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Original Research Article

Bacteremia after Dental Procedures

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ABSTRACT

Aims and objective: Dental extraction and scaling are very simple dental procedures carried out routinely in most outpatient departments. However, these seemingly innocuous procedures have been known to result in transient bacteremia which may cause problems in patients with cardiac valve defects, with prosthetic joints, in patients with renal transplant and in immunocompromised patients. In pregnant women with periodontal disease transient bacteremia increases three to five times greater risk of preterm birth. In the present study, the incidence, type, intensity and duration of bacteremia following dental procedure was assessed.

Materials and methods: Aerobic and anaerobic blood culture and quantitative estimation of bacteremia was studied for up to 30 min. after dental procedures. As a control group bacteremia was assessed in ten individuals after mastication.

Results: The incidence of bacteremia was 80% after dental procedure. In 50 % patients bacteremia was observed at 10 min. after the procedure and in 26 % it persisted for 30 min. More than 30 CFU /ml of blood were present in 6% patients at 10 min. and in 4% patients at 30 min. A high incidence of bacteremia was reported after dental extraction (88%), after dental scaling (75%) and after intra oral wire removal (100%) Aerobes were isolated from 73.33% of the blood cultures. Common aerobes isolated were alpha hemolytic streptococci and Actinomyces spp. Anaerobes were isolated from 26.66% of the blood cultures. Common anaerobes encountered were Prevotella spp. and Peptostreptococci spp.

Conclusions: Since bacteremia following dental procedures is poly microbial and usually caused by oral flora, adequate prophylaxis should be directed at decreasing the oral flora by application of local antiseptics and chemo prophylaxis with broad spectrum antibiotics prior to every minor dental surgical procedure.

Key words – Transient bacteremia, dental procedures, blood culture.

INTRODUCTION

Modern dietary habits have increased the incidence of dental problems in today's society. Caries and periodontitis continue to be major public health problems throughout the world. Many dental procedures are carried out routinely as outpatient procedures in the OPD. However, these seemingly innocuous procedures may occasionally be associated with serious complications.

Dental procedures on patients with gingivitis and periodontitis are likely to result in transient bacteremia. [1] A nidus of these organisms settles at various sites during the phase of bacteremia and later multiply leading to life threatening complications. This bacteremia may result in bacterial endocarditis in patients with cardiac valve defects. [2] Patients having prosthetic joint replacement may lose a prosthetic joint because of bacteremia following dental procedures [3] In patients on haemodialysis or with kidney transplant, it may result in renal infection. Lastly with the increasing incidence of HIV, it may lead deep-seated abscesses in an immunocompromised patient. [4] In pregnant women with periodontal disease, transient bacteremia increases three to five times greater risk of preterm birth. [5]

In the present study, incidence, duration, intensity of bacteremia following dental bacteremia was assessed and efforts were made to find out the common causative agents of bacteremia.

MATERIALS AND METHODS

Fifty patients undergoing various dental procedures were studied. Informed consent was taken from all the patients. All the patients in this study group were given Cotrimaxzole for three days prior to the procedures. All the dental procedures were carried out under local anesthesia. 10 ml of blood was collected ten minutes and thirty minutes after dental procedure and processed as follows.4 ml of blood was used to quantitate the bacteremia by pour plate technique.3 ml of blood was added to 30 ml of freshly prepared thioglycolate broth containing resazurine as an indicator; this broth was used to cultivate microaerophilic and the anaerobic organisms. After inoculating blood in to the broth air was evacuated from the bottle and bottle flushed with carbon dioxide. 3 ml of blood was added to the 30 ml of tryptose phosphate broth for aerobic blood culture.

