When Do You Call The Surgeon?
Surgical Interventions.

James C McKee, DPM
Learning objectives

● Participant will be able to identify several instances of referring for surgical debridement.
● Participant will be familiar with the Infectious Disease Society of America wound infection grading scheme and how it applies to a decision to admit.
● Participant will recognize several different levels of amputation in the lower extremity.
● Participant will understand common sequelae associated with amputation in the lower extremity.
● Participant will understand decision-making from surgeon’s perspective about medical vs surgical management of lower extremity infections.
Disclosures

None.

Opinions presented in this talk are my own and not necessarily the opinions of MultiCare Health.
Seeing Wounds

Etiology: Why is the wound there

Investigation to determine etiology is at the core of wound care.

“Listen to the patient, they will tell you the diagnosis.” William Ostler.
Debridement

Earlier lecture

Must see the base of the wound to determine what is going on

Must see base of wound every visit to determine progress and character
What to treat yourself vs refer

- What is your experience level and comfort level with wounds
- How sick is the patient
- How long does the patient have with this wound before irreversible damage is done
  - Holding on to patients too long means your referral is for amputation, not advanced modalities
- Do I know what is causing the wound
Where to refer?

- Emergencies
- Urgencies
- Routine

- ED
- Wound care clinic
- Podiatry (LE)
- Surgeon
- Specialist (eg Derm)
Workup

- Appropriate workup of wounds
- Trying to get information regarding extent and severity of condition and wound prior to treatment initiation
  - This may lead to transfer
Workup

● Do you know what caused the wound?
  ○ If not, it may be reasonable to transfer for 2nd opinion, bring in cavalry
● Record what has been tried so far
● Before calling ->
● Is pt medically optimized?
  ○ How is DM
  ○ Well controlled, poorly controlled, brittle
  ○ Recent A1c (>7.0 = postop complications Jupiter et al )
  ○ Taking medications
  ○ Tobacco use
  ○ Etoh, Illicits
  ○ Taking other medications
    ■ Socioeconomic factors
Medical optimization

- May not be possible to do everything above
- More that is documented the better for the treating surgeon/team
- In DM best results with glucose 140-180 mg/dL
- A1C < 7.0 (Jupiter et al)
- Anticoagulation status
- On/Off meds
- Recent MI
- Substance abuse
Lower Extremity Emergencies

1) Lymphangitis (Streaking)
2) Gas gangrene (emphysema)
3) Sepsis or suspected sepsis
4) Necrotizing soft tissue infection

In all the above cases, pt may well be sitting and chatting with you perfectly normally, and may also be at death’s door.

Send these patients to the ED immediately
Lymphangitis (streaking)

- Infection has spread to the lymphatic channels
- These move toward the heart and will cause sepsis and death if untreated
- Need IV abx for several days until clears
- **Marking infection**
Gas Gangrene

- Due to clostridium perfringens technically, but more commonly gas is due to staph aureus today (Brucato, Joseph)
- Usually very malodorous, can smell it before you can see it if there is a sinus tract
- On radiographs may appear as black bubbles
- Wet vs dry gangrene
- IDSA

39. We recommend urgent surgical intervention for most foot infections accompanied by gas in the deeper tissues, an abscess, or necrotizing fasciitis, and less urgent surgery for wounds with substantial nonviable tissue or extensive bone or joint involvement (strong, low).
Necrotizing Fasciitis

- Ozalay et al
- 22 pts
- 16 initially had surgical debridement
- Debridement needed 1-4 times, mean 2 times
- 9 patients went to BK or AKA
- 3 deaths
  - Older patients more likely to die
  - No mortality difference between amputation and debridement groups
Sepsis

- Bacteremia - bacteria in blood
- Septicemia - more severe
- Sepsis - circulatory collapse with end organ damage (Joseph 2009)
- Septic shock is the end result here
- Due to bacterial infection which spreads to the bloodstream
- Bacteremia untreated quickly leads to septicemia and end organ failure and death
- Send to ED immediately
- Retain high degree of suspicion
Sepsis

