Surgical Management of Diabetic Foot Infections

DR.YOUSRY ABDELAZIZ

GULF DIABETES and MEDICAL CENTRE

FACTS ABOUT DIABETES AND ITS FOOT COMPLICATIONS

- Diabetes mellitus is a well-known medical problem with a rising incidence among populations. Its known complications both vascular and neurological are leading cause to the diabetic foot phenomenon with the consequent increased risk of ulceration, infection, amputation and even mortality .
- The number of people with diabetes is increasing in every single nation
- By 2030, at least 550 million people will have diabetes- approximately 10% of the world's adult population.
- Diabetes kills more people annually than breast cancer and AIDS combined.
- Quiet. Slow. Deadly. Expensive: Chronic Diseases Account for 75% of our Healthcare Costs.

- Seconds Count: Every 7 seconds someone dies from diabetes. Every 20 seconds someone is amputated.
- 60-70% of those with diabetes will develop peripheral neuropathy , or lose sensation in their feet.
- More than 90% of people with diabetic peripheral neuropathy are unaware they have it.
- Up to 25% of those with diabetes will develop a foot ulcer.
- More than half of all foot ulcers (wounds) will become infected, requiring hospitalization and 20% of infections result in amputation.
- Diabetes contributes to approximately 80% of the 120,000 nontraumatic amputations performed yearly in the United States.

- After a major amputation, 50% of people will have their other limb amputated within 2 years.
- More than half of people with osteomyelitis of the heel will undergo high level amputation
- The relative 5-year mortality rate after limb amputation is 68%. When compared with cancer – it is second only to lung cancer (86%). (Colorectal cancer 39%, Breast cancer 23%, Hodgkin's disease 18%, Prostate cancer 8%)
- People with a history of a diabetic foot ulcer have a 40% greater 10 year mortality than people with diabetes alone.
- One third of patients seeking care for ischemic wounds die unhealed.
- For people on dialysis receiving an amputation, 2 year mortality is 74%.
- Diabetic foot ulcers double mortality and heart attack risk while increasing risk for stroke by 40%.

SURGICAL MANAGEMENT

It is clear that foot infections are common among diabetic patients with ulceration and are a major cause of hospitalization and lower extremity amputation.

Consequently aggressive and emergent surgical intervention is essential in the face of life- or limb-threatening infection to achieve limb salvage and survival.

A severe diabetic foot infection carries a 25% risk of major amputation.

A consistent stepwise surgical approach combined with sound surgical principles is paramount for successful management of the severe diabetic foot infection.

Collaboration between the medical and surgical disciplines of the diabetic foot care team determines if the patient is medically stable for the operating room for urgent surgery to control a severe diabetic foot infection. Emphasis is placed on pre-existing conditions such as renal insufficiency, coronary artery disease, peripheral vascular disease, congestive heart failure, and immunosuppression in conjunction with readily assessable clinical and laboratory findings when making this decision. Most important among these are the severity of infection based on specific tissue involvement and the presence of systemic toxicity and/or metabolic instability. Communication between the surgeon and the medical team is paramount to determine the stability of the patient and the risk the infection poses to the patient and the limb to establish the venue of management.

The initial assessment: **includes a thorough history and physical examination to determine the patient's overall medical condition.**

The history and physical examination focus on evaluating extent of systemic response to the infection by determining if the patient has a fever, rigors, nausea, vomiting, hypotension, unexplained hyperglycemia, and tachycardia. Serum chemistry analysis and hematological testing are reviewed to assess the metabolic state of the patient.

COMPONENTS OF THE FOOT EXAM

- History
- General inspection (Foot and Shoes)
- Dermatological assessment.
- Musculoskeletal assessment.
- Neurological assessment.
- Vascular assessment.
- Risk classification

The surgeon should palpate for the presence or absence of pedal, popliteal, and femoral pulses.
Clinical observation of ischemia, necrosis, and gangrene should be noted .
Determining the extent of tissue involvement is paramount in deciding if limb salvage is feasible.
The surgeon should inspect, debride, and probe the wound to determine the presence of muscle, tendon, bone, and/ or joint involvement; sinus tracts; and abscess. Deep tissue infections that can be limb or life threatening may reveal on inspection the development of superficial bullae, petechia, ecchymosis, fluctuance, and soft tissue crepitus. Pain on palpation in the presence of neuropathy may indicate deep infection.

Physical examination of the entire lower extremity, not simply the foot, is essential in determining the proximal extent of the infection.

Radiographs are obtained to determine the absence or presence of osteomyelitis, gas in the soft tissues, and foreign body.

Blood cultures should be obtained on initial presentation to evaluate for bacteremia or frank sepsis.

Cultures taken in the operating room allow the surgeon the ability of obtaining deep tissue specimens under sterile conditions. In this regard, the culture tubes should be opened prior to obtaining the culture.

Swab cultures may be taken initially, but there is debate in regard to their usefulness.

- Neurological assessment:

- Is the patient responsive to the Touch test or to a monofilament test?
- In addition, is there any deformity and/or limited joint mobility, and if so, how long has it been present?
- Is the midfoot or ankle hot, red, or swollen (Charcot Foot)?
- Is there any malalignment on gait analysis?

Vascular workup: **consisting of noninvasive and invasive vascular studies is delayed until infection is adequately controlled through urgent surgical debridement. Vascular surgery and/or endovascular intervention is not feasible or beneficial to the patient with a severe life- or limb-threatening infection until the infection is controlled through surgical debridement .**
However, vascular surgery should be consulted as soon as possible, especially in the face of ischemia,
to reach consensus on the treatment plan and to perform any needed revascularization early after the initial surgical debridement.
For a patient with a severely infected dysvascular foot, it is preferable to perform revascularization within 1 to 2 days after the initial surgical debridement .

