

Oral Surgery in a Child with a Prosthetic Aortic Valve and Pulmonary Artery Stent at Risk for Thromboembolism

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Children with prosthetic cardiac valves and other invasive mechanical devices that direct blood flow require anticoagulant medication for prevention of thrombosis. Dental surgery for these children has historically consisted of decreasing and/or discontinuing the oral anticoagulant and instituting heparin therapy prior to the planned dental procedure, which can result in thromboembolism and increased morbidity and mortality. This case report demonstrates that oral anticoagulation need not be decreased or discontinued prior to extraction of multiple carious primary teeth in a child at risk for thromboembolism.

Keywords: oral surgery, warfarin, thromboembolism, pediatric

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INTRODUCTION

Anticoagulation is commonly required in patients with prosthetic cardiac valves as well as other invasive mechanical devices to prevent thrombosis.¹⁻⁵ Warfarin sodium has traditionally been used to achieve an INR (International Normalized Ratio) of 2.5-3.5.²⁻⁵ In the past, patients requiring oral surgery were placed in one of three categories based on the risk of thrombosis, and warfarin dosage would either be unaltered or it would be discontinued and pre-operative heparin therapy instituted.² Warfarin withdrawal may create a hypercoagulable state and place the patient at risk of embolic complications, including death.⁴ Recently, patients on warfarin therapy with a therapeutic INR have successfully undergone minor oral surgical procedures without adjusting or discontinuing anticoagulation.³⁻⁵ The purpose of this case report is to document the

successful extraction of multiple carious teeth in a child with a prosthetic cardiac valve and pulmonary artery stent with a therapeutic INR and no adjustment of daily warfarin medication.

Case Report

A 10-year old male with velocardiofacial syndrome was referred by the Division of Pediatric Cardiology for evaluation and possible extraction of multiple carious teeth. The patient's cardiac history included a type B interrupted aortic arch, aortic stenosis, and a ventricular septal defect. He underwent repair of the interrupted aortic arch and ventricular septal defect shortly after birth and, at 5 months of age, an aortic commissurotomy. By 6 years of age he had developed aortic stenosis/insufficiency, so underwent a Ross procedure. Following this operation he soon developed severe aortic and mitral insufficiency and right pulmonary artery stenosis which necessitated aortic valve replacement, mitral valve repair, intraoperative stenting of the right pulmonary artery and patch pulmonary arterioplasty. Four years after his last cardiac surgery, a cardiac ultrasound revealed moderate-severe stenosis of both pulmonary arteries which required cardiac catheterization and additional stent placement.

To prevent thrombosis of the prosthetic valve and stents, the patient was maintained on warfarin sodium 4 mg Sunday, -Wednesday and Friday, and 6 mg Thursday and Saturday. Acetylsalicylic acid was also prescribed at a dosage of 81 mg per day. The patient's INR was monitored with a target level of 2.50.

Oral examination revealed the presence of moderate gingivitis and severe caries involving the right and left maxillary primary first and second molars, left maxillary primary canine and left mandibular primary second molar. No fluctuance or abscesses were noted. A radiographic examination

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of the dentition showed the same carious teeth with pulpal involvement and no periapical pathology. He was asymptomatic and had recently completed a course of amoxicillin for acute otitis media.

The patient was scheduled for oral surgery in the operating room. Following a consultation with Pediatric Cardiology, acetyl salicylic acid was discontinued 10 days prior to the operation. Warfarin was continued on a normal schedule. A pre-operative INR was found to be therapeutic (2.48). Electrolytes and a complete blood count were within normal ranges. A repeat INR was done on the day of surgery and was also therapeutic (2.97). The patient was taken to the operating room and given clindamycin 20 mg/kg IV for infective endocarditis prophylaxis as recommended by the American Heart Association. The patient was orally intubated to reduce the chance of nasopharyngeal bleeding and after an adequate depth of anesthesia was obtained the patient was prepped and draped in the usual manner for a head and neck procedure. A maxillary and mandibular gingival scrub using 0.12% chlorhexidine gluconate was done. Local anesthesia was delivered using periodontal ligament injections around all teeth to be extracted. Two cc of 2% lidocaine containing 1:100,000 epinephrine were used. All teeth were atraumatically extracted. Surgicel was placed into the extraction sites and local pressure with 4 x 4 gauze was used to achieve hemostasis. Bleeding was adequately controlled. The patient was extubated without difficulty and discharged to home after a 2 hour postoperative recovery period. A one week postoperative examination showed well healed sockets and no bleeding problems.