- Temp < 36 C (96.8F) or >38 C (100.4F)
- HR > 90/min
- Resp > 20/min or PaCO2 <32 mmHg
- WBC <4000 or > 12000, or 10% bands

High degree of suspicion in DM.
Osteomyelitis

- Bone infection
- Ulceration > 2 square cm
- Depth > 3mm
- Exposed bone
- ESR > 60 with exposed bone
  - As ESR increases, higher correlation with bone infection
- Exposed bone should be surgically resected (Allahabadi et al)
- Probe to bone test
Osteomyelitis: Medical vs Surgical Tx

- Senneville
- 50 pts with DM and infection
- Abx 11 +/- 4 weeks
- 64% in remission after 12 mos

Clinical Care/Nutrition/Psychosocial Research

Outcome of Diabetic Foot Osteomyelitis Treated Nonsurgically

A retrospective cohort study

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Audrey Lombard, MD
Eric Beltrand, MD
Michel Valette, MD

Laurance Legout, MD
Marie Cazeneuve, MD
Yazdan Yazdanpanah, MD, PhD
Pierre Fontaine, MD, PhD

OBJECTIVE — The purpose of this article was to identify criteria predictive of remission in nonsurgical treatment of diabetic foot osteomyelitis.

RESEARCH DESIGN AND METHODS — Diabetic patients who were initially treated without orthopedic surgery for osteomyelitis of the toe or metatarsal head of a nonischemic foot between June 2002 and June 2003 in nine French diabetic foot centers were identified, and their medical records were reviewed. Remission was defined as the absence of any signs of infection at the initial or contiguous site assessed at least 1 year after the end of treatment. A total of 24 demographic, clinical, and therapeutic variables including bone versus soft tissue culture-based antibiotic therapy were analyzed.

RESULTS — Fifty consecutive patients aged 62.2 ± 11.1 years (mean ± SD) with diabetes duration of 16 ± 10.9 years were included. The mean duration of antibiotic treatment was 11.3 ± 4.21 weeks. Bone biopsy was routinely available in four of the nine centers. Overall patient management was similar in the different centers except for the use of rifampin, which was recorded more frequently in patients from centers in which a bone biopsy was available. At the end of a 12.8-month posttreatment mean follow-up, 32 patients (64%) were in remission. Bone culture–based antibiotic therapy was the only variable associated with remission, as determined by both univariate (18 of 32 [56.3%] vs. 4 of 18 [22.2%], P = 0.02) and multivariate analyses (odds ratio 4.78 [95% CI 1.0 – 22.7], P = 0.04).

CONCLUSIONS — Bone culture–based antibiotic therapy is a factor predictive of success in diabetic patients treated nonsurgically for osteomyelitis of the foot.

Diabetes Care 31:637–642. 2008

The question of surgical versus nonsurgical treatment for diabetic patients may lead to biomechanical deterioration, some authors have tried to group (3), antibiotic therapy for these patients was based on culture of nonbone specimens such as wound tissues or deep samples taken during debridement of foot lesions (4–7).

The factors associated with success in diabetic patients treated for osteomyelitis of the foot have been assessed in several studies (5,7,12,13). Bamberger et al. (12) found that success was associated with intravenous therapy given for at least 4 weeks or with a combination of intravenous and oral therapy administered for at least 10 weeks. Bacteremia, gangrene, and open versus closed wounds were identified by Peterson et al. (13) as risk factors in failure. More recently, Embil et al. (7) did not find any difference in the outcome of patients treated with bone versus nonbone debridement nor in those treated with oral versus oral plus intravenous therapy. The respective roles of an increase in serum creatinine levels and of a fever, identified by Prit et al. (5) as independent predictive factors of failure in such patients, cannot be applied to bone infections, as deep tissue infection and osteomyelitis were not evaluated separately in their study. Appropriate antimicrobial therapy is obviously of major importance in nonsurgical treatment, together with other components of patient care, such as
Surgery for OM

