Does Guideline-Based Management of Diabetic Foot Osteomyelitis Reduce Risk of Further Proximal Amputations?

Eugene Lee, MD[1]; Jesse Sutton, PharmD[2], Jakrapun Pupaibool, MD[1]; Laura Certain MD, PhD[1,2]

[1]Division of Infectious Diseases, University of Utah

[2]VA Salt Lake City Health Care System

VA | U.S. Department of Veterans Affairs

HEALTH UNIVERSITY OF UTAH

Background

- Diabetic foot osteomyelitis (DFO) is a common complication of diabetic foot ulcers often resulting in amputation and long antibiotic therapy.
- The antibiotic treatment of DFO after limb-sparing amputation, particularly with residual osteomyelitis, is not standardized.
- While there are several guidelines regarding antibiotic therapy for DFO after limb-sparing amputation, there has been limited published evidence demonstrating that adherence to guidelines improves clinical outcomes.

Objective

- We evaluated whether adherence to antibiotic choice and duration for diabetic foot infection (DFI) in accordance with our institution's guidelines reduced risk of future amputations.

Methods

- We conducted a retrospective chart review of 110 patients with DFO treated with limb-sparing amputations at a VA hospital from 2015 to 2019.
- We used our institutional guidelines, which are largely based on IDSA guidelines, to assess adherence to antibiotic choice and duration for DFO therapy after amputation.
- Primary outcome was further proximal amputation occurring within six months or death from all causes within three months.

Guidelines

Table 1: Recommended duration of therapy after amputation

Presence of infection	Duration of antibiotics
No residual infection or residual soft tissue infection only	2 to 14 days
Residual infected bone	4 to 6 weeks

Guidelines

Table 2: Recommended Empiric Antibiotics for Diabetic Foot infection

Severity	Probable Pathogens	Considerations	Salt Lake City VA guidelines	IDSA suggested antibiotics[1]
Mild (*local infection involving only skin & subcutaneous tissue*)	Gram-positives: Staphylococcus aureus Streptococcus species	Non-purulent	Cephalexin, clindamycin (if allergic)	Dicloxacillin, clindamycin, cephalexin, levofloxacin, amoxicillin-clavulanate
		Purulence or history of MRSA	Doxycycline, trimethoprim/ sulfamethoxazole	Doxycycline, trimethoprim/ sulfamethoxazole
Moderate (*erythema >2cm or involving deeper structures than subcutaneous tissue*)	Gram-positives ± Enterobacteriaceae	No previous antibiotics	Cefazolin, if purulent add IV vancomycin	Levofloxacin, cefoxitin, ceftriaxone, ampicillin-sulbactam, moxifloxacin, ertapenem, tigecycline, levofloxacin with clindamycin, imipenem-cilastatin. If concern for MRSA: Linezolid, daptomycin, vancomycin If concern for pseudomonas: Piperacillin-tazobactam
		Previous antibiotics	Ampicillin-sulbactam, if purulent add IV vancomycin	
Severe (*Local infection with signs of SIRS*)	Gram-positives ± Enterobacteriaceae ± Obligate anaerobes	No previous antibiotics	Ampicillin-sulbactam, if purulent add IV vancomycin	
		Previous antibiotics	IV vancomycin plus cefepime plus metronidazole	
Severe and hypotensive or organ dysfunction	Gram-positives ± Enterobacteriaceae ± Obligate anaerobes ± P. Aeruginosa		IV vancomycin plus cefepime plus metronidazole	

Table 3: Recommended Definitive Antibiotics for DFO[2]

Organism		Antibiotics
MRSA		Vancomycin Trimethoprim-sulfamethoxazole Doxycycline
MSSA		Cefazolin Trimethoprim-sulfamethoxazole Doxycycline
Streptococcus species[2]		Penicillin 24 million units IV daily infusion
Enterococcus species[2]		Ampicillin 12 IV daily infusion OR Penicillin 24 million units IV daily infusion OR Vancomycin 15 mg/kg IV q12 hours
Enterobacteriaceae		Ciprofloxacin 750mg PO Q12hours OR Trimethoprim-sulfamethoxazole 2 DS PO Q12 hours OR Ceftriaxone 2 gm IV Q24 hours
Pseudomonas aeruginosa		Ciprofloxacin 750 mg PO q 12 hours OR Cefepime 2 grams IV q12 hours
Culture negative	No history of MRSA	Cefazolin Trimethoprim-sulfamethaxazole Levofloxacin
	History of MRSA or positive MRSA nasal swab	Vancomycin plus ciprofloxacin for two weeks then trimethoprim plus ciprofloxacin or doxycycline plus ciprofloxacin

