

Case Report

Precautionary measurements and rationale use of antibiotics in diabetic foot ulcer can save amputation: A case report

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Accepted 16 May, 2012

Diabetic foot is one of the major and most frequently occurring complications of diabetes mellitus (DM). There are many underlying factors for the development of diabetic foot ulcer. Among these factors poor supply of blood to lower extremities due to increase peripheral resistance in blood vessels (PVD), presence of Ischemia, infection or trauma to foot. The present case report is under discussion to rationalize the proper use of antibiotics in diabetic foot ulcer and a few safety recommendations. A male diabetic patient with 25 years span of diabetes was reported with some complications regarding small ulcer on big toe of right foot. The patient was in usual state of health when he noticed putrid smell and drainage of pus on the big toe of right foot. Patient was carrying insulin dependent diabetes mellitus (IDDM) with well controlled sugar level. He had gone through amputation of left knee and 2nd phalange of right foot. Currently, the patient was under uncontrolled hypertension and was gradually moving towards complications of diabetes. He was on the following medication during his hospital stay: Pletal tablet 50 mg BD (cilostazol for peripheral vasodilation), Oflobid tablet (ofloxacin) 200 mg BD (anti-bacterial), Amlocard tablet 5 mg BD (that is amlodipine), Surbex-Z tablet BD (multi-vitamins), vomilux tablet 10 mg (para-aminobenzoic acid as anti-spasmodic), methycobal tablet 500 mg BD and loftyl tablet 150 mg (buflomedil for chronic venous insufficiency). During hospital stay, patient was treated with third generation cephalosporin (rocephin injection 1G BID) and ofloxacin for follow up therapy. Patient has hepatitis C positive. Critically observing the treatment offered for diabetic foot ulcer does not justify the pathophysiology of disease. Microbial flora coverage and aggressive treatment was nowhere in the course of therapy. In follow up visits, no precautions were given to the patient to avoid further amputation. The aim of this study is to emphasize the need of appropriate selection of antibiotics and dosage form of antibiotics. Moreover, this study focuses on aggressive treatment of diabetic foot ulcer. This case report is serving as continuous medical education activity for medical professionals as well as sufferers.

Key words: Diabetes, trauma, hypertension, Type II DM, peripheral vascular disease (PVD), medication, hepatitis C.

INTRODUCTION

Diabetes mellitus is a syndrome having many secondary complications. This situation becomes alarming when patient is struck with the fear of limb loss (amputation). In the United State, its prevalence ranges from 1 to 4%;

4.6% in Kenya and 20.4% in Netherland (Bartus and Margolis, 2004; Nyamu et al., 2003; Bouter et al., 1993). Prospective studies conducted in hospitals demonstrated that occurrence of loss of limb was 11.7%, while it was 19.1% in diabetics individual (Unachukwu et al., 2007; Fard et al., 2007). The prevalence of the disease in Iran was 20% in diabetic hospitalized patients (Fard et al., 2007). In general, the rate of amputation is increasing and

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and it is 5% among Canadian population. This rate is assumed to double in the following 10 years (Tan et al., 1997). The International Diabetes Federation feels the need to focus on overwhelming rate of diabetic foot ulcer in 2005. Risk of developing diabetic foot in diabetic increases in life by 25% (Singh et al., 2005) and there is loss of limb after every 30 s due to diabetes (International Diabetes Federation, 2005). Foot infections are the most frequently occurring infection which needs hospitalization of diabetics. Amputation usually damage lower limb due to many factors like ischemia or peripheral vascular disease (PVD) trauma and hyperglycemic condition, all of which ultimately leads to the loss of limbs.

Another underlying cause of foot ulcer which worsens the condition of foot ulcer is peripheral neuropathy which may lead to shunting blood away from its vascular bed, thus resulting in the poor supply of nutrients, oxygen and healing factors. In normal individuals, this result in edema or bruises on the skin, and the individual also feels pain and discomfort which compel him to go for therapy. In peripheral neuropathy, patient lose this sensation of pain and continue to work in routine life which lead to so miserable condition that end with loss of limb. A prospective study showed that the loss of sensation to the 10 g filament on the sole of the foot was associated with a 10-fold risk of foot ulceration and a 17-fold risk of amputation over a 32-month follow-up period (Rith-Najarian et al., 1992).

