

The Role of Carbapenems in the Management of Diabetic Wounds

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Diabetic Wounds

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ABSTRACT

Objective: To study the role of Carbapenems in the Management of Diabetic Wounds.

Study Design: Prospective Study

Place and Duration of Study: This study was conducted at the Idris Teaching Hospital Sialkot from January 2014- Nov 2017.

Materials and Methods: To study the role of Carbapenems in the Management of Diabetic Wounds. One hundred patients of diabetic wounds were included in this prospective study during January 2014- Nov 2017 at Idris Teaching Hospital Sialkot. Carbapenems antibiotic one gram twice daily was given to all patients in this study. The performa was designed to record age, gender, duration of treatment, grades of the wounds & area of the body involved in diabetic wounds. Informed consent of all the patients was considered before treatment and permission of ethical committee of the institute was also obtained.

Results: The diabetic wounds were more common in female 63 (63%) as compare to male 37(37%) as shown in table no.1. The common age range was 50-60 years 35 (35%) cases in female and 20 (20%) cases in male as shown in table no.1. The incidence of diabetic wounds of foot, legs, back, and hands was 86%, 3%, 5% and 6% respectively as shown table no.2. It showed that the foot was most common area involved in diabetic wounds 86 cases (86%). The incidence was in different grades of the wounds (I-V), 20 (20%), 30 (30%), 20 (20%), 15 (15%) & 15 (15%) respectively as shown in table no. 03. It showed that the incidence of grade II wounds was maximum 30 (30%). In grades of wounds from I-V, the duration was 3-7 days, 8-15 days, 16-30 days, 31-45 days, 46-60 days respectively as shown in table no.03.

Conclusion: It showed that wounds of the grade 2 have maximum incidence 30 (30%) as compared to other grade of the wounds.

Key Words: Carbapenems, Management, Diabetic Wounds

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INTRODUCTION

At some time in their life, 15% of people with diabetes develop foot ulcers. Eighty-five percent of amputations are preceded by an ulcer¹ and there is an amputation every 30 seconds throughout the world.² The main reason for this is that foot ulcers are highly susceptible to infection.³ This may spread rapidly leading to overwhelming tissue destruction and the need for amputation. Guidelines on the Diagnosis and Treatment of Diabetic Foot Infections have been issued from the Infectious Diseases Society of America (IDSA)⁴ and also by The International Working Group on the Diabetic Foot, which produced its International Consensus Guidelines on Diagnosing and Treating Infected Diabetic Foot in 2003⁵ and recently guidelines

for the treatment of Diabetic Foot Osteomyelitis in 2007.^{6,7} New developments have recently been reviewed by Lipsky.⁸

Various classifications of infection exist and the ISDA has staged infection from mild to moderate to severe.⁴ Mild infection is characterized by the presence of 2 manifestations of inflammation (purulence, or erythema, pain, tenderness, warmth or induration), with cellulitis/erythema extending less than 2 cm around the ulcer, and infection is limited to the skin or superficial subcutaneous tissue with no other local complications or systemic illness. In moderate infection, the patient has one of the following characteristics: cellulitis extending >2 cm, lymphangitic streaking, spread beneath the superficial fascia, deep-tissue abscess, gangrene, and involvement of muscle, tendon, joint or bone, but is systemically well and metabolically stable. In severe infection, the patient has systemic toxicity or metabolic instability (e.g., fever, chills, tachycardia, hypotension, confusion, vomiting, leukocytosis, acidosis, severe hyperglycemia, or azotemia). Validation of the IDSA's diabetic foot infection classification system has been reported in a longitudinal study of 1666 persons with diabetes.⁹ There was an observed trend toward an increased risk for amputation, higher-level amputation and lower extremity-related

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hospitalization with increasing infection severity. Other classifications include limb threatening and non-limb threatening infections.¹⁰

Carbapenem is a broad-spectrum antibacterial agent of the carbapenem class. Carbapenem has excellent activity against a broad range of bacteria including many Gram-positive and Gram-negative pathogens, including many potentially resistant strains such as *Pseudomonas aeruginosa*, as well as anaerobic organisms.

