

Pre- and Post-operative Dental Focus of Patients with Prosthetic Heart Valves

R Schmelzeisen, F Yabroudi, A Dannan

Citation

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Abstract

Introduction and Aim: Patients who are going to receive prosthetic heart valve operation should have all indicated dental treatment performed before the valve is placed since they are more susceptible to infective endocarditis or to prosthetic valvular endocarditis arising from oral infections. The aim of this study is to evaluate the incidence of potential odontogenic infections sources in patients with pre- and post- prosthetic heart valve operations.

Materials and Methods: Twenty patients with pre- and postoperative valves replacement were subjected to comprehensive clinical and radiographic dental examination. Information considering age, gender, oral pathological features like periapical periodontitis, cysts, remained roots, impacted teeth, the existence of current diabetes mellitus and the form of the valve replacement were also included in the documentation.

Results: Patients who were examined after prosthetic heart valve operation showed relatively more dental problems, more past canal treatments and more chronic periodontitis than patients who were examined before prosthetic heart valve replacement.

Conclusion: Optimized dental treatment planning for patients scheduled to undergo cardiac valve replacement is always a need. Optimal cooperation between the cardiologist and the dentist is to be considered. The need of prophylactic antibiotics before and after several dental manipulations should be always discussed.

INTRODUCTION

Valvular heart diseases include a variety of congenital and acquired disorders that are of importance to the dentist for two reasons; first, disorders of the cardiac valves can adversely affect cardiac performance and place dental patients at risk for cardiac emergency and second, some disorders of the cardiac valves can increase patient risk for having infective endocarditis which develops as a result of oral flora bacteremia.

Medical risk assessment for dental patients with valvular heart diseases is principally concerned with 3 issues:

CARDIAC FUNCTION

Progressive valvular heart disease results in an imbalance of myocardial oxygen demand and supply leading to ventricular dysfunction, cardiac ischemia, and increased risk for heart failure. During a period of compensation, the heart rate and force might increase to maintain cardiac output. Such compensation can be at the expense of cardiac reserve to respond to cardiovascular stress (1).

POTENTIAL FOR ALTERED HEMOSTASIS

Many valvular disorders will require anticoagulation due to the risk for thrombus formation either at the site of the injured valve or at the site of myocardium. All prosthetic valves increase the risk for thromboembolism, although risk is minimal or negligible for the porcine bioprosthetic valve. For any patient taking an anticoagulant, both the dentist and the physician must assess the risk for altered bleeding after an invasive dental and/or oral procedure. Assessment includes the magnitude of the invasive procedure, the patient's bleeding history and a bleeding profile which will generally include the prothrombin time (PT), partial thromboplastin time (PTT) and the international normalized ratio (1,2)

INFECTIVE ENDOCARDITIS

Infective endocarditis (3) is an infection of the heart valveolar endocardium. Although it might result form a bacteremia originating from any site and representing almost any species, it is of interest to the dentists as it relates to the oral bacterial flora as a potential source for bacteremia and endocarditis. IE is an uncommon but potentially fatal

disease. The onset of IE after bacteremia can vary from weeks to months, and diagnosis is confirmed by blood culture and echocardiogram. IE can lead to death caused by heart failure or acute thromboembolic events (¹). There are conditions associated with increased risk for IE, but the risks associated with the initiating bacteremia are less well studied. For instance, although it is well established that mitral valve prolaps with regurgitation is a significant risk factor for IE, it is not well established what bacteremia will result in IE. Many reports demonstrated bacteremia after routine oral activities such as chewing and after a variety of mild and significantly invasive oral procedures (^{1,2}).

Although there was evidence that some bloody dental procedures present a risk for the development of IE, prophylactic antibiotics provided no significant protection.

Ideally, the patient who is going to receive a prosthetic heart valve operation (pHVO) should have all indicated dental treatment performed before the valve is placed. Once the patient has received a prosthetic heart valve and is found to be in poor dental repair, serious thought should be given to rendering the patient edentulous and constructing dentures (³).

The risk of endocarditis for patients with prosthetic heart valves is about 2% per annum for mitral valve replacement and 0.5% per annum for mitral valve replacement. While the risk of a normally functioning prosthesis being infected after dental procedure is probably no higher than the risk in patients with damaged native valves, it should be noted that the morbidity and mortality is much higher in case the prosthesis become infected (i.e. around 50%) (⁴).

Of particular interest to dentists is the susceptibility of patients with prosthetic heart valves to infective endocarditis or more specifically, to prosthetic valvular endocarditis which may be caused by bacteria, fungi, rickettsia, and possibly Chlamydia or viruses (^{3,5}).

