Fig. 6: Peptostreptococci



Fig. 7: Peptococci in clusters.

TABLE-1: Sensitivity to aerobic orismgans

Sr No	Species	Sensitive to					
		Lincomycin		Ampicillin		Metronidazole	
		No of organism	%	No of organism	%	No of organism	%
	Streptococci	18	75	23	96	0	0
	Staphylococci	13	81	13	81	0	0
	Klebsiella	3	60	3	60	0	0
	Niesseria	3	100	1	33	0	0

cases. The sensitivity of these organisms to Lincomycin, Ampicillin and Metronidazole was also tested. (Table 1.)

Amongst the 41 isolates of bacteriodes 26 (63%) were sensitive to lincomycin, 25(61%) were sensitive to ampicillin and 41(100%) were sensitive to metronidazole. Out of 26 Peptostreptococci isolates, 18(71%) were sensitive to Lincomycin 17 (67%) to Ampicillin and 23 (90%) to Metronidazole. Amongst 19 Peptococci isolates, 18 (93%) were sensitive to Lincomycin ,16(86%) to Ampicillin and 19(100%) to Metronidazole. Out of 8 isolates of fusiform Bacilli ,5(60%) were sensitive to L:incomycin, 6 (75%) were sensitive to Ampicillin and 8 (100%) were sensitive to Metronidazole. Among the 3 isolates of Actinomyces, 3 (100%) were sensitive to Lincomycin, 2 (67%) were sensitive to Ampicillin and Metronidazole each. The results of the comparison of sensitivity of aerobes and anaerobic organisms showed that 70 % of anaerobic organisms were sensitive to Lincomycin and 77% of aerobic organisms were sensitive to Lincomycin.96% of anaerobic were sensitive to Ampicillin and 83% were sensitive to it. 60% of anaerobic were sensitive to Metronidazole ,whereas 0% of aerobes were sensitive to it .(Table 3)

Five patients out of 65 were treated by lincomycin,25 were treated by ampicillin and 35 were treated with metronidazole. Lincomycin was effective in all the 5 cases in which it was used. 23 patients out of 25 treated with ampicillin were successful giving a success rate of 72% and 33 patients out of 35 treated with metronidazole were successful giving 9 success rate of 95%.(Table 4)

TABLE-2 : Comparison of aerobic and anaerobic sensitivity

Sr No	Type of organism	Sensitive to					
		Lincomycin		Ampicillin		Metronidazole	
		No of organism	%	No of organism	%	No of organism	%
	Anaerobic	68	70	66	68	93	96
	Aerobic	37	77	40	83	0	0

TABLE-3 : Treatment results

Sr No	Drug	No of treated cases	No of successful cases	Percentage of successful cases
1	lincomycin	5	5	100
2	metronidazole	25	23	92
3	Ampicillin	35	33	94

Table-4 : Sensitivity of anaerobic species to lincomycin, ampicillin, metronidazole

Genus	Species			Sensitive to			
		Lincomycin		Ampicillin		Metronidazole	
		No of organism	%	No of organism	%	No of organism	%
Bacteroids		26	63	25	61	41	100
	B.melaninogenicus	16	84	12	63	19	100
	B.oralis	4	80	5	100	5	100
	B.corrodens	1	25	2	50	4	100
	B.unidentified	5	38	6	46	13	100

DISCUSSION

The exact etiology of pericoronitis is obscure. Aerobic as well as anaerobic organisms have been implicated in the etiology but none of them is a sole cause in itself. The variety of organisms present show that some of the organisms may be present as support organisms supporting the growth of other pathogenic organisms by the phenomenon known as synergy. The aerobes present in the pericoronal area may provide an ideal environment for growth of anaerobes by utilising/consuming the oxygen present in the environment and thus reducing the oxidation reduction (redox) potential, thereby helping the survival and proliferation of anaerobes. The oxidation reduction potential is further lowered by the tissue necroses and a reduced blood supply in the pericoronal area.

In the present study the age range was 16 to 42 years. A large group of patients belong to 20 to 25 years age group. These observations correspond to the other studies. N.C.Sengal [3,4,5] found this to be the common group as most third molars erupt in this age.In this study majority of patients(45) had pain as chief complaint. Swelling due to local inflammatory reaction or due to an abscess was seen in 26 cases .Trismus, due to involvement of fibres of temporalis was seen in 9 cases.