- Peters 2012
- Early surgery reduced need for higher or major amputation in diabetic foot
- Peters 2016
- IWGDF many routes for and types of antibiotics without a clear ‘winner’

A systematic review of the effectiveness of interventions in the management of infection in the diabetic foot


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The International Working Group on the Diabetic Foot conducted a systematic review of the published evidence relating to treatment of foot infection in diabetes. Our search of the literature published prior to August 2010 identified 7137 articles, 29 of which fulfilled predefined criteria for detailed data extraction. Four additional eligible papers were identified from other sources. Of the 31 papers included, 11 were cohort studies, 12 were case series, 2 were cross-sectional, 1 was a decision analysis, and 4 were reviews. The quality of the evidence was low, with only 13 studies having more than 50 patients. The outcomes included were infection control, foot salvage, and amputation, with no single intervention demonstrating superiority.

Summary

The International Working Group on the Diabetic Foot expert panel on infection conducted a systematic review of the published evidence relating to treatment of foot infection in diabetes. Our search of the literature published prior to August 2010 identified 7137 articles, 29 of which fulfilled predefined criteria for detailed data extraction. Four additional eligible papers were identified from other sources. Of the 31 papers included, 11 were cohort studies, 12 were case series, 2 were cross-sectional, 1 was a decision analysis, and 4 were reviews. The quality of the evidence was low, with only 13 studies having more than 50 patients. The outcomes included were infection control, foot salvage, and amputation, with no single intervention demonstrating superiority.

Interventions in the management of infection in the foot in diabetes: a systematic review


Department of Internal Medicine, Vrije Universiteit Medical Centre, Amsterdam, The Netherlands

The current literature has identified seven new articles meeting our criteria that were published since the 33 identified with the previous search, making a total of 40 articles from the world literature. The identified articles included 37 randomised controlled trials (RCTs) and three cohort studies with concurrent controls, and included studies on the use of surgical procedures, topical antibiotics, negative-pressure wound therapy and hyperbaric oxygen. Among the studies were 15 with no demonstrated outcomes of treatment.
Surgery for OM

- Expert panel statements
- Open or infected joint spaces are an absolute indication for surgical management (Allahabadi et al)
- Visible or exposed bone within a forefoot ulcer is sufficient to establish diagnosis of DFO

CLINICAL RESEARCH ARTICLE

Consensus on surgical aspects of managing osteomyelitis in the diabetic foot

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Background: The aim of this study was to develop consensus statements that may help share or even establish ‘best practices’ in the surgical aspects of managing diabetic foot osteomyelitis (DFO) that can be applied in appropriate clinical situations pending the publication of more high-quality data.

Methods: We asked 14 panelists with expertise in DFO management to participate. Delphi methodology was used to develop consensus statements. First, a questionnaire elicited practices and beliefs concerning various aspects of the surgical management of DFO. Thereafter, we constructed 63 statements for analysis and, using a nine-point Likert scale, asked the panelists to indicate the extent to which they agreed or disagreed with the
Optimization

- HbA1c
- Glucose ideally between 140-180 before surgical intervention
- A1C target of 6-7 normally
- If >7 lower extremity complications start to increase
Infectious Disease Society of America Guidelines (IDSA)

- Look at guidelines from standpoint of decision to admit
- Mild ok treat with PO abx and should be seen 3 days out
- IDSA Moderate is criteria for admission.
- If not admitting with IDSA moderate, recommend see within 3 days to re-evaluate and document decision making.

