

In this month's "Point of Care" section, Drs. Allen Aptekar and George K.B. Sándor answer questions frequently asked by dental practitioners about the need to employ prophylactic antibiotics in the management of patients who have coronary artery stents, indwelling central venous catheters, ventriculoperitoneal shunts, breast implants or penile prostheses and who are undergoing invasive dental treatment. For the purposes of this overview, invasive dental treatment is defined as dental procedures that are expected to result in gingival bleeding or to cause bacteremia. These procedures would also be potentially harmful to a patient otherwise at risk for subacute bacterial endocarditis. Infection of such alloplastic prostheses can result in considerable morbidity or a delay in otherwise necessary treatments and may in some cases be life-threatening.

QUESTION 1

What precautions and measures do I have to consider when providing dental treatment to a patient with a coronary artery stent?

Background

The American Heart Association has reported that coronary artery disease affects over 13 million people in the United States and is the number one cause of death in that country.¹ Over the past 20 years, one of the more popular procedures for treating coronary artery stenosis has been percutaneous transluminal coronary angioplasty (PTCA). However, PTCA has some shortcomings, and in some cases reclosure of the artery occurs after such treatment.² Coronary artery stents came into clinical use in the mid-1990s and have been a mainstay in the prevention of restenosis following PTCA.³

A coronary artery stent is a wire mesh tube used to physically open the lumen of an artery during and after angioplasty. The stent is collapsed

to a small diameter and placed over a balloon catheter for insertion (Fig. 1). The stent is then moved into the area of the blockage through an intra-arterial approach. When the balloon is inflated, the stent expands and locks into place, forming a scaffold that endothelializes and holds the newly dilated artery open (Fig. 2). The stent, which stays in the artery permanently, improves blood flow and alleviates the ischemic symptoms of coronary artery disease.¹ Patients with such stents in place receive antiplatelet medications to decrease the chances of restenosis.³ The concerns in treating these patients for other medical or dental problems include the effects of possible bacteremia on recently stented vessels, the risk of post-treatment bleeding and the possibility of interactions with prescribed medications.



Figure 1: Coronary artery stent on a catheter which is inflated to insert the stent via the lumen of the receiving vessel.



Figure 2: Coronary artery stent expanded as if it were inserted into the intima of the receiving vessel.

Management

Dental professionals should have a basic understanding of the precautions necessary for patients with coronary artery stents. The stents do not cure the patient's cardiac problem, which can progress with further atheroma formation.³ The dentist must also have some understanding of the risk of dental treatment causing bacteremia in these patients. Stents are placed in intimate contact with the endothelial wall of stenosed vessels under high pressure. It takes 72 hours to 30 days after stent placement for the neointima to fully cover the stent and organize itself on top of the smooth muscle in the vessel wall and to be completely endothelialized.³ According

to the recommendations of the American Heart Association, patients should be given prophylactic antibiotic therapy if they are to

receive invasive dental treatment within the first 30 days after stent placement.³ Pallasch and others⁴ have even suggested prophylactic antibiotic therapy for up to 6 months after stent placement. If there is any doubt, the dentist should consult the patient's cardiologist to inquire about the need for prophylaxis.

The potential for postoperative bleeding should also be a concern when treating patients with stents. These patients are usually receiving antiplatelet medications to prevent further stenosis. This regimen may result in an increase in bleeding time, which can lead to bleeding complications if invasive dental treatment is undertaken. Therefore, the dental practitioner should inquire about the patient's recent tendency for bleeding or bruising.⁵ If the history indicates an enhanced tendency for bleeding, the dental practitioner should ask the patient's physician about the platelet count and possibly the bleeding time. Furthermore, the dentist must be cautious in prescribing other medications. Nonsteroidal anti-inflammatory drugs should be avoided in patients who are receiving antiplatelet medications, as these drugs may cause or potentiate a further increase in antiplatelet action.^{3,5}

Conclusions

In treating patients with coronary artery stents, the dental practitioner should be familiar with the medical history, including the bleeding history, and should consider the need for prophylactic antibiotic therapy. The recommended prophylaxis regimen is amoxicillin 2.0 g orally 1 hour before the procedure or, if there is an allergy to penicillin, clindamycin 600 mg orally 1 hour before the procedure. In addition, the dentist should be aware of the patients' antiplatelet regimen and the bleeding time and should be cautious with respect to the analgesic medications being prescribed. When there is any doubt, the dentist should consult the patient's cardiologist or family physician. ♦

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QUESTION 2

What precautions and measures do I have to consider when treating a patient who has had breast augmentation?

