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MANAGEMENT OF DIABETIC FOOT INFECTION: A REVIEW

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Abstract

Diabetic foot infection is a serious complication of diabetes .Diabetic foot problems are common throughout the world, it results medical, social and economic consequences for patients. Patient at greatest risk of foot infection can be easily identified by the clinical examination of the feet. Most of the diabetic foot infections are polymicrobial infection so that need a combined antimicrobial therapy for initial management. A multi-disciplinary team approach is required for the effective management of diabetic foot syndrome. This article explains the various types of foot infections ,diagnosis and advanced management of diabetic foot infections.

Keywords: Diabetic foot infection, Wound debridement, HbA1C.

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INTRODUCTION

Diabetic foot infection is the most significant and devastating complication of diabetes, and defined as the foot affected by ulceration and also associated with neuropathy or peripheral arterial disease of the lower limb of patient have diabetes. Overall 15% of individuals with diabetes will have history of foot ulceration during their life time. The risk of diabetic foot ulceration increases with age and the severity of diabetes. Diabetic foot infection is preventable by screening the foot problems and detection of patients at high risk [1].

CLASSIFICATION OF DIABETIC FOOT INFECTIONS

Meggitt-wagner classification:

The most commonly using classification system is Wagner Diabetic Foot classification System. This system explains the gradations of superficial ulcer, deep ulcer, abscess osteitis, gangrene of the fore foot and entire foot. Only the grade 3 shows the problem of infection.

Depith-Ischemic classification:

This classification is a modification of Wagner-Meggitsystem.

This classification is more accurate, rational, easier to distinguish between wound and vascularity of foot.

University of Texas classification:

This is another popular system which incorporates lesion depth and ischemia.

This also modification of Wagner System. Each grade of Wagner System is again divided into stages according to the presence of infection or ischemia or combination of both. This system is somewhat superior for predicting the outcome in comparison to the Wagner System [2].

RISK FACTORS

The various risk factors are gender (male), duration of diabetes longer than 10 years, age of patients, high Body Mass Index, and other co-morbidities such as retinopathy, diabetic peripheral neuropathy, peripheral vascular disease, glycated hemoglobin level (HbA1C), foot deformity, high plantar pressure, infections, and inappropriate foot self-care habits.

Blood sugar control:

The patients with diabetic foot infection, control of glucose is an important factor. Inadequate blood sugar control is the primary cause of diabetic foot ulcer. HbA1C is the best indicator of glucose control.

This test measures the average bloodsugar concentration over a 90-d span of the averaged blood cell in peripheral circulation. Higher theHbA1C level leads to more glycosylation of hemoglobin in red blood cells will occur [2]

Causative organisms

Diabetic foot infections are polymicrobial infections, both gram positive and negative aerobes and anaerobes cause infections. The organisms isolated from infected foot ulcers of diabetic patients are S.aureus, S.epidermidis,E.coli,P.aureginosa, Proteus mirabilis,Klebsiellapneumonia, Candida species,Enterococcus species etc. [3]

DIAGNOSIS OF DIABETIC FOOT INFECTION

Diagnosis of diabetic foot infection is done by to observe the clinical signs such as the redness, temperature, pain,tenderness,edema and also the presence of discharge from the wound area. This discharge is taken for the culture sensitivity test for the proper antibiotic selection [4]. Patient past medical history should be focus related complications such as renal liver, cardiovascular disease, neuropathy and retinopathy. Patient complete diabetic history should be considered, including the duration of disease, insulin dependence, previous complications or ulcerations and assessment of recent glycemic control. Other physical examination should observe by acquiring vital signs, BMI and assessment of patient's general well-being. Hypothermia or fever,hypotension,tachycardia,and tachypnea are considered signs of severe infection and sepsis [5].

Examination of feet is important for physical examination of each patient. It will help to find out the neuropathic changes like dry skin, fissures, deformities, callus, ulceration, prominentveins, nail lesions,and abnormal changes of foot [6].

MANAGEMENT OF DIABETIC FOOT INFECTION

The management goals of diabetic foot infection are to closure the wounds as possible. Diabetes is a multi-organ systemic disease; all comorbidities that affect wound healing must be managed by a multidisciplinary team for obtain optimal outcomes with diabetic foot infection. Managementof diabetic foot infection includes several foot care methods. Offloading and debridement are helpful for healing of wounds [7].

Wound debridement

Debridement of diabetic foot ulcers are helps in the management of the wound. Proper debridement removes the necrotic and non-viable tissues and keeping a healthy granular wound

bed. The careful assessment need for the ulcer if ischemia is suspected. Before a debridement revascularization intervention may be necessary. Debridement is also help to stimulate the release of growth factors to promote the healing [7].