**CAUTION**

<table>
<thead>
<tr>
<th>Uninfected</th>
<th>No symptoms or signs of infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDSA Mild</td>
<td>Infection involving the skin and subcutaneous tissue only (without involvement of deeper tissues and without systemic signs as described below)</td>
</tr>
<tr>
<td></td>
<td>- Local swelling or induration</td>
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<tr>
<td></td>
<td>- Erythema &gt; 0.5 to 2 cm around the ulcer</td>
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<td></td>
<td>- Local tenderness of pain</td>
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<td></td>
<td>- Local warmth</td>
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<tr>
<td></td>
<td>- Purulent discharge (thick opaque to white or sanguineous secretion)</td>
</tr>
<tr>
<td>IDSA Moderate</td>
<td>Erythema &gt; 2cm plus one of the items described above (swelling, tenderness, warmth, discharge) or Infection involving structures deeper than skin and subcutaneous tissues as abscess, osteomyelitis, septic arthritis, fasciitis. No systemic inflammatory response signs, as described below</td>
</tr>
<tr>
<td>IDSA Severe</td>
<td>Any foot infection with the following signs of a systemic inflammatory response syndrome (SIRS). This response is manifested by two or more of the following conditions: - Temperature &gt; 38 or &lt;36 deg C</td>
</tr>
<tr>
<td></td>
<td>- Heart rate &gt; 90 bpm</td>
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<tr>
<td></td>
<td>- Respiratory rate &gt; 20 breaths/min or PaCO2 &lt; 32 mmHg</td>
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<tr>
<td></td>
<td>- White blood cell count &gt; 12,000 or &lt; 4,000 cu/mm or 10% band</td>
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</tbody>
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**CAUTION**
IDSA Validation

- Lavery et al validated IDSA system
- 1666 pts
- Higher level of IDSA classification associated with
  - Increased amputation risk
  - Higher level of amputation
  - LE related hospitalization

Validation of the Infectious Diseases Society of America’s Diabetic Foot Infection Classification System

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In this longitudinal study of 1666 persons with diabetes, there was an observed trend toward an increased risk for amputation ($\chi^2$ test for trend, 108.0; $P < .001$), higher-level amputation ($\chi^2$ test for trend, 113.3; $P < .001$), and lower extremity-related hospitalization ($\chi^2$ test for trend, 118.6; $P < .001$) with increasing infection severity. The Infectious Diseases Society of America’s foot infection classification system may be a useful tool for grading foot infections.

diabetic foot wounds [7–13], and some include an assessment for infection [14, 15], until recently there has been no widely accepted classification for infection severity [16]. In 2004, the Infectious Diseases Society of America (IDSA) and the International Working Group on the Diabetic Foot (IWGDF) each published a comprehensive set of guidelines for the management of diabetic foot infections that included a classification scheme for infection severity (table 1). These systems, which are essentially identical, first divide wounds by whether they are clinically infected on the basis of the presence of purulent secretions or local or systemic signs of inflammation or infection. Infected wounds are further divided into those that are considered to be mild, moderate, or severe on the basis of the size (especially involved) of the infection and the amount of the foot involved. These systems of experts in diabetes validated their foot infection staging system, and the ability of the...
Who do I call?

- OK to wait for a podiatry consult or need urgent ED eval?
- Stable/chronic vs acute or acute on chronic wounds
- Get to know your local podiatrists
- Find out which ones like limb salvage, and who covers your local hospital
- Easier if you are under one health system
- Can be more difficult if no hospital podiatrist or no local coverage
- Some hospitals covered by on-call surgeon
  - Orthopedics
  - Trauma
  - General surgeon
  - Podiatry
Surgical options

What surgical treatment will be offered?

Depends on level and extent of infection

Options range from I&D up to AKA (above knee amputation)
Levels of amputation

I&D

- Performed to reduce bioburden
  - Remove abscess, clean area
  - “Solution to pollution is dilution”
  - Often these are multi-stage procedures meaning there will be more than one surgery
  - Pt may leave with a wound VAC or packing in place
  - Traditionally packing was changed daily, but newer packing options can last 7 days
Superficial I&D

- Generally fluidic mass palpable
- Block area with lidocaine
- Incision into abscess
- Irrigate
- Pack as appropriate
  - Packing duration
Deep I&D