Background

Surgical procedures for breast augmentation with alloplastic materials have been in routine clinical use for over 40 years and are among the most commonly performed cosmetic surgical procedures.¹ Breast augmentation is used for esthetic purposes and may also be used for reconstruction after breast cancer surgery. Two main types of breast implants have been used over the past 50 years. The first type, filled with silicone gel, was very popular from 1963 until 1992, when it was banned by the U.S. Food and Drug Administration. The ban was implemented in response to a presumed relation between these implants and systemic immunologic conditions. Use of the second type, saline-filled silicone breast implants, has steadily increased since 1992.¹

Breast implants are classified as body prostheses (Fig. 1) and, like any other foreign body or implant prosthesis, can become infected.² This raises the question of whether a dental procedure can be a source of infection in patients with breast implants. There has in fact been one documented case of breast implant infection originating from dental treatment.³

Management

Antibiotic prophylaxis before dental treatment for patients with breast implants is controversial. Such prophylaxis has been deemed unnecessary by some authors because of a lack of scientific evidence,² even though a documented anecdotal case

report has been published.³ Hunter and others³ described a single case in which a breast implant infection occurred after treatment of an abscessed tooth. The bacterium involved was *Clostridium perfringens*, a species commonly found in the gastrointestinal tract and oral cavity. Hunter and co-workers,³ as well as other authors,^{2,4} have suggested antibiotic prophylaxis in the form of a cephalosporin in situations where bacteremia might develop in patients with breast implants.

Breast implant infection originating from bacteremia seems to be extremely rare. The case by Hunter and others³ is the only one ever reported among the hundreds of thousands of breast implants being placed every year. Therefore, the risks and benefits of antibiotic prophylaxis must be considered in this setting. Not prescribing antibiotic prophylaxis is justified, given the very low incidence of such infections.^{5,6} However, patients who have received breast implants for reconstructive purposes may also have undergone immunosuppressive chemotherapy and therefore could be more susceptible to infection by oral bacteria.² Such patients may benefit from antibiotic prophylaxis. If in doubt, a consultation with the patient's physician is recommended. ♦

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Figure 1: A saline-filled breast implant just before insertion.

QUESTION 3

What precautions and measures do I have to consider when providing dental treatment to a patient who has a penile prosthesis?

Background

The implantation of a penile prosthesis has been a popular solution for erectile dysfunction.¹ Candidates for these prostheses are generally men who have tried all other forms of nonsurgical treatment for erectile dysfunction, physical injury to the penis or penile cancer, without success.² Penile prostheses are surgically implanted by a urological surgeon. There are 2 main types: semirigid and inflatable. The choice, a matter of preference and cost, is made jointly by the surgeon and the patient.² The inflatable penile prosthesis seems to be more popular at the present time. One of the major complications of these prostheses, though rare, is infection of the prosthesis. Some predisposing factors to such infection are spinal cord injury, uncontrolled diabetes, history of urinary tract infections, and immunocompromised status. Such infections may cause loss of function, need for more surgery, removal of the prosthesis and possibly death.³ Even though stringent infection control standards are followed before, during and after surgical implantation of penile prostheses, such infections are still of concern, and some studies have shown possible evidence that dental treatment may be the source of infection.³ Therefore, prevention of penile prosthesis infection is important for patients with such implants.