Surgical debridement

It is one of the standard methods in diabetic foot ulceration. By this method minimize the healthy tissue loss, foot function should be preserved, deformities and ulcers should be prevented. In case of ulcers with large amount of necrotic and non-viable tissues surgical debridement is done. A scalpel blade have a tip pointed in a 45-degree angle or a tissue nipper used for surgical debridement. By using this to remove all necrotic and non-viable tissues until a bleeding healthy base is obtained [7].

Enzymatic debridement

Enzymatic debridement means application of topical agents on the foot ulcer. These are applied once a daily. Enzymatic debridement produce action based on the necrotic tissue degradation using proteolytic digestive enzymes such as streptokinases, trypsin, papain, fibrinolysin-DNase, collagenase, papainurea and streptodornase. This method need long time application, as well as the high cost [7].

Mechanical debridement

This is a simple and inexpensive tool. It is used to remove both viable and non-viable pain causing tissues in insensate foot. This method use a wet gauze dressing and that applied to the wound bed and then kept it to dry. This will leads to embedded the necrotic debris in the gauze. And the gauze is mechanically stripped from the wound bed [7].

Wound care

The ideal wound dressing should be sterile and does not contaminate the ulcer with foreign particles, it readily available, can be used easily and cost effective, should keep a moist environment for adequate wound healing, should be able to absorb excess exudates from the wound, it should not adhere to the wound floor, also should be non-allergic and non-toxic. The wound dressing material should be able to protect the wound from microorganisms and also provides mechanical protection, it should maintain the adequate tissue gaseous exchange and control wound odor. The ideal dressing not only provides protection against bacterial contamination but also maintains the moisture balance, optimizes the wound pH, and reduces local pain. Nowadays advanced moist wound therapies are available, and each

therapy has its own characteristics. Hydrogels, Hydrocolloids, Alginates, and silver compounds have been found to promote wound healing and reduce bacterial contamination. Various dressings are available to target specific characteristics of the wound. The normal-saline dressings are suitable for most of the wounds. [7]

Surgical Management

Diabetic foot surgery plays a important role in the prevention and management of diabetic foot infection. Most of the surgical interventions for patients with diabetic foot infection are not without risk. In the general surgery for diabetic foot ulcer healing includes non vascular and vascular foot surgery. Nonvascular foot surgery is divided into elective, prophylactic, curative, and emergent surgeries that help to correct deformities. Vascular foot surgery means bypass grafts from femoral to pedal arteries and peripheral angioplasty will improve blood flow of recently developed ischemic foot. This type of surgical procedures help to heal ischemic ulcers. The primary aim of diabetic foot infection management focuses on limb salvage and in some cases amputation may produce a better functional outcome. In case of general, amputation is considered as an urgent or curative surgery and should be the last for after all other salvage techniques. Amputation include the removal of infected or gangrenous tissues, control of wound infection, and creation of a functional foot or stump that can accommodate the footwear or prosthesis [8].

TREATMENT OF INFECTION

Infection is the common component of diabetic foot ulcers which act as an entry route for pathogens. High level of pathogens delays or prevents wound healing. Majority of diabetic foot infections are polymicrobial so we need a combined antimicrobial therapy for the management. Selection of antibiotics based on the culture sensitivity test. Mostly all antibiotic were given for seven days and it extends depends on the depth and healing of the ulcers. For proper management of diabetic foot infection should have knowledge about the antibiotic sensitivity pattern. Staphylococcus aureus as the common isolate for the diabetic foot infection. Staphylococcus species are susceptible to vancomycin, tigecycline, teicoplanin and linezolid. Enterococcus species susceptible to vancomycin. Most of the Klebsiella and Acinetobacter isolates were resistant to cefoperazonesulbactam, co-trimoxazole and piperacillin-tazobactam [9].
Basic principles of foot care in clinic and home

- Examine the feet daily for discoloration, swelling, skin cracks, pain or Numbness

- Use the self help methods for foot examination by using mirrors.
- Follow the foot hygiene (daily washing, followed by drying feet carefully, especially between the fingers).
- Control water temperature before washing the foot
- Avoid barefoot or wearing shoes without socks
- To choose correct sizeshoes, the best time for buyingshoes is in the afternoon.
- Avoid the manipulation of foot lesions such as corn
- To keep wet the dry surfaces of foot by moisturizing creams except
- between the fingers [10].

CONCLUSION

Diabetic foot is the common cause of hospitalization in diabetic patient's leads to lower limb amputation unless a prompt, rational, multidisciplinary approach therapy is taken. Diabetic foot infection is generally preventable. The ulcer prevention can be done by the careful screening of foot problems and careful detection of patients at high risk. The management of diabetic foot infection includes education, blood sugar control, wound debridement, advanced dressing, offloading, surgery, and advanced therapies which can be used clinically.

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