[2]*Antibiotic therapy tailored to susceptibility report with consideration for oral therapy when orally bioavailable agents are available*

[3]*May consider de-escalation to oral oral β-lactam; however, data is limited supporting this approach and oral bioavailability should be considered.*

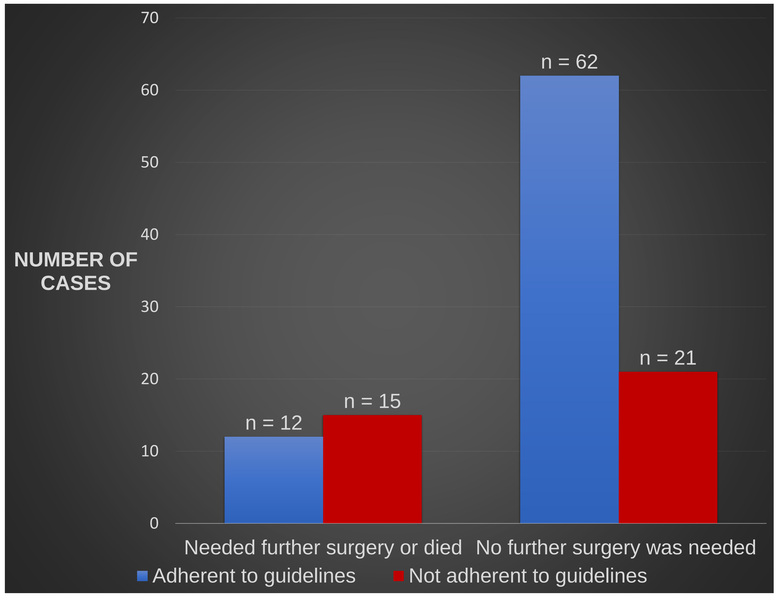
Results

Table 4: Patient demographics

Variable	Totals (n=110)	Adherent to guidelines (n=74)	Not adherent to guidelines (n=36)	P value
Age (years)	67 ± 9	68 ± 9	66 ± 9	0.5
Body Mass Index (BMI) (Kg/m2)	32 ± 8	32 ± 8	31 ± 7	0.47
Active smoking history	16% (16 of 110)	13.5% (10 of 74)	22% (8 of 36)	0.25
End stage renal disease (Stage V or greater)	4.5% (5 of 110)	2.7% (2 of 74)	8% (3 of 36)	0.18
Previous amputation	43% (47 of 110)	47% (35 of 74)	31% (11 of 36)	0.1
Peripheral arterial disease*	22% (24 of 110)	24% (18 of 74)	17% (6 of 36)	0.36

**chart documented peripheral arterial disease, previous angioplasty or bypass, nonpalpable dorsalis pedis or posterior tibial pulses, ABI <0.9*

Figure 1: Guideline-based antibiotic therapy for diabetic foot osteomyelitis after amputation significantly reduces risk of further proximal surgery



Chi squared test showed a statistically significant difference between these two groups (p=0.004)

Table 5: Reasons for non-adherence

	Totals	Did not need further surgery	Needed further surgery
Non-adherence to antibiotic options	27	16	11
Antibiotics were too broad*	8	5	3
Prolonged duration of antibiotics**	16	10	6
Short duration of antibiotics or no antibiotics given*	28	18	10

** Subset of non-adherence to antibiotic options. Antibiotics covered organisms not indicated by severity of infection or culture data*

*** Antibiotic durations that were two weeks greater than or one week shorter than recommended duration was determined as non-adherent*

Limitations

- The sample size is too small to perform multivariate analysis
- All patients were male
- Nearly 50% of patients did not get bone or deep tissue cultures done
- Post-op soft tissue infection was not always documented

Conclusions

- Our study showed that guideline-based antibiotic therapy for DFO treated with amputation significantly lowered the need for further proximal amputations

References

1. Lipsky B, et al. 2012 Infectious Diseases Society of America clinical practice guidelines for the diagnosis and treatment of diabetic foot infections. *Clin Infect Dis.* 2012;54:e123-e172.