Globally, diabetic foot ulcers are one of the major public health problems leading to socioeconomic burden to the suffering individuals.^{1,2} Around 15% of all diabetic patients develop a foot ulcer that is highly vulnerable to infections, at some time in their life.³ Foot ulcer infections usually spread rapidly on account of polymicrobial growth, predominantly consisting of aerobic, Gram-positive and Gram-negative organisms.^{4,5} In recent years, the number of the incidents and complications-related to diabetic foot infections (DFIs) has drastically increased due to increased incidence of multidrug-resistant organisms.⁶ Adequate management of these infections needs appropriate antibiotic selection on the basis of culture and susceptibility test reports.⁷ Knowledge of microbes that cause infections is helpful in determining proper antibiotic therapy.³ Hence, this pilot study was undertaken in order to investigate the antimicrobial susceptibility pattern of microbes isolated from diabetic wounds.

MATERIALS AND METHODS

To study the role of Carbapenems in the Management of Diabetic Wounds. One hundred patients of diabetic wounds were included in this prospective study during January 2014- Nov 2017 at Idris Teaching Hospital Sialkot. Carbapenems antibiotic one gram twice daily was given to all patients in this study. The performa was designed to record age, gender, duration of treatment, grades of the wounds & area of the body involved in diabetic wounds. Informed consent of all the patients was considered before treatment and permission of ethical committee of the institute was also obtained.

RESULTS

The diabetic wounds were more common in female 63 (63%) as compare to male 37(37%) as shown in table no.1. The common age range was 50-60 years 35 (35%) cases in female and 20 (20%) cases in male as shown in table no.1. The incidence of diabetic wounds of foot, legs, back, and hands was 86%, 3%, 5% and 6% respectively table no.2. It showed that the foot was most common area involved in diabetic wounds. The incidence was in different grades of the wounds (I-V), 20 (20%), 30 (30%), 20 (20%), 15 (15%) & 15 (15%) respectively as shown in table no. 03. It showed that the

incidence of grade II wounds was maximum 30 (30%). In grades of wounds from I-V, the duration of treatment was 3-7 days, 8-15 days, 16-30 days, 31-45 days, 46-60 days respectively as shown in table no.03. It showed that wounds of the grade 2 have maximum incidence 30 (30%) as compared to other grade of the wounds.

Table No. 1 Age & Gender Distribution in role of Carbapenems in Diabetic Wounds

Sr#	Age (Years)	Male (%) N=37	Female (%) N= 63
1	30-40	04 (4%)	5 (5%)
2	41-50	10 (10%)	15 (15%)
3	51-60	20 (20%)	35 (35%)
4	61 & above	3 (3%)	8 (8%)
	Total	37 (37%)	63 (63%)

Table No. 2 Distribution of Area of the body in Diabetic Wounds

Sr#	Area of the Body	Cases	Percentage %
1	Foot	86	86%
2	Legs	3	3%
3	Back	5	5%
4	Hands	6	6%
	Total	100	100%

Table No. 3 Duration of Treatment in Different Grades of Diabetic Wounds

Sr#	Duration of Treatment (Days)	Grades of Wounds	No. of Cases (%)
1	3-7	Grade I (Superficial Ulcer)	20 (20%)
2	8-15	Grade II (Excluding up to tendon, ligament or joint capsule)	30 (30%)
3	16-30	Grade III (Abscess formation or Osteomyelitis)	20 (20%)
4	31-45	Grade IV (Forefoot Gangrene)	15 (15%)
5	46-60	Grade V (Whole foot Gangrene)	15 (15%)
	Total	100	100%