- Abscess extends through deep fascia
- May begin at skin but tunnel into deeper spaces or bone
- Better to do this in OR
- Abscess next to bone has higher risk of osteomyelitis
- If started in clinic, may irrigate then urgent refer for surgeon
- Superficial vs deep are not actual I&D, just for clarification
Bone debridement

- Infected bone can sometimes be removed while keeping other surrounding bone intact
- Common in isolated lesser metatarsal head procedures
- Common to avoid amputation of digit
- Common to save time - kick the can down the road
Digital amputation

- Surgical removal of part or all of a digit
- Digit 1 (hallux) very involved with balance, will impact walking after healing
- Digit 2-5 (lesser digits) little effect on balance
- No special modifications need usually to shoes/inserts other than DM shoes/inserts
- Healing can be slow depending on vascular status and WB status
Partial Ray Amputation

- Common with 5th ray
- Less common with 1st ray
- May occur in any ray
- Rays 2-4 are in a mortice, and locked
- Rays 1 and 5 have independent motion
- Loss of hallux will impact balance
- Higher energy cost for ambulation
- Vascular status and WB status have high impact on healing
- May need shoe insert with filler depending on extent of amputation
- May need PT after
Multiple Ray Amputations

- Commonly done to eliminate infection
- Sometimes are not formalized
- Rule of 1 metatarsal
- TMA if > 3 digits for stability
- Transfer lesion
- Long term ambulation
- Shoes/inserts
Transmetatarsal Amputation (TMA)

- Transverse osteotomies of metatarsals 1-5
- 1st beveled medialward and 5th beveled lateralward
- Should form a parabola for even weight distribution
- May need TAL/gastroc release
- Will need special shoes/inserts always need podiatrist during follow up
- Will need PT
- Longer the length the more functional
Tarso-metatarsal Disarticulation (Lisfranc amputation)

- Shorter than TMA
- Less functional
- Will need shoes/inserts
- Close f/u with podiatrist
- Will need PT
- May need adjunctive TAL/gastroc
- May need tendon balancing
- Increased energy cost vs TMA
Proximal amputations

- Chopart level amp (leaves talus and calcaneus)
- Symes’ amp (leaved tib/fib)
- Poor outlook with both without very specific orthoses/prosthesis
- Need special shoes/inserts
- Needs PT
- Only commonly done in certain areas of country with specialized support
- Also done on patients for source control (osteo) on non-ambulatory patients
  - WB doesn’t matter to some patients
Trans-tibial Amputation (TTA or BKA)

- Sometimes better to avoid limb salvage
- Sicker patient
- Severe PAD/CLTI (Critical limb threatening ischemia)
- Abscess extending past ankle
  - Need team to salvage these limbs
  - Hard work usually done at specialist centers or academic centers
- WISHES OF THE PATIENT
- Extensive rehab
- Long PT time frame
- Prosthetics support
- Energy cost to ambulate 40-80% higher
Extensive necrosis of heel

Not salvageable
Case

- DM pt
- Off medications - lost insurance
- Foot evaluated and felt not too bad initially
- Limb salvage consulted
- BG on admit >500 mg/dL
- Living in 300’s on floor
- On eval pt wants to know if he can go to work in a few days
Initial Debridement

- All areas of abscess need to be evaluated
- Follow where abscess leads
- No exposed bone
- Multiple deep sinus
4 weeks later
6 weeks

- Tried VAC
- Too wet in SNF environment
- Purple is methylene-blue
12 weeks

- Compliant patient
- Remained in SNF throughout recovery

**HIGH RISK FOR LIFE**

Needs long term follow up.
So When Should You Call The Surgeon?

● When did Noah build the Ark?
● Call them before you need them
● Establish your team and begin building relationships now
● Call (refer) for medical emergencies
  ○ Lymphangitis
  ○ Sepsis
  ○ Gas gangrene
● Call when you don’t know the etiology of a wound
● Call when not responding to reasonable wound care
● Refer if pt unstable
References