Management

Urological surgeons have been placing penile prostheses with an antibiotic surface treatment, to reduce the chance of infection. Carson showed that the use of surface-treated prostheses was successful,⁴ concluding that individuals receiving treated prostheses had an infection rate 82.4% lower than those receiving untreated devices after 60 days and 57.8% lower after 180 days.⁴ However, the risk for future infection increased with time.⁴

A rare source of penile prosthetic infections is invasive dental procedures, and 5 cases have been reported.^{3,5} The infecting organisms in some of these cases were *Staphylococcus* or *Streptococcus* bacteria. The authors of these anecdotal case reports recommended that all patients with penile prostheses should receive antibiotic prophylaxis before any type of invasive dental procedure.^{3,5}

Little and Rhodus conducted a survey regarding the need for prophylactic antibiotic coverage for patients with penile prostheses when undergoing invasive dental treatment.⁶ Most of the 297 urologists who responded to the survey did not recommend antibiotic prophylaxis for patients with penile prostheses who were undergoing invasive dental treatment. Those who did recommend antibiotic prophylaxis selected a cephalosporin.⁶

The information available in the literature suggests that the dental practitioner should deal with antibiotic prophylaxis in this setting on a case-by-case basis. A consultation with the family physician or urologist is justified to determine if antibiotic prophylaxis is needed. If antibiotic prophylaxis is deemed appropriate, the guidelines set out by the American Heart Association for the prophylaxis of subacute bacterial endocarditis could be followed: amoxicillin 2.0 g (or clindamycin 600 mg if the patient is allergic to penicillin), given 1 hour before invasive dental treatment likely to cause bacteremia.⁷ ♦

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QUESTION 4

What precautions and measures do I have to consider when providing dental treatment to a patient with a central venous catheter?

Background

For certain groups of patients, indwelling central venous catheters offer significant improvement in quality of life. These catheters have offered many patients freedom from the hospital environment and enhanced mobility by allowing much of their intravenous care to be administered by trained personnel outside the hospital. Central venous catheters are used for various reasons. In general, such devices provide simplified access for long-term intravenous therapy on an outpatient basis and thus help to avoid repeated venipuncture.¹ This mode of therapy may be required to administer chemotherapy for oncologic disorders, nutritional disorders, or end-stage renal disease (by dialysis).^{1,2} The use of such catheters is becoming very common, and millions of North Americans have such devices. They are usually inserted percutaneously or by venous cut-down (under local or general anesthesia) through the internal jugular, external jugular, cephalic, saphenous or femoral vein (Fig. 1).

Although the devices are generally safe, serious complications such as catheter infections and catheter-related bloodstream infections can occur.³ These infections are associated with high morbidity and mortality rates, increasing the

costs of medical treatment and often the length of the hospital stay.³ Moreover, these complications may mean temporary cessation or withholding of necessary life-sustaining treatments such as chemotherapy. It is therefore important to eliminate any possible source of infection in these patients, as they are at risk for the development of endocarditis, septicemia, and other infections. It is also important to remember that many of these patients are immunocompromised because of their particular treatments or underlying illnesses.^{1,2} One possible source of infection in these patients is invasive dental treatment, which can result in bacteremia. Therefore the dental practitioner should be aware of and aim to minimize the potential risks in treating such patients.^{1,2}

Management

There are 2 main routes by which central line catheters may become infected: exogenous contamination (e.g., from the skin) or endogenous contamination (bacteremia or fungemia).¹ The most common organisms associated with catheter infection are gram-positive cocci such as *Staphylococcus* spp., gram-negative organisms such as *Pseudomonas aeruginosa* and fungi such as *Candida* spp.^{1,3} Some of these organisms are commonly found in the mouth, and may cause bacteremia and catheter infection after dental treatment.

There are additional concerns for patients with a central line catheter who are receiving hemodialysis and who require dental treatment. Such patients may be at risk for excessive bleeding and anemia. In particular, anticoagulant use while the patient is undergoing dialysis therapy and mechanical trauma to the platelets during dialysis may lead to bleeding issues.² Chronic renal failure also results in decreased erythropoietin levels and consequent anemia, along with unexplained platelet dysfunction and anemia of chronic disease. Patients receiving hemodialysis and those receiving chemotherapy are at risk for catheter-related infections. Both groups of patients suffer from altered cellular immunity, as well as hypoproteinemia and diminished antibody production. All of these factors lead to an increased susceptibility to infection.^{1,2}



Figure 1: Central venous catheters are indwelling venous catheters used to provide repeated venous access for drug therapy or dialysis.

