

BACTEREMIA AFTER ORTHODONTIC BANDING

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ABSTRACT

The placement of orthodontic bands on molar teeth is a routine procedure during orthodontic treatment. There is a possibility that bacteria may enter the blood stream during this process. The objective of this study was to determine the frequency of post procedural bacteremia in patients undergoing orthodontic banding.

A Cross sectional survey was carried out at the Department of Orthodontics, de, Montmorency College of Dentistry / Punjab Dental Hospital Lahore during a period of 6 months (1st March, 2009 to 31st August, 2009)

The study included 140 subjects with age range between 8-25 yrs of both sexes. Bands were placed on molar teeth and blood samples were taken before and after placement of bands. Blood cultures were done on the samples to assess the presence of bacteremia.

The study revealed that there was no significant bacteremia after orthodontic banding so as to be considered a potential threat for normal patients.

It was concluded that the level of bacteremia detected was not significant to be considered hazardous in routine orthodontic treatment. The prescription of antibiotic therapy should be based on the latest guidelines.

Key Words: Orthodontic banding, molar teeth, bacteremia.

INTRODUCTION

Orthodontic therapy has been historically considered to be completely non-invasive and physiologically benign, but specific orthodontic procedures may place patients at risk for serious sequelae.¹ Risks caused by various orthodontic procedures include bacteremias

introduced by band placement and removal, bleeding and infection caused by mucosal or gingival irritation, and the ability of patients to tolerate treatment.^{1,2}

A transient bacteremia may occur following various dental procedures including extraction, periodontal therapy endodontic therapy and some orthodontic manipulations e.g. band placement and removal.^{2,3} Of all the orthodontic procedures band fitting and removal offer greatest insult to gingival margin.⁴ In a study conducted by Lucas up to 44% bacteremia has been detected in patients after orthodontic banding.³ It may last up to 30 minutes and may be a matter of grave concern.²

Bacteremia can be life threatening and can lead to infective endocarditis, brain abscesses and other dis-

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Received for Publication: April 2, 2013

Revision Received: May 3, 2013

Revision Accepted: May 15, 2013

tant site infections.⁵ In fact, infective endocarditis is the most widely studied condition resulting from oral bacteremias. The incidence of infective endocarditis is 2-6/100,000 patient years and the condition results in death in 3% of patients who develop it despite advances in antimicrobial therapy.^{6,7} Hence the primary prevention of endocarditis is very important.^{8,9} The most common causative bacterial organism responsible for infective endocarditis is streptococcus viridans followed by staphylococcus aureus.¹⁰

The individual's susceptibility to infective endocarditis is related to the underlying cardiac lesion.¹¹ The predisposing cardiac conditions which may lead to infective endocarditis include most congenital cardiac malformations, previous infective endocarditis, rheumatic and other acquired valvular dysfunctions, hypertrophic cardiomyopathy, mitral valve prolapse with valvular regurgitation, prosthetic cardiac valves and surgically constructed systemic pulmonary shunts.¹²

Infection control and prophylaxis is an essential prerequisite for every dental procedure.¹³ To reduce the complications of dental treatment, a prophylactic approach must be considered in certain orthodontic procedures,¹⁴ specially initial placement of orthodontic bands but not bracket placement.^{1,3} Prophylaxis involves not only the prescription of medication prior to treatment but also maintenance of oral hygiene so as to prevent any complications.

A considerable amount of work has been done to investigate the presence of bacteremia after banding.¹¹ So far the results have not conclusively proved significant bacteremia so as to make antibiotic prophylaxis essential before banding.

The rationale of this study is to investigate bacteremia after initial placement of orthodontic bands so that it can be determined whether antibiotic prophylaxis is required before the procedure in patients at risk for serious sequelae.

METHODOLOGY

A total of 140 patients of both sexes of age range 8-25 years were selected from the OPD of Orthodontics Department at de' Montmorency College of Dentistry/ Punjab Dental Hospital for the study according to the selection criteria (Table 1) over a period of six months

(1-03-2009 to 30-08-2009). An informed consent was taken in accordance with the terms of the ethical approval for this study.

