

Prophylactic Antibiotics And Foot Implant Procedures

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INTRODUCTION

Preoperative antibiotic prophylaxis refers to the administration of an antibiotic agent with the goal of preventing an infection associated with the surgical procedure. The therapeutic use of antibiotics should not be confused with prophylaxis. Antibiotic usage after tissues have become contaminated should be considered treatment and not prevention.¹

The use of antibiotic prophylaxis in implant foot surgery continues to be a controversial subject. Although antibiotic prophylaxis is generally considered to be indicated in implant foot surgery²⁻⁴, there are surgeons who do not routinely use antibiotic prophylaxis in pedal implant surgery. Infection rates in these reported cases have been 1-2%, which is very similar to or less than the infection rate reported for clean foot surgery^{5,6}.

CLINICAL REVIEW

Surgical procedures have been typically classified, with reference to antibiotic prophylaxis, as clean, clean contaminated, contaminated, and dirty (Table 1). This classification system was developed to compare the effectiveness of antibiotic prophylaxis in similar surgical procedures. However, it must be noted that a wide spectrum of procedures with varying infection rates fit into each category. The majority of elective procedures performed on the foot are classified as clean procedures, with the exception of implant surgery which has been classified as clean contaminated⁷.

Because of a number of controlled studies previously conducted, it is generally accepted today that the use of properly administered prophylactic antibiotics is effective in preventing postoperative wound infections in certain surgical procedures which have typically been classified in the literature as clean contaminated, or contaminated⁷. However,

because of the relatively low infection rates in clean surgical procedures, it is generally agreed upon in the literature, that the routine use of prophylactic antibiotics is not indicated in clean surgical procedures⁸⁻¹⁰.

Table 1

WOUND CLASSIFICATIONS⁵

Clean Wound

Nontraumatic wounds with no break in sterility. No inflammation present. No entry of the respiratory, alimentary or genitourinary tracts.

Clean Contaminated Wounds:

Nontraumatic wound with a minor break in sterility. Included in this category are implant procedures. Entry into the gastrointestinal, genitourinary, or respiratory tracts without significant spillage.

Contaminated Wounds:

Traumatic wounds or an operation in which a major break in sterility occurred. Includes incisions through devitalized, purulent, or acutely inflamed tissue. Includes gross spillages from the gastrointestinal or genitourinary tracts.

Dirty Wounds:

Infected traumatic wounds with delayed treatment, retained foreign body, or from a dirty source.

The great majority of clinical studies performed investigating the effectiveness of antibiotic prophylaxis have involved general and orthopedic surgery, with very few studies specifically involving antibiotic prophylaxis and foot surgery. The only published study noted to specifically involve prophylactic antibiotics and foot implant surgery was performed by Laundry et al. in 1987¹¹. Laundry reviewed 265 isolated first metatarsophalangeal joint implant procedures in 230 patients. Prophylactic antibiotics were used in 17 patients. One patient, who did not receive prophylactic antibiotics, developed a postoperative infection which necessitated implant removal. The reported infection rate was 0.38%.

In a yet-unpublished preliminary study investigating the need for universal antibiotic prophylaxis in foot implant procedures performed by Lemm et al.¹², 96 foot implant procedures were reviewed in 70 patients. In this study, 21 of the 70 patients received prophylactic antibiotics. One patient developed a superficial infection that did not necessitate implant removal. The reported infection rate was 1.05%.

CRITERIA FOR USAGE

The decision to use antibiotic prophylaxis must be based on the potential of the surgical patient to develop an infection versus potential adverse effects of using antibiotics. Numerous risk factors that may predispose a patient to developing a postoperative infection are discussed in the literature with reference to antibiotic prophylaxis. The risk factors can be divided into two main groups: systemic factors, and local factors (Table 2).

There is some debate in the literature regarding the necessity to use prophylaxis for any or all of the listed risk factors. It is generally felt that universal prophylaxis for a single risk factor may not be warranted. However, each risk factor should be addressed in the overall evaluation of the potential for the patient to develop a postoperative infection. Antibiotic prophylaxis has also been reported to be indicated in patients with certain heart murmurs, surgical cases involving trauma, and in situations in which an infection would result in a "catastrophic result"^{2,13}.

Table 2

FACTORS ASSOCIATED WITH INCREASED INFECTION RISK

<u>Systemic Factors</u>	<u>Local Factors</u>
Age > 65	Surgery > 2 hours
Diabetes Mellitus	Foreign Body Material
Remote Infections	Breaks in Sterility
Rheumatoid Arthritis	Hair Removal Techniques
Immunodeficient States	Use of Drains
Collagen Vascular Disease	
General Malnutrition	
Chronic Renal Disease	
Chronic Lung Disease	
Obesity	

Many antibiotic agents and regimes have been used in the past to prevent postoperative wound infections. Although some debate over the optimal

duration of prophylaxis still exists, it is generally agreed upon that a short preoperative course of a parenteral antibiotic is effective in reducing postoperative wound infections^{14,15}. Current recommendations for the duration of prophylaxis vary between the classical 24 hour regime and a single dose regime.