The above observations correspond to the finding of N.C.Sengal.[3,4,5]Aerobic isolates were found in 32(52%) cases and anaerobic isolates in 60 (98%) cases as shown in table 2.The average number of aerobic isolates was 1 per specimen while that of anaerobic isolates was 2 per specimen. This finding correlates well with the finding of Greenberg et al[6] who found 1 aerobe and 3 anaerobes per specimen. Kannangara et al[7] who also found anaerobes in greater number and Barlett et al[8] and Labriola et al [9] who found 2 anaerobes and 1 aerobe per specimen. Our finding is a contrast to the finding of who found aerobes in large number than anaerobes.The anaerobes bacteroides were isolated in 41(67%) cases. Bacteroids are obligate anaerobes and parasites of man. The species commonly implicated as significant pathogen of man are B.fragilis and B.melaninogenicus.B.melaninogenicus were isolated in 19(46%) cases. This finding is consistent with the finding of Barlett[8]and Labriola[9] who them found in 40% and 49% of their cases in contrast with the findings of Sabiston et al[10] who found them in only 15% of cases.B.melaninogenicus are gram negative, obligate anaerobes. Some strains are haemolytic, shows red bucked fluorescence in ultra violet light early in growth before black pigment is produced. It is resistant to Lincomycin , Kanamycin and sensitive to Penicillin, Erythromycin and Rifampicin. B.corrodens was isolated in 4(10%) cases. This was consistent with the finding of Von Konow et al[11] but more than the finding of Labriola et al[9] who found them in 2 % of cases.

This is the only species causing pitting of agar media and the only one giving oxidase positive. It is sensitive to Penicillin, Neomycin, Kanamycin, Erythromycin and Rifampicin.B.oralis was found in 5 (12%) cases. This is slightly less as compared to the finding of Labriola et al[9] who found them in 12 (24%) cases and more than the finding of C.B.Sabiston et al[10] who found them in 3 cases.B.fragilis may be one amongst the unidentified bacteriodes which was not indentified due to the unavailability of facilities for their indentification. These are the species most often associated with Penicillin resistant bacteriodes infection.Peptostreptococcus was isolated in 26 cases.This findings coincide with findings of Kannangara et al[7] and Labriola et al[9].

These are sensitive to Penicillin,Tetracycline, Erythromycin, Chloremphenicol, Lincomycin, and Metronidazole. These have been associated with postoperative syndergestic bacterial gangrene. Peptococci was isolated in 19(31%) cases, is slightly more than that reported by Labriola et al[9] and less than the finding of Kannargara et al[7] who found them in 24 (40%) cases. These have similar sensitive patterns as peptostreptococci.Fusiform bacilli were isolated in 8 (13%) cases .They are sensitive to Tetracycline, Ampicillin and Metronidazole but are resistant to Erythromycin.Actinomyces were found in 3 (5%) cases .This corresponds to the finding of

Sabiston et al[10] who found them in equal number of cases, but is variable with the finding of Labriola at al [9] and Kannangara et al[7] who found them in 1 (2%) cases and 11 (20%) cases respectively. It is sensitive to Penicillin, Tetracycline and Lincomycin. Actinomyces are known to cause actinomycosis in man. Extraction of teeth or mucosal abrasions may lead to actinomycosis by irritations or portal of entry for the organisms. Streptococci were found in 24 (39%) cases. This corresponds to the study of Kannagara et al[7] who found them in 35%of his cases but is less than the finding of Labriola et al[9] who found them in 70% of his cases. These are the important human pathogens causing pyogenic infections with a characterstic tendency to spread because of the significant amount of hyaluronidase and fibrinolysin produced by them.Staphylococci were found in 16(26%) cases. This is more than the finding of Barlett et al[8] and Labriola et al[9] who found them in 15 % and 14 %of their cases respectively but less than the finding of Kannangara et al[7] who found them in 55% of his cases. They are ubiquitous and form the commonest cause of localized suppurative lesions in man. Klebsiella were found in 5%cases. This corresponds well to the finding of Kannangara et al.[7]

The above findings reflect the nature of organisms encountered in pericoronitis.The treatment results showed that Lincomycin was effective in all the 5 cases in which it was used .It was not used in greater number of cases because of the repoted complication of psuedomembranous colitis associated with the use and also bccausc of its cost , but none of our patients developed any complication due to this drug. It may be due to its short duration for which it was used. Ampicillin was effective in 23 (92%) cases. The 2 cases in which it was not effective turned out to be infectious due to Bacteriods ,which subsided when subsequently the patient was shifted on Metronidazole . Metronidazole was effective in 33 (94%) of cases. Since Metronidazole was infective against facultative anaerobes and yet was as effective as Ampicillin in the patients in our study, showed that the obligate anaerobic organisms were the sole pathogens atleast once the infection has established.

CONCLUSION

The exact etiology of pericoronal infections is not clear. Aerobic as well as anaerobic organisms are the etiological factors but none of them is a sole cause in itself. Anaerobic organisms have been found in majority of cases of pericoronal infections and have a much greater significance as compared to aerobic organisms. Ampicillin is the antibiotic of choice in these infections since it is effective in vitro against majority of anaerobes and aerobes. Ampicillin and metronidazole should be routinely used in all cases of pericoronitis which would take care of aerobic and anaerobic organisms both.

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