Watankunakorn (^{6,7}) reported that the incidence of early prosthetic valvular endocarditis, occurring within two months of the approximately 1% and late prosthetic valvular endocarditis, occurring after the first two months, is also 1%. Early prosthetic valvular endocarditis is thought to result from contamination during surgery, and late prosthetic valvular endocarditis is thought to be caused by transient blood-borne microorganisms. The presence of microorganisms is recognized as a fundamental event in the pathogenesis of infective and prosthetic valvular

endocarditis. It is well known that the presence of blood-borne microorganisms is a common occurrence and that numerous dental procedures produce transient bacteremias. Antibiotic therapy to prevent prosthetic valvular endocarditis is used in susceptible patients having dental treatment that may produce blood borne microorganisms (⁸). The prolific resident and transient oral flora is an important source of spontaneous bacteremias associated with acute or chronic oral/odontogenic infections. These infections may represent a far greater cumulative risk for the development of endocarditis than do occasional health care procedures administered in a professional setting.

The purpose of this study is to evaluate and compare the incidence of potential odontogenic infections sources in patients with pre- and after prosthetic heart valve operations and to suggest guidelines for the dental management of these patients.

MATERIALS AND METHODS

Twenty patients with pre- and postoperative valves replacement achieved - or to be achieved - at the department of general surgery in Freiburg Clinic University – Germany participated in this study. All patients came to the department of Oral and Maxillofacial surgery at Freiburg Clinic University for dental focus pre -and post operation.

A comprehensive clinical and radiographic regional examination was performed, with particular emphasis on identifying acute and chronic oral/odontogenic conditions, such as infected or nonrestorable teeth, periapical pathosis, and moderate to advanced periodontal disease, which may contribute to early or late prosthetic valve endocarditis. Regional radiographic examination included a panoramic and selected periapical views to help assess the extent of caries activity and periapical and periodontal disease patterns.

Determination of the periodontal status of the patients based on the new classification of periodontal diseases (⁹).

Information considering age, gender, oral pathological features like periapical periodontitis, cysts, remained roots, impacted teeth, the existence of current diabetes mellitus and the form of the valve replacement were also included in the documentation.

RESULTS

The clinical and radiographic data of 20 patients with prosthetic heart valve replacement before and after operation

were reviewed.

There were 6 women (31.25%) and 14 men (68.75%) in the cohort with mean age 73.27/53.5 years old (Male/Female). All patients required or had aortic, mitral valve, or multiple valves. The mean number of teeth per patient was 9.4/14.25 (Table 1).

The mean number of decayed teeth per patient was 2.27/2.75 (Before pHVO/After pHVO). Radiographic finding revealed at least one periapical abscess associated with decayed or restored teeth in patients after prosthetic heart valve operation. In addition, (0.3/0.75) of the patients had evidence of past root canal treatment. 0.63/1 of the patients presented with chronic Periodontitis (Table 2).

Figure 1

Table 1: The patients' information (n=20) before and after valves replacemen

| | Before prosthetic heart valve operation | After prosthetic heart valve operation |
|-----------------------------------|---|--|
| Patients number (n=20) | 14 Male | 6 Female |
| Age (Mean %) | 73.27 | 53.5 |
| Teeth number per patient (Mean %) | 9.4 | 14.25 |
| Diabetes mellitus | 2/14 | 1/6 |

Figure 2

Table 2: Incidence of dental infection sources with patients of valve replacement

| | Before prosthetic heart valve operation | After prosthetic heart valve operation |
|--|---|--|
| Decayed teeth (Mean per patient) | 2.27 | 2.75 |
| Remained roots | 0.5 | 0.5 |
| Impacted teeth | 0 | 0.75 |
| Periapical abscess associated with decayed or resorted teeth | 0 | 0.25 |
| Past canal treatment | 0.3 | 0.75 |
| Chronic Periodontitis | 0.63 | 1 |

DISCUSSION

The relationship between certain health care procedures and transient bacteremias has been examined extensively (6,10). The frequency of such bacteremias is reported as “the highest” for oral health care procedures, intermediate for those procedures related to the genitourinary tract, and “low” for procedures involving the gastrointestinal tract. The

relative frequency of endocarditis associated with these bacteremia-porne procedures also follows the same order.

Consequently, evidence that particular bacteremia-porne procedures caused a specific case of endocarditis is, at best, circumstantial, and causation based on a temporal relation seems to account for only 4% to 19% of all cases of endocarditis.

Acute oral infection has been implicated in the pathogenesis of a minority of cases of early prosthetic valve endocarditis. Acute and chronic oral infections and bacteremia-prone oral health care procedures may contribute to the development of late prosthetic valve endocarditis in a large number of cases. The incidence of spontaneous bacteremias associated with acute or chronic oral/odontogenic infections in unknown.