DISCUSSION

Foot infections are common in individuals with diabetes.¹¹ Among the decisions that the clinician treating such a patient must select the most appropriate

antibiotic regimen, usually in the face of inadequate microbiological information. If too narrow a spectrum is chosen, there is a risk of missing a pathogen in these often polymicrobial infections, potentially leading to a poor clinical outcome.¹² Opting for unnecessarily broad-spectrum therapy contributes to the growing problem of antibiotic resistance, and potentially increases the risk of drug toxicity and treatment expense. Some basic principles can provide guidance. First, criteria established by the Infectious Diseases Society of America¹³ or the International Working Group on the Diabetic Foot¹⁴ should be used to determine the severity of the infection. Broad-spectrum therapy is usually needed only for patients with severe infections; these require an adequate antibiotic regimen until the results of culture are available.¹⁵ Mild, and most moderate, infections can often be treated with an agent with a more narrow spectrum of activity.¹⁶ Even if some organisms isolated from an infection are found to be resistant to the selected regimen, most patients with non-severe infections will improve (or at least stabilise) if they receive proper supportive care,¹⁷ debridement, pressure off-loading and wound care. Second, therapy should virtually always include coverage for aerobic Gram-positive cocci, especially *Staphylococcus aureus*, which is both the most frequent and virulent pathogen isolated. Whether or not empirical coverage for methicillin-resistant *S. aureus* (MRSA) should be provided is a growing concern worldwide¹⁸. This decision depends largely on the overall local prevalence of MRSA, and the presence or absence of risk-factors for MRSA infection, e.g., recent hospitalisation or residence in a healthcare facility, recent antibiotic therapy or a requirement for renal dialysis. Agents that cover *S. aureus* will usually cover the β -haemolytic streptococci that are also relatively frequent pathogens. While enterococci are often isolated from diabetic foot infections, they are rarely primary pathogens.¹⁹

This is a carbapenem given once daily and is useful against Gram-positive and Gram-negative organisms and also anaerobes. It is generally given to adults as a 1 g dose, once a day, by intravenous infusion or intramuscular injection. It may be given intramuscularly as 1 g diluted with 3.2 mL of 1% lidocaine.

In a recent study ertapenem was shown to be equivalent in action with piperacillin/tazobactam in treating infected diabetic feet.¹¹ In the Sidestep study, 586 patients were randomized into two treatment groups to receive intravenously either ertapenem 1 g once daily (n = 295) or piperacillin/tazobactam 3.375 g every 6 hours (n = 291) for a minimum of 5 days with the option to switch to oral amoxicillin/clavulanate for a total of 5 to 28 days of treatment (parenteral and oral). Patients were assessed by their clinical response between treatment groups at the 10-day post therapy follow-up visit. Of

those patients described as evaluable (ertapenem n = 204; piperacillin/tazobactam n = 202), 75.0% of the patients taking ertapenem had a favorable clinical response compared to 70.8% of the patients taking piperacillin/tazobactam (CI = 95%).

Baseline characteristics of the 108 diabetic foot ulcer patients taken for the study showed 72.2% (78/108) were males and 27.8% (30/108) were females. Increased male prevalence has been reported in other studies.[20] In our study the female prevalence was 63 (63%) & male 37 (37%) had been observed.

In our study the diabetic wounds were more common in female 63 (63%) as compare to male 37(37%). The common age range was 50-60 years 35 (35%) cases in female and 20 (20%) cases in male. The incidence of diabetic wounds of foot, legs, back, and hands was 86%, 3%, 5% and 6% respectively. It showed that the foot was most common area involved in diabetic wounds. The incidence was in different grades of the wounds (I-V), 20 (20%), 30 (30%), 20 (20%), 15 (15%) & 15 (15%) respectively. It showed that the incidence of grade II wounds was maximum 30 (30%). In grades of wounds from I-V, the duration of treatment was 3-7 days, 8-15 days, 16-30 days, 31-45 days, 46-60 days respectively.

CONCLUSION

It showed that wounds of the grade 2 have maximum incidence 30 (30%) as compared to other grade of the wounds.

Author's Contribution:

Concept & Design of Study:	Rehan Anwar
Drafting:	Asif Javed
Data Analysis:	Mansoor Hassan, Abdul Hamid
Revisiting Critically:	Rehan Anwar, Asif Javed
Final Approval of version:	Rehan Anwar

Conflict of Interest: The study has no conflict of interest to declare by any author.

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