

SOFT TISSUE INFECTIONS OF FOOT IN DIABETIC PATIENTS ⁺

Khwam Reissan Al-Husseiny*

Abstract

This study was carried out in Al-Nasseria Hospital , Forty- two specimens were obtained patients (31maels and 11 females patients) underlying diabetic foot infections. All wound swabs were cultured directly under aerobic and anaerobic conditions.

Aerobic isolates were the most common pathogens as *Proteus spp.* (24.52%), *Staphylococcus aureus* (16.98%), *Klebsiella spp.* (15.09%) and *Streptococcus spp.* (15.09%) *Pseudomonas spp.* (9.43%) ,*Enterobacter spp.* (7.54%) and *Escherichia coli* (5.66%) respectively ,while anaerobic isolates with low frequently such as *Bacteroides spp.*(5.66%).

Results of 12 types of antibiotic sensitivity which used in the hospital showe that Ciproflaxcin and Gentamycin are the highly effective antibiotic agents Gram-negative isolates and mild effective against Gram-positive isolates .On the other hand b- lactame group antibiotics was low effective against isolates.

المستخلص

أجريت هذه الدراسة في مستشفى الناصرية العام . تم اخذ ٤٢ نموذجا (٣١ من الذكور و ١١ من الاناث) من المرضى المصابين بخمج أنسجة القدم الرخوة ويعانون من مرض السكري. زرعت النماذج على أوساط زرعيه مناسبة وحضنت في ظروف هوائية ولاهوائية.

اظهرت النتائج ان العزلات الهوائية هي السائدة على التوالي بكتريا المتقلبات *Proteus spp.* (24.52%) ؛المكورات العنقودية الذهبية *Staphylococcus aureus* (16.98%) ؛ الكليسيلا *Klebsiella* (15.09%) ؛المكورات السبحية القحيحة *Streptococcus pyogenes* (15