It is therefore imperative to eliminate any oral source of infection. Patients with central venous catheters must receive prophylactic antibiotic therapy before invasive dental care to prevent the possibility of catheter infection and bacterial endocarditis.^{1,2,4} The recommended regimen is amoxicillin 2.0 g orally 1 hour before the procedure or, if there is an allergy to penicillin, clindamycin 600 mg orally 1 hour before the procedure.⁴ If the dentist is in doubt about treating such a patient in the office, he or she should consult the patient's physician or should refer the patient to a hospital dental facility. ♦

QUESTION 5

What precautions and measures do I have to consider when treating a patient with ventriculoperitoneal or ventriculoatrial shunt?

Background

A ventriculoperitoneal (VP) shunt is a type of catheter that transports excess cerebrospinal fluid from the lateral ventricle of the brain to the peritoneal cavity (Fig. 1), whereas a ventriculoatrial (VA) shunt transports excess cerebrospinal fluid from the ventricle of the brain to the right atrium of the heart. Both types of shunt are used to maintain proper intracranial pressure and thereby prevent or treat hydrocephalus in infants and children with chronically elevated intracranial pressure. If left untreated, hydrocephalus can lead to severe headaches, skull deformation, blindness, mental deterioration, and death.¹ VP shunts are used more often than VA shunts, as they require less operative time and fewer revisions.² Both types of shunt are surgically placed by neurosurgeons.



Figure 1: A lateral cephalogram showing the cranial portion of a ventriculoperitoneal shunt.

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One of the major complications of such shunts is infection, which can lead to significant morbidity and mortality.^{2,3} Shunt infections occur either early (within 8 weeks after insertion) or late. Early infection is usually associated with impaired immunological status of the patient during the early postoperative period. One way to prevent early infection is impregnation of the shunt with antibiotics before surgical implantation.⁴ Late infections, which are less common, are usually caused by delayed contamination of a shunt by microorganisms.¹ Organisms that commonly cause shunt infections are *Staphylococcus* spp. and *Streptococcus* spp.^{1–3} These bacterial organisms are commonly found in the oral cavity and have led to documented shunt infections after dental procedures.⁵

Management

There is some controversy associated with antibiotic prophylaxis for patients with these shunts. According to the guidelines of the American Academy of Pediatric Dentistry,⁶ patients with VA shunts require antibiotic prophylaxis before dental treatment, whereas those with VP shunts do not, because the latter type of shunt does not involve any vascular structures. However, a literature review has indicated disagreement with these guidelines. For example, a survey of pediatric dentists and neurosurgeons, conducted by Acs and Cozzi,⁷ showed that some pediatric dentists and some neurosurgeons recommend antibiotic

prophylaxis for both VP and VA shunts, although these clinicians still believed that patients with VA shunts were at greater risk for shunt infection than those with VP shunts. The prophylactic agent recommended by 60% of the neurosurgeons in the survey was penicillin.⁷

Other literature clearly supports the use of antibiotic prophylaxis for any patient with a shunt who is undergoing invasive dental procedures that could result in bacteremia. The reasoning behind such prophylaxis is that the bacteria found in the flora of the mouth, oropharynx and nasopharynx are also the bacteria found in shunt infections.⁵ However, the research and corresponding literature with respect to shunt infections caused by dental procedures is limited.

Given the evidence available, a team approach should be used in treating patients with shunts in the dental office. The dental practitioner should consult with the patient's family physician or neurosurgeon about the need for antibiotic prophylaxis. If in doubt, or if such consultation is not possible, the dentist should err on the side of caution and give antibiotics to the patient, according to the guidelines set out by the American Heart Association: 2.0 g amoxicillin 1 hour before the invasive dental procedure (or 600 mg clindamycin if the patient is allergic to penicillin).⁸ ♦

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