Orthodontics, Bacteremia, and the Heart Damaged Patient

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INTRODUCTION

A transient bacteremia following dental treatments has become an accepted fact. Specifically, dental extractions, periodontal surgery, dental prophylaxis, restorative procedures, and denture irritations have all been indicted. The dental-induced bacteremia has serious implications for a patient with rheumatic heart disease or other heart defects because of the possibility of contracting endocarditis. Antibiotic coverage surrounding the period of regular dental treatment has become the accepted procedure to prevent endocarditis in the heart damaged patient.

Orthodontics, however, has not received adequate attention in its relationship to bacteremia. Orthodontic treatment presents special problems, unlike other dental procedures, because it is not a one visit affair but rather a progressive, long-term proposition. It may not be sufficient to merely consider the regular monthly visits as separate dental procedures for which antibiotic coverage must be given. Consideration must also be given to the continuous tooth movement caused by active appliances between regular visits. In any event, investigation is warranted into the relationship between orthodontics, bacteremia, and the heart damaged patient.

REVIEW OF THE LITERATURE

Coxson, Altman, and O'Brian[4] brought recent attention to a well-established practice of providing antibiotic coverage for dental extractions and periodontal surgery in rheumatic or heart defect patients. Their study of seventy-five patients with streptococcal bacterial endocarditis found fifty-seven with dental implications. Even oral ulcers caused by ill-fitting dentures were mentioned as possible sources of bacteremia. Support was also found for bacteremia of dental origin in patients with healthy mouths. Harvey and Capone[6] found that minor forms of trauma can lead to transient bacteremia and occasionally endocarditis. Simon and Goodwin[10] again implicated a minor traumatic oral lesion as a possible cause of bacteremia as part of their argument against dental clearance in the prevention of endocarditis. In addition to the risk of bacteremia during the extractions, they pointed out that denture ulcerations may also cause bacteremias. The possibilities of inducing bacteremia from minor oral trauma then has been repeatedly mentioned in the literature. However, the specific mention of oral lesions induced by orthodontic appliances has not occurred.

A study by Brandt[3] showed that dental operative procedures such as subgingival hand scaling and ultrasonic scaling have caused a transient bacteremia in seventy-three per cent of the patients tested. It seems logical to extend the induction of bacteremia by periodontal, surgical and operative procedures to include orthodontic procedures although the literature has no reports of such an extension.

Bloom[2] showed that in full-banded orthodontic patients the mean populations of all oral bacterial types were increased. The streptococcal count was increased by some ninety-five per cent and a conclusion was reached that inherent irregularities of orthodontic appliances could provide an area of environment suitable for bacterial growth. The elevation of the streptococcal

count coupled with oral ulcerations from sharp appliances, altered periodontal structures, and heightened tooth mobility during orthodontic treatment could set up a situation favoring bacteremia.

The American Heart Association[1] recommended higher doses of penicillin than those used to prevent rheumatic fever for the prevention of dental-induced endocarditis. If oral doses are to be used, it recommended either four doses of 0.25 Gm. of Penicillin V or four doses of 500,000 units of penicillin G on the day of the dental procedure and an extra dose one hour before the procedure. For two days after the procedure, either 0.25 Gms of Penicillin V or 500,000 units of penicillin G should be given four times a day. In penicillin-allergic individuals, 250 mg of Erythrocin should be substituted for each dose of penicillin. No reference could be found in the literature specifically tailoring antibiotic coverage to the orthodontic heart-damaged patient. The inherent nature of orthodontics is such that a series of monthly visits for up to two years is necessary to complete the case. The question arises whether providing a series of monthly increases in the maintenance dose is desirable or even sufficient since the orthodontic appliances remain active between visits.

Okell and Elliott[9] reported causing transient bacteremia by normal mastication but a study by Robinson et al.[8] could demonstrate no streptococcal bacteremia after twenty-seven people had chewed on tough wax for five to ten minutes. Diener et al.[5] showed a bacteremia in twenty-two per cent of fifty patients with periodontal disease after chewing five minutes on bubble gum. The implications of these studies are that, if normal mastication can cause a transient bacteremia, possibly the altered periodontium during orthodontic treatment would heighten this effect much like a temporary case of periodontitis.

Methods and Materials

The purposes of the study were to see if orthodontic procedures could induce a transient bacteremia, and if, in full-banded orthodontic patients with assumed altered periodontium, a transient bacteremia could be demonstrated on normal mastication.

Twenty-five fully banded orthodontic patients between the ages of twelve and twenty-four were instructed to chew vigorously on two pieces of bubble gum for five minutes prior to having a blood sample drawn. Fifteen patients with no orthodontic appliances were similarly instructed to act as a control group. It was felt safe to assume the absence of bacteremia before chewing because of a literature review by Korn[7] who found twelve reports of 874 preoperative blood cultures with only twelve positives. On this basis it was decided not to subject the patients to preoperative sampling.

Ten patients were selected for postoperative blood culturing following banding of one arch or the debanding of both arches. It was felt that banding and debanding would be the most traumatic of orthodontic procedures and the ones likely to demonstrate a bacteremia.

Seven ml of blood were drawn under sterile conditions immediately following the procedure or the chewing. Five milliliters of blood was cultured anerobically with fifty cc of brain heart infusion media. One milliliter of blood was cultured aerobically in thioglycollate media. The last milliliter of blood was discarded. All cultures were incubated at 37° C. for fourteen days and checked daily for growth.

Results

All blood cultures were negative.

Discussion

The well-known phenomenon of transient bacteremia following dental procedures could logically be expanded to include orthodontic procedures. The present study could not demonstrate such a tie but the possibility still logically exists and will undoubtedly be demonstrated with larger samples and increased trauma.

It is well known that between regular orthodontic visits active appliances are moving teeth and the normal periodontium is altered to a state that has been likened to controlled pathology. The present study indicates that the change induced is not sufficient to mimic a temporary periodontitis with bacteremia on mastication. Furthermore, this study indicates that a transient bacteremia is not a sequelae of mastication as reported by Okell and Elliott.[9]

In view of the present information it would seem justifiable to treat patients with a history of rheumatic fever but no heart damage as normal individuals requiring no antibiotic coverage for the orthodontic procedure.

The author, however, is not yet satisfied to accept diagnosed heart-damaged patients for orthodontic treatment. From a medical-legal viewpoint the orthodontist may still be responsible for protecting these patients during a long series of potential bacteremias. Adequate study has not yet determined whether between visit activity may liken orthodontic treatment to an office procedure of two year duration for which antibiotic coverage must be given. In addition, the question of appliance-induced oral lesions serving as sites for bacterial entry has not been considered. Only further investigation will determine whether the risk of endocarditis for the heart-damaged patient can be minimized to make orthodontic treatment possible.

Summary

1. No transient bacteremia could be demonstrated in full-banded orthodontic patients after five minutes of chewing.
2. No transient bacteremia could be demonstrated in nonbanded patients after five minutes of chewing.
3. No transient bacteremia could be demonstrated by orthodontic banding or debanding.
4. Further investigation is necessary into the possible effects of orthodontic treatment in the heart damaged patient before he is acceptable for treatment. Adequate prevention of endocarditis must be assured before orthodontic treatment can be done.

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