Recently, single dose prophylaxis has been shown to be as effective as multiple dose prophylaxis¹³. Single dose regimes should be utilized to minimize the potential adverse reactions of using antibiotics. The *Medical Letter*¹³ states that postoperative doses of prophylactic antibiotics are usually not necessary, and recommends a single dose of a parenteral antibiotic administered within 30 minutes of the surgery. A second dose is recommended for procedures lasting longer than 2 hours.

OPTIMAL REGIME

An effective prophylactic regime should include an antimicrobial agent directed against the most likely infecting pathogen. This agent should be given at an appropriate dose and time, be relatively free of toxicity, be relatively inexpensive, and possess a relatively narrow spectrum of activity^{7,13,15}.

The organism most likely to cause a postoperative wound infection in lower extremity surgery is *Staphylococcus aureus*¹⁶. *Staphylococcus epidermidis* is the most common cause of infections in implant surgery².

First generation cephalosporins are commonly used for prophylaxis in lower extremity surgery. Cephazolin (Ancef) is the most frequently used prophylactic agent in orthopedic-related surgery. Cephazolin has a relatively long serum half-life, good bony penetration, is relatively inexpensive, and has good antistaphylococcal coverage. Its long half-life allows coverage with good serum levels for the duration of most cases.

Third generation cephalosporins are generally not recommended for prophylaxis because of their expense, decreased Staphylococcal coverage, and their relatively broad spectrum coverage against infrequently encountered gram negative rods which could potentiate emergence of resistant strains of organisms¹³. Vancomycin is the drug of choice in patients with a documented allergy to cephalosporins². Clindamycin is also an acceptable alternative to vancomycin in penicillin allergic patients¹⁷ (Table 3).

Table 3

**PROPHYLACTIC ANTIBIOTIC AGENTS
FOR USE IN PODIATRIC SURGERY**^{2,17}

CEFAZOLIN (ANCEF)

Long Serum Half Life	Dose: 1 gram IV 30
Good Bony Penetration	minutes pre-op given over
Relatively Inexpensive	15 minutes
Good Anti-Staph. Coverage	May repeat dose in cases
	lasting longer than 2-4 hrs.

VANCOMYCIN

For Penicillin Allergy	Dose: 15 mg/kg IV infused
Drug of Choice for MRSA	slowly over 1 hour pre-op
& MRSE	
Potential Redman Syndrome	
Increased Toxicity Potential	Do Not Repeat Dose

CLINDAMYCIN

For Penicillin Allergy	Dose: 600 mg IV infused
Good Anti-Staph. Coverage	over 30 minutes pre-op
Good Bony Penetration	
Anaerobic Coverage	May repeat dose in cases
Increased GI Upset Potential	lasting longer than 2-4 hrs.
Renal & Hepatic	
Elimination	

ADVERSE REACTIONS

Antibiotics have been associated with a large number of adverse reactions and side effects that include toxic and allergic reactions, the emergence of resistant bacteria, the development of super-infections, and potential drug reactions^{13,18,19}. Other potential side effects associated with the use of antibiotics include "redman's" syndrome (commonly

associated with Vancomycin), pseudo-membranous colitis, gastrointestinal effects, drug reactions, phlebitis, headache, and paresthesias^{18,19}.

The decision to use prophylactic antibiotics should involve an overall assessment of the patient's risk of developing a postoperative infection versus the potential adverse effects of using antibiotics¹³.

Although the literature is sparse with regards to specific studies involving foot implant surgery and antibiotic prophylaxis, many long term studies of digital implant surgery have been published with relatively low infection rates reported (Table 4).

SUMMARY

Prophylactic antibiotics have been shown to be effective in reducing postoperative wound infections in certain surgical procedures. However, because of the low rates of infection that accompany hand and foot implant procedures in patients with minimal risk factors, the universal use of prophylactic antibiotics in foot implant surgery is probably not warranted.

Based on the authors' preliminary study and past infection rate reports, it is apparent that implant surgery alone, without the use of antibiotic prophylaxis, presents no significant increased risk of developing a postoperative wound infection. Each patient should be evaluated individually to determine the potential risk of developing a postoperative infection and the decision to use antibiotic prophylaxis should be made accordingly.

Table 4

PREVIOUSLY PUBLISHED INFECTION RATES IN DIGITAL IMPLANT SURGERY			
Author	Number of Procedures	Antibiotic Prophylaxis	Infection Rate
Beckenbaugh et al. ^{20*}	530	None	0.64%
Laundry et al. ¹¹	265	Parenteral in 17/265	0.38%
Swanson 1972 ^{21*}	3,915	None	0.69%
Laporta et al. ²²	536	Topical in 220/536	0.74%
Millender et al. ^{23*}	2,105	Topical in all	0.48%
Swanson 1985 ^{24*}	815	None	0.36%
Lanham ²⁵	233	Oral in all	0.86%
Ferlic et al. ^{26*}	162	None	1.23%
Cracchiolo et al. ^{27*}	159	Parenteral in all	1.26%
Swanson 1979 MPJ ²⁸	270	None	0.74%
Smith 1983 STA-PEG ²⁹	53	None	0.00%

**Hand Implant Surgery, All Others - Foot Implant Surgery*

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