Different treatment protocols are available for diabetic foot ulcer and only requirement is to diagnose the causative pathogen. As it is well established, diabetic foot is polymicrobial disease. Among pathogens, *Staphylococcus aureus* predominates and prevalence of methicillin-resistant *S. aureus* (MRSA) in infected foot ulcers is 15 - 30%, and there is an alarming trend in many countries (Eleftheriadou et al., 2010). The aim of this study is to highlight the facts regarding the microbial flora in diabetic foot ulcer and selection of suitable antibiotic that can justify its rational use to save amputation. This case report highlights the importance of infusion in clinically serious infections.

CASE REPORT

A male diabetic patient of 55 years was subjected to admission in a well reputed government Hospital. The patient was suffering from diabetic foot secondary complication of diabetes mellitus. He was a well controlled diabetic since 1985 and for the first time he was hospitalized in 2005 for surgical procedure due to left foot Ulceration. The surgeon recommended amputation of left leg below knee to save rest part of the leg. After amputation, patient was discharged and was advised on insulin control for diabetes. However, in 2010 (five years after), this patient again observed the pus and putrid discharge under the great toe of his right leg. He was

again hospitalized in November 2010 and was examined by surgeons and this time he had additional complication of hypertension.

During this stay, it was noticed that the patient is hepatitis C virus (HCV) positive and sensitive to quinoline (anti-biotic, quinolone), hence the patient remained on different therapies to prevent amputation. Surgeon recommended augmentin tablet (co-amoxiclav), oflobid tablet (ofloxacin) BiD, lisinopril tablet (HS, insulin 70/30 subcutaneous) 40 IU in the morning and 28 IU in the evening, clexane injection (anticoagulant) 80 S/C alternative days (enoxaprin), and herbesser tablet (antihypertensive). All these therapies failed to save amputation and patient great toe and 2nd phalange of right foot was subjected to amputation. After 63 days of therapies and fear of loss of limb, the patient was discharged when the fear became a fact.

DISCUSSION

In view of the cited case report, it is revealed that proper, timely and aggressive treatment is required to save amputation. The evaluation of the vascular status and the severity of ischemia of the lower limbs have a strong predictive value in the outcome of these infections (Diamantopoulos et al., 1998). Patient has been subjected to amputation two times and for both times, surgical repetition was done. In 2010, the patient was admitted a second time when disease was earlier diagnosed and aggressive treatment could save loss of limb. The patient was hospitalized a second time for the period of two month. In this critical period of treatment, targeted drug therapy was required for specific pathogen responsible for this complication. Aggressive treatment means full therapeutic dose of antibiotic in intravenous form so that particular pathogen can be eradicated and healing can be facilitated. Selection of antibiotic agent in diabetic foot infection requires knowledge about pathological agents and complication level of infection (Lipsky, 2001).

It is an established fact from data that *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Pseudomonas aeruginosa* and *Escherichia coli*, Gram negative bacteria have been dominant than Gram positive strains (Sotto, 2010) in diabetic foot. In the current case, the surgeon prescribed ofloxacin (quinolone), co-amoxiclav for Gram negative and positive bacteria in tablet form which negate the aim of aggressive therapy. The patient was also placed on third generation cephalosporin antibiotic in infusion form for shorter span of time, which is effective against Gram positive and negative bacteria. Overall, the treatment protocols adopted for this complicated case were empirical in its sense. No tissue culture was done to select a specific antibiotic for particular strains of causative pathogen and drug interaction has not been given primary importance in this complicated case. Co-amoxiclav, moxifloxacin and enoxaparin were prescribed

in a random way, omitting the fact that all these drugs increase international normalized ratio (INR) and increase bleeding time which can lead to another complication.