Both lower first permanent molars were selected for separator placement and only one molar was banded for the study, the other molar served as a backup in case the separator got dislodged prematurely. Elastomeric separators were placed through the mesial and distal contact points. Before separation alginate impressions were taken to facilitate band selection. Oral hygiene instructions were given to each patient and they were asked not to brush on the day designated for fitting of molar bands to avoid accidental trauma associated with tooth brushing that may cause bacteremia.

Molar bands were selected on plaster model and autoclaved and placed in a sterile labeled container. Separators were left in place for a week. Preoperative blood sample (10ml) was taken before the removal of separator and only patients with no bacteremia in the preoperative sample were included in the study. A three way cannula was fitted in a vein in the left antecubital fossa with a three-way Luer valve enabling the blood to be taken and discontinued for a short period, and facilitating syringe replacement for pre and post operative samples. The separator was removed and the previously selected band was filled with GIC and seated using band pusher and seater. After seating the band about 60 seconds was allowed to pass before another blood sample (10ml) was taken. Blood culture and sensitivity was done on the samples for presence or absence of bacteremia. Other variables e.g. intensity (i.e. cfu/ml) and species of bacteria were be assessed from the same blood samples. The bias was controlled by using the same teeth, materials, and selection of bands on plaster model, patient's avoidance of brushing prior to banding and the confounding factor was controlled by taking blood sample prior to procedure.

RESULTS

Out of 140 subjects included in this study, there were 61 males and 79 females. The mean age of the sample was 15.05 ± 4.82 years, with a range of 8-25 years. (Table 2 & 3) The data was entered into SPSS version 11 for windows and analyzed. Statistical

TABLE 1

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> Require routine orthodontic separation prior to fitting a molar band Both lower first permanent molars Gingival index and plaque index < 1 No bacteremia in the blood sample taken prior to separator removal (pre procedural) Patients with age range between 8-25yrs Both genders 	<ul style="list-style-type: none"> Diagnosed cases of following diseases on the basis of history and previous investigations: congenital heart disease prosthetic heart valves mitral or aortic incompetence previous history of infective endocarditis hypertrophic cardiomyopathy bleeding disorder positive history of antibiotic use within the previous month. restoration adjacent to gingival margin on selected molar tooth (seen on clinical examination)

TABLE 2: AGE CHARACTERISTICS OF THE SAMPLE

Mean	SD	Range	Min	Max
15.05	4.828	17	8	25

(n=140)

TABLE 3: GENDER DISTRIBUTION OF THE SAMPLE SELECTED

	Frequency	Percent
Females	79	56.4
Males	61	43.6
Total	140	100.0

(n=140)

TABLE 4: INCIDENCE OF BACTEREMIA IN THE SELECTED SAMPLE (PRE BANDING)

Bacteremia	Frequency	Percent
No	133	95.0
Yes	7	5.0
Total	140	100.0

n=140

TABLE 5: INCIDENCE OF BACTEREMIA IN THE SELECTED SAMPLE (POST BANDING)

Bacteremia	Frequency	Percent
No	126	90.0
Yes	14	10.0
Total	140	100.0

n=140

TABLE 6: MICROORGANISMS ISOLATED FROM THE POST-OPERATIVE BLOOD SAMPLES (CFU= COLONY FORMING UNITS)

cfu/ml	Species	Subject no.
2	Streptococcus sanguis(2)	6
4	Streptococcus mitis(1) Streptococcus sanguis(3)	15
1	Streptococcus constellatus(1)	16
4	Veillonella(2) Streptococcus mutans(1) Streptococcus mitis(1)	23
1	Actinomyces(1)	29
2	Streptococcus mutans(2)	41
3	Streptococcus salivarius(2) Streptococcus oralis(1)	52
5	Streptococcus oralis(4) Streptococcus mitis(1)	67
2	Streptococcus mitis(2)	77
4	Streptococcus sanguis(1) Streptococcus mitis(3)	80
5	Streptococcus mutans (4) Actinomyces(1)	84
1	Streptococcus sanguis(1)	95
3	Streptococcus sanguis(1) Veillonella(2)	106
1	Streptococcus oralis(1)	125

analysis was performed to calculate the frequency and percentage of bacteremia in the sample.