The thioglycolate broth was plated on Neomycin blood agar and Kanamycin vancomycin blood agar. All strict anaerobes were subjected to biochemical test and the isolates were identified according to the Wadsworth anaerobic manule. [6]

For aerobic organisms subcultures were made on 2^{nd}, 4^{th} and 7^{th} day. The media inoculated were blood agar and Mac conkey's agar. Isolates were identified according to Mackie and Macartney. [7]

A control group of ten individuals with good dental hygiene were also included in the study. Each individual was asked to chew sugarcane for five minutes. Blood samples were collected at 10 minutes and 30 minutes after mastication. These were processed in the same manner as the test group.

OBSERVATIONS AND RESULTS

Incidence of bacteremia in the test group was 80% and in control group it was 20%. The incidence of bacteremia was significant in test group using the Fisher exact test.

Table 1. Incidence of bacteremia in relation to dental procedures in test group

No	Dental procedures	No. Of patients with bacteremia	Percentage
1	Extraction (27)	24	48
2	Scaling (8)	06	12
3	Tooth rocking (5)	03	06
4	Wire removal (3)	03	06
5	Removal of bony spicules (2)	02	04
6	Dental filling (3)	01	02
7	Root canal (1)	01	02
8	Excision of epulis (1)	00	00
	Total	40	80

(Table 1) In the present study the incidence of bacteremia following various dental procedures was 80%. The incidence of bacteremia was maximum after more traumatic procedures such as wire removal

and extraction. It was minimum for minor dental procedures such as dental fillings.

Table. 2- Incidence of bacteremia following dental procedures with relation to time interval for collection of blood.

Sr no.	Time interval for collection of blood sample	No. of patients with bacteremia	percentage
1	Only 10 min positive	25	50
2	10 min and 30 min positive	13	26
3	10 min negative and 30 min positive	02	04
4	10 min and 30 min negative	10	20

Table 3- Quantitative study of 10 minutes and 30 minutes blood samples indicating intensity of aerobic and anaerobic bacteremia following dental procedures

Colony forming units /ml of blood	10 minutes		30 minutes	
	No of patients	Percentage	No of patients	Percentage
1 — 5	33	66	10	20
6 — 10	04	08	--	--
11 – 20	--	--	--	--
21 – 30	--	--	01	02
More than 30	03	06	02	04
No growth	10	20	37	74

Table. 4- Correlation of degree of aerobic and anaerobic bacteremia with relation to time period after the dental procedure.

	Type of incubation	Patients with quantifiable organisms	
		No.	Percentage
10 minutes	Aerobic	24	60
	Anaerobic	16	40
	Total	40	100
30 minutes	Aerobic	07	53.84
	Anaerobic	06	46.16
	Total	13	100

(Table 2) In 50% patients bacteremia was observed after 10 min of dental procedures. In 26% of patients it persisted for 30 minutes. In 4% patients late onset bacteremia was observed and bacteria were isolated only from 30 minutes blood samples. (Table 3) Intensity of bacteremia was low. (Table 4)Out of forty patients with bacteremia, in 24 patients aerobic organisms were present at 10 minutes. However, they persisted for up to 30 minutes after dental procedures, in only 7 patients. In 16 patients anaerobic organisms were present at 10 minutes and in 6 patients persisted up to 30 minutes, after dental procedures. Anaerobes seem to persist in the blood for a longer time. Aerobic and anaerobic mixed type of bacteremia was present in many patients.

Table -5 Types of aerobic and facultatively anaerobic microorganisms isolated from blood cultures after dental procedures.

Sr. no	Type of organism	No of patients	Percentage
1	Streptococci	25	37.87
2	Actinomyces spp.	12	18. 17
3	Diptheroids	11	16.66
4	Staphylococci	08	12.11
5	Campylobacte spp.	03	04.54
6	Bacillus spp.	02	03.03
7	Citrobacter spp	01	01.51
8	Candida spp.	01	01.51
9	Haemophilus spp.	01	01.51
10	Moraxilla spp.	01	01.51
11	Unindentified Gram negative coccobacilla	01	01.51
	Total	66	100

Table 6. Type of anaerobic organisms isolated from blood cultures after dental procedures.