Data considering the frequency of bacteremias after selected oral health care procedures have been reported (2,11). The incidence of bacteremias after tooth extraction was reported to be 60% (ranged 18% to 85%), and bacteremias was more predictable in patients who underwent multiple extractions or who had associated periodontal disease. The incidence of bacteremia after periodontal operations was reported to be 88% (ranged 60% to 90%). Bacteremia after teeth- brushing and irrigation has a reported incidence of 40% (ranged 7% to 50%). Considering that this activity is repeated by the average patient at least once daily, the cumulative risk of endocarditis associated with routine oral home care in patients with predisposing heart disease likely overshadows the risk associated with occasional oral health care procedures in a professional setting. The incidence of acute and chronic oral/odontogenic infections was sufficiently high to mandate a comprehensive clinical and radiographic examination preoperatively, with implementation of appropriate therapeutic intervention (if possible, before valve operations) whenever such high-risk patients were identified.

Acute oral infection has been implicated in the pathogenesis of a minority of cases of early prosthetic valve endocarditis. Acute and chronic oral infections and bacteremia-porne oral health care procedures may contribute to the development of late prosthetic valve endocarditis. However, the incidence of spontaneous bacteremias associated with acute or chronic oral/odontogenic infections is unknown (12).

Once the prosthetic heart valve is in place, patients should not be exposed to a procedure with a high incidence of bacteremia if an alternative treatment with a lower incidence

of bacteremia is available. The American Heart Association recommendation states that some patients with a prosthetic heart valve in whom a high level of oral health is being maintained may be offered oral antibiotic prophylaxis for routine dental procedures and that parental antibiotics are recommended for patients with prosthetic valves who require extensive dental procedures, especially extractions, or oral or gingival surgical procedures (13). Parental administration of antibiotics is favored, when practical, because it provides more predictable blood levels of the antibiotic and better control of the therapy (8).

It is well known that the examination of normal teeth, and even brushing of teeth, can give rise to bacteremia, and there is a risk that local odontogenic infections such as hidden root infections and periodontitis, may seed bacteria into the blood (Investigators have shown that the majority of dental infections are anaerobic, and blood-borne anaerobes can be cultured after various dental manipulations). Moreover, the jaws and the oral cavity may be the most common sites of hidden infections (14).

Although risk of endocarditis with various procedures may be low, the consequences are potentially grave. For years, many susceptible patients have received systemic prophylactic antibiotics prior to manipulations known to cause transient bacteremia. No conclusive demonstration of their benefit is the paucity of reported endocarditis cases in patients who received antibiotic prophylaxis, with rare exceptions (10).

Medical and dental practitioners must work closely together in the management of patients with prosthetic heart valves. Even before a patient receives the prosthesis, the physician should seek dental consultation and any needed dental treatment should be performed before the valve is placed (3,5,8,15).

If a patient who had already received a prosthetic heart valve has poor oral health, consideration must be given to removing his teeth and fabricating dentures. Before such a decision is to be made, the risks, possible treatment plans, prognosis and expense must be discussed with the patient and his physician (2,8,15).

Although our data do not prove that therapeutic intervention preoperatively will reduce the long term risk of prosthetic valve endocarditis, we can expect that this might be the case. Thus, a randomized study is required for long term assessment to compare the incidence of endocarditis

between patients who are screened and treated preoperatively and those who are not.

CONCLUSION

The detection of all teeth with pathological conditions and optimal treatment planning of the affected teeth for patients scheduled to undergo cardiac valve replacement are of great importance. The same could be stated considering patients who already have prosthetic heart valves.

Procedures in the susceptible host where prophylactic antibiotics seem prudent include dental manipulations. Whether patients with acquired valvular or congenital heart disease who are to undergo abdominal surgical procedures should routinely receive prophylactic antibiotics is unclear. However, until the incidence of transient bacteremia associated with various abdominal procedures is further defined, endocarditis-prone patients should probably receive prophylaxis.

Optimal timing of dental consultations is helpful in the oral rehabilitation of patients who are about to undergo valve replacement procedure. Furthermore, close interdisciplinary cooperation is necessary to minimize the social and psychological problems following unexpected tooth extractions. Cardiologists and heart surgeons have an important role in the organization of the oral rehabilitation of patients undergoing valve replacement procedures.

CORRESPONDENCE TO

Dr. Aous Dannan Breitestr. 94 58452 Witten Germany

Email: aousdannan@yahoo.com

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Author Information

Rainer Schmelzeisen, Ph.D.

Department of Oral and Maxillofacial surgery, Freiburg Clinic University

Feras Yabroudi, D.D.S.

Department of Oral and Maxillofacial surgery, Freiburg Clinic University

Aous Dannan, D.D.S., M.Sc.

Department of Periodontology, Faculty of Dental Medicine, Witten/Herdecke University