It was found that there was an incidence of 5% bacteremia in the pre banding blood sample (Table 4). Out of a total of 140 patients, 7 who had bacteremia were then excluded from the study and 7 more subjects were taken who were found to be free from bacteremia prior to banding. This was done so as to have a sample of subjects with no baseline bacteremia so that the

accurate presence of bacteremia can be determined after banding.

From the total sample of 140 patients the incidence of bacteremia post banding was found to be 10%. Out of a total of 140 subjects 14 were found to have bacteremia (Table 5).

Other variables e.g. intensity (i.e. cfu/ml) and species of bacteria were assessed from the same blood samples (Table 6). The post operative bacterial organisms detected ranged from 1 to 5 colony forming units (cfu)/ ml of blood. *Streptococcus sanguis* and *Streptococcus mitis* were the most prevalent amongst the blood culture samples and in two cases *Actinomyces* and *Veillonella* species were also found.

DISCUSSION

Amongst all the orthodontic procedures, orthodontic band placement is considered to cause utmost mutilation of the gingival margin and hence may be a source bacteremia. The objective of this study was to investigate the prevalence and intensity of bacteremia after orthodontic banding.

In this study out of a total of 140 subjects 14 subjects (10%) presented with bacteremia after banding. Although the sample size was large as compared to the previous studies but the incidence of bacteremia did not show much difference from what has been proved in the previous studies.^{2,3,4,8,12,16,17} Degling,¹⁷ was the first to investigate bacteremia and he found no bacteremia after the procedure in a sample of 25 subjects. McLaughlin JO,¹⁶ found 10% bacteremia in sample of 30 subjects. Everdi,⁴ et al found 7.5% bacteremia in a sample of 40 subjects in his first study. In his second study Everdi et al,¹² studied orthodontic debanding in 30 subjects and found the incidence of bacteremia to be 6.6%. In his third study Everdi,² found the post procedure bacteremia to be 2.5% in a sample of 40 individuals. Lucas,³ detected 44% bacteremia in a sample of 61 subjects. Burden,⁸ found 13% bacteremia in a sample of 30 subjects after debanding and debonding. Lucas,¹¹ in another study, on 49 subjects found 26% bacteremia after debanding.

In this study, 5% patients had preoperative bacteremia. Although not very high as compared to previous studies, this was not an unexpected finding. Although

some studies have found no bacteremia present in healthy subjects before invasive procedures,¹⁹⁻²² other studies have reported the incidence of bacteremia arising spontaneously to be up to 23%.¹⁵

The American Heart Association (AHA) modified its guidelines in 2007 and the new guidelines emphasize good oral hygiene for preventing viridans streptococcal endocarditis. Antibiotic prophylaxis for dental procedures is only recommended for patients with the highest-risk cardiac conditions; moderate risk cyanotic heart diseases are now deemed to not require prophylactic antibiotic coverage.²³ The American Heart Association (AHA) recognizes that the effectiveness of its recommendations is not clear, and defines them as corresponding to class IIb (i.e., a variety of opinions exist, or there is conflict in the evidence on the usefulness or efficacy of the recommendations- their usefulness/ efficacy ratio being deficiently established by the existing evidence / opinion), with B level evidence (the data are derived from a single randomized trial or from non-randomized studies).¹⁸

In march 2008, National Institute for Health and Clinical Excellence (NICE) has issued the most recent recommendations stating that antibiotic prophylaxis should not be recommended to patients at risk for infective endocarditis undergoing dental procedures. It also states that chlorhexidine mouthwash should not be used as a prophylaxis against infective endocarditis.²⁴

In sum, it is advisable that the orthodontist should seek guidance from the patient's cardiologist before placing orthodontic bands in patients at risk. Alternatively, avoiding trauma to the gingival margin by placing bonded attachments to the molars may help resolve the clinical dilemma.

CONCLUSION

The following conclusions can be drawn from this study :

- The incidence of bacteremia after orthodontic banding found in this study is 10% and is similar to previous studies although a larger sample size was taken.
- The final decision about whether antibiotic prophylaxis should be administered in cardiac pa-

tients undergoing orthodontic treatment should be based on the latest recommendations in consultation with the patient's cardiologist.

- More studies need to be done which replicate the actual clinical situation so as to remove the current confusing and contradictory guidance available to orthodontists.

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