Antibiotic treatment : **started initially is empirical and based on history, clinical appearance, and odour along with antibiotic susceptibility results to anticipated organisms at that hospital.**

For severe diabetic foot infections, initial antibiotic therapy should commence with parenteral broad-spectrum antibiotics that have activity against gram-positive cocci as well as gram-negative and obligate anaerobic organisms .

Definitive antibiotic therapy is based on culture and sensitivity results from the deep intraoperative cultures along with the patient's clinical response to the empirical antibiotic therapy.

Consideration should also be made in choosing the safest antibiotic that is most convenient to administer given that treatment may last for 6 weeks or longer.

- **Antibiotic Choice :**
- **Mild Infections :**
- **Oral antibiotics that cover skin flora including streptococci and *Staphylococcus aureus*. Agents such as cephalexin, dicloxacillin, amoxicillin-clavulanate, or clindamycin are effective choices. If methicillin-resistant *S aureus* (MRSA) infection is suspected, then clindamycin, trimethoprim-sulfamethoxazole, minocycline, or linezolid may be used. If gram-negative aerobes and/or anaerobes are suspected, dual drug treatment with trimethoprim-sulfamethoxazole plus amoxicillin-clavulanate or clindamycin plus a fluoroquinolone such as levofloxacin or moxifloxacin may be used.**

- **Moderate-to-severe infections:**
- **Patients should be hospitalized for parenteral antibiotic therapy. Empiric choices should cover streptococci, MRSA, aerobic gram-negative bacilli, and anaerobes. MRSA is covered by vancomycin, linezolid, or daptomycin. Acceptable choices for gram-negative aerobic organisms and anaerobes include ampicillin-sulbactam, piperacillin-tazobactam, meropenem, or ertapenem. Alternatively, ceftriaxone, cefepime, levofloxacin, moxifloxacin, or aztreonam plus metronidazole would be sufficient to cover aerobic gram-negative and anaerobic organisms.**

Severe diabetic foot infections require surgical intervention to control infections that may be life or limb threatening to the patient. The surgeon operating on severe diabetic foot infections must be knowledgeable of the anatomy of the foot along with the pathophysiology of ulceration and infection. In most instances, the surgeon should be experienced in the surgical management of diabetic foot infections to prevent failure of surgery and higher amputation.

During surgery, it is important to begin with a detailed wound exploration that includes the removal of all sloughed skin and the opening of sinus tracts to establish the tissue planes and the compartments of the foot that are violated.

The surgeon can now determine the portion of the foot that needs to be amputated or widely excised to adequately control the infection.

Limited incisions and drains should be avoided because infected tissue is left behind despite decompression of the infected area. All nonviable and infected soft tissue and bone, regardless of size and quantity, needs to be excised during the initial debridement to enable wound healing. Exposed tendons should be excised to prevent further tracking of the infection.

After adequate surgical debridement, the wound is then irrigated with copious amounts of saline to reduce the number of bacteria present in the wound .

The open wound is then packed with a moist dressing followed by a dry dressing. The goal is to maintain a moist wound healing environment. Dressings usually are changed daily, beginning 24 to 48 hours after the initial debridement.

Repeat debridement should be performed as needed to control infection as well as the use of negative pressure therapy to control tissue edema and help in the wound bed preparation .

Soon after the initial surgical debridement is when noninvasive and invasive vascular studies are performed.

Angioplasty, various forms of stenting, and endovascular atherectomy are valuable means of minimally invasive forms of revascularization that can be followed, if unsuccessful, by distal arterial bypass.

Peripheral arterial bypass has been shown to be a beneficial procedure for salvage of the ischemic diabetic limb with considerable tissue loss .

Obtaining long-lasting wound closure after radical surgical debridement to control infection is one of the most challenging aspects in the surgical management of the diabetic foot especially extensive soft tissue loss is usually present.
soft tissue reconstruction can only take place when infection is eradicated, nonviable soft tissue and bone are completely excised, and arterial perfusion is sufficient.
Numerous techniques are used to obtain wound closure in the diabetic foot, and the procedure chosen must be tailored to
each patient and circumstance to obtain soft tissue coverage that is durable and mechanically sound. The simplest and least invasive modalities should be used first when feasible.

The surgeon first has to decide if primary wound closure with minimal tension is possible
after revision debridement or limited pedal amputation.

Wounds that are not suitable for primary closure, particularly those with continued drainage or extensive soft tissue loss, are usually managed with wet to dry dressings in tandem with negative pressure therapy to facilitate granulation tissue formation.

In many complex wounds, plastic and reconstructive surgical techniques are later used to achieve wound closure .

When these tenets are followed, the surgeon can optimize the likelihood of limb salvage .

The goal of limb salvage is to provide the patient with a limb that is stable, mechanically sound, and resistant to further skin breakdown while resuming an ambulatory status .

Custom shoes, inserts, and/or bracing are used postoperatively to assist in achieving this long-term goal .

Unfortunately, a severe foot infection is often the “wakeup call” to the diabetic patient who did not comprehend previously the severity of the disease .

- Finally, the patient has to be better educated on his or her disease to prevent further diabetes-associated complications.
- Diabetic neuropathy is the main cause associated with majority of foot problems as due to diminished or absent sensation minor injuries will pass unnoticed leading to delayed presentation which will lead consequently to more tissue loss, morbidity and even mortality.
- This fact should encourage us to screen all diabetic patients especially newly diagnosed for neuropathy and start its treatment in early phase with patient education which will lead to early presentation and consequently less foot complications .

Any Question

THANK YOU

Dr. YOUSRY ABDELAZIZ