DISCUSSION

Warfarin is a commonly used for anticoagulation in patients with prosthetic valves. It is a vitamin K antagonist and impairs the production of vitamin K dependent clotting factors, namely II, VII, IX, X and proteins C and S. The result is impaired fibrin formation and protection from thromboembolism. The International Normalized Ratio (INR) is used to adjust warfarin dosage and, in patients with prosthetic cardiac valves, the INR usually is maintained from 2.5 to 3.5.^{3,4}

In the past, patients that required anticoagulation and needed minor oral surgical procedures were classified as to risk of thromboembolism. Those patients taking warfarin and deemed to be at a relatively low risk had warfarin withdrawn several days prior to the procedure until the INR was nearly normal, whereas those patients deemed to be at a high risk for thromboembolism had warfarin discontinued and heparin instituted.^{3,5} The problem with this protocol is that patients were still at risk for thromboembolism with or without heparin infusion^{3,5} with Wahl³ reporting several documented cases of embolic complications, including death, after warfarin withdrawal. Recently, there have been several reports of extraction of teeth in patients who require warfarin without interrupting therapy with no adverse sequelae.¹⁻⁵

Minor oral surgical procedures differ from other surgical procedures in that major vessels are not encountered, access to bleeding sites is not hindered and local measures such as gauze or sutures are easily placed. Beirne⁵ discussed several studies in which oral surgical procedures were done without interrupting anticoagulation therapy with the INR in a therapeutic range and Wahl³ concluded that minor oral surgery could be done with the INR within the therapeutic range. Most post operative bleeding can be controlled using local measures only. Souto *et.al*⁴ and Goss¹ used tranexamic acid, a local antifibrinolytic agent after oral surgery in patients who had no adjustment of systemic anticoagulation. No postoperative bleeding problems were observed. Apparently tranexamic acid suppresses the activation of fibrinolysis that is found in saliva.

Scully² discussed oral surgical procedures in patients receiving anticoagulation therapy and recommended that limited oral surgery, such as uncomplicated extraction of one to three teeth, can be done in patients with an INR of 3.5 or less. Local measures to achieve hemostasis can be used either alone or with tranexamic acid.

Several anti-infective agents have been shown to displace warfarin from protein binding sites, including penicillin, erythromycin, augmentin and cephalosporins.² Since patients with prosthetic cardiac valves require anti-infective agents prior to operation for prevention of infective endocarditis, it is theoretically possible to unsafely increase the baseline INR using the American Heart Association regimen with ampicillin, amoxicillin or cephalosporins. Clindamycin appears to be the ideal antimicrobial agent to administer pre-operatively without the fear of increased INR, particularly to those patients who may harbor resistant strains of bacteria because of a recent history of antimicrobial therapy with penicillin.

The patient presented in this report did very well after extracting six primary teeth with an INR of 2.97, which is in agreement with other published cases.^{2,5} We attribute this to careful surgical technique and local measures for control of bleeding. Furthermore, the bone supporting primary teeth is more easily expanded when performing extractions and the likelihood of bone fracture and leaving residual bone fragments is small.

This case supports previous reports from the oral surgical literature that anticoagulation need not be interrupted for minor oral surgical procedures such as the extraction of multiple primary teeth. Local measures appear to be effective and if significant post-operative bleeding is encountered, tranexamic acid may be used either topically with pressure or as a systemic infusion.

CONCLUSION

The supporting literature and the preponderance of current opinion suggest that children with prosthetic cardiac valves who are at risk for thromboembolism that need minor oral surgical procedures, can be treated without interrupting ther-

apeutic anticoagulation. Local measures for hemostasis are usually successful and tranexamic acid may be used in those cases with prolonged postoperative bleeding.

This case presentation is important to pediatric dentists because it corroborates adult studies which suggest that warfarin therapy to prevent thromboembolism does not need to be interrupted for minor oral surgical procedures.

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