Patient was also diagnosed hepatitis C virus (HCV) positive and suffering from liver infection, which in future could be another hazard. In spite of all these facts, all the antibiotics are prescribed in oral formulation owing to its metabolism in liver which may further contribute to hepatic dysfunction. Acute infection should be given high priority by giving intravenous infusion. The main issue in antibiotic therapy is achieving adequate serum levels and delivering the drug at a therapeutic concentration to the infected site. Intravenous antibiotics are indicated for patients who are systematically ill, have a severe infection, are unable to tolerate oral agents, or suspected to have pathogens that are not sensitive to available oral agents. There was diabetes born complication that is hypertension which verifies the fact that hypertension can be result of secondary complication of diabetes (Huma et al., 2011).

Another fact went unnoticed throughout the course of therapy that diabetic foot infection may be due to vascular insufficiency to lower extremities. One possible reason was the decreased bioavailability of the drug and poor penetration to the affected organ, which led to poor therapeutic outcomes and inability of therapeutic agents to facilitate healing of wounds. Efficacy of any antibiotic in diabetic foot infection (DFI) is dependent on its tissue penetration. Therefore, drugs that are circulated through intracellular fluid (lymph fluid) should be recommended. The entire therapeutic agent recommended to this patient have acceptable penetration in different areas compared to clindamycin (dalacin); its penetration is more than sufficient to meet minimum inhibitory concentration (MIC) for many pathogens. Investigation reported that clindamycin show good penetration in bones, muscles, fats, abscesses, pressure sores and various body secretions (Vacek et al., 1972; Nicholas et al., 1975; Smilack et al., 1976; Berger et al., 1978; Dhawan and Thadepalli, 1982; Brattstrom et al., 1988). The microbial coverage of clindamycin justify its used in diabetic foot infection.

Concentration of clindamycin in tissue and serum of patients receiving 600 mg and 900 mg intravenous infusion in diabetic foot with neuropathy were found to be 0.04 - 2.8 mg/kg in tissues and 1.1 to 11.1 mg/L in serum (Duckworth et al., 1993). In the current study, nine of the eleven tissue samples the clindamycin concentration exceeded the MICs reported for many pathogens commonly involved in such infections. Clindamycin (7-chloro-7-deoxy-lincosamide) is a valuable option, because this lincosamide antibiotic is active against *Staphylococci*, *Streptococci* and anaerobic bacteria (Mandell et al., 2000). A study by Mandell et al. (2000) also demonstrated that continuous infusion of clindamycin is feasible, convenient and safe. In addition, another study emphasized that disease relapse rate is less with clindamycin as

compared to other combination (Samad et al., 2008). Clindamycin in combination with ciprofloxacin not only proved effective but also has reduced the cost of treatment and hospital stay (Sesin et al., 1990). The combination of ciprofloxacin/clindamycin was found to provide an excellent empirical as well as definitive treatment of severe diabetic foot infections (Sesin et al., 1990).

Recommendation

In skin and soft tissue infection like diabetic foot, focus should be on the prevention and not just cure, and measurements should also be adopted to prevent hospitalization. Among these measures are:

1. Inspection of your skin daily and cleaning the space between fingers to avoid hidden infections.
2. Bathing fingers of hands and feet with normal water (not hot water) and application of lotion for cleaning purpose.
3. Corns and calluses should be treated in particular ways to avoid complication.
4. Socks and full covered shoes should be used.
4. Clindamycin and amino glycoside in combine form must be recommended in case of serious infections.

Conclusion

This discussion reveals that timely diagnosed diabetic foot ulcer; proper selection of antibiotic for specific pathogen and aggressive therapeutic dose alone or in combination in infusion can save amputation and increase the quality of life of diabetic patients. Clindamycin is a drug of choice for such cases. In the present study, aggressive therapy has not been adopted, that is why prognosis led to the loss of limb. This study therefore emphasizes the need for selection of appropriate antibiotic, dosage form and aggressive treatment as the educational and professional outcome of this study.

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