Sr no	Type of organisms	No of patients	Percentage
1	Peptrostreptocopccus spp.	06	25.00
2	Prevotella melaninogenicus	04	16.66
3	Unidentified Gram positive bacilli	04	16.66
4	Bacteroides spp.	04	16.66
5	Peptococcus spp	02	8.33
6	Veillonella parvula	02	8.33
7	Fusobacterium nucleatum	01	4.16
8	Clostridium spp	01	4.16
	Total	24	100

(Table 5 and 6). Alpha hemolytic *Streptococci*, *Actinomyces*, *Peptostreptococci species*, *Prevotella species* and *Bacteroides species* were most commonly isolated from blood cultures following dental manipulations. Alpha hemolytic Streptococcal species isolated were *S.mitis*, *S.intermedius*, *S,salivarious*, *S,sangiis*. Variety of Actinomyces isolated from blood samples after dental procedures were *A,viscosus*, *A,odontolyticus*, *A.naeslundii.*

DISCUSSION

Blood is usually sterile, but transient bacteremia can occur after manipulations of infective focus. [8,9] Every dental procedure,

even minor dental manipulation may result in transient bacteremia.

In the present study overall incidence of bacteremia was 80%. Various workers have reported an incidence of bacteremia ranging from 15 to 100%. [10-14] In Indian patients incidence of bacteremia was 52% after dental procedures. (Pol D G. Unpublished data 1981, dissertation.).

Incidence of bacteremia following dental procedures was maximum after traumatic procedures and procedures involving handling of periodontal tissue. (Table 1) It was minimum for minor dental procedures such as dental fillings. Similar results has been reported by Rogosa et al. [12]

In the present study intensity of bacteremia was low. Similar low intensity has been reported by other workers also. [1,14] (Table 3)

Ninety different types of organisms were isolated from forty bacteremic patients. Out of these, 66 (77.33%) were aerobes and facultative anaerobes, where as 24 (26. 66 %) were obligatory anaerobes. Alpha hemolytic Streptococci and Actinomyces spp. were most commonly isolated from blood cultures after dental procedures.

Streptococci comparable to the present Study were reported by various workers. [15,16] Actinomyces strains are regular inhabitants of the oral cavity and play an important role in periodontitis. Actinomyces have been isolated from Indian patients suffering with gingivitis and periodontitis. [17]

Actinomyces causing bacteremia following dental procedures has been reported to range from 8. 54% to 14.73%. [15,16] *Peptostreptococci* (33.32%), *Prevotella spp.* (16. 66%) and *Bacteroides spp* (16.66%) were commonly isolated from blood cultures after dental procedures.

Dental manipulations leading to bacteremia can act as a potential focus of endogenous infection. Various infections linked to the oral cavity, at present reported in literature may be representing only the tip of the iceberg. Increased awareness may generate evidence linking these diseases to bacteremia resulting from dental manipulation.

Bacteremia after dental manipulations may have long-term sequlae. So frequent follow up and prophylactic antibiotics for patients undergoing dental manipulations are required. According to American Heart Association recommendations only people with highest risk of developing infective endocarditis should receive antibiotics.

Antibiotic prophylaxis is not generally recommended for people with moderate risk conditions. [18]
When treating patients with heart conditions, dentists follow recommendations developed by the_American Heart Association (AHA), with input from the American Dental Association. For patients who have total joint replacements, they refer to recommendations developed by the American Academy of Orthopaedic Surgeons (AAOS).

The best approach to control this bacteremia would be preoperative preparation of the oral cavity with a view to decrease the bacterial load at the time of dental procedure. Important dental care recommendations are –Anyone who is at risk of developing endocarditis should follow a program of careful mouth and tooth care. This includes a professional cleaning every six months, twice daily tooth brushing, and once daily flossing. These measures can help to prevent plaque and bacteria from building up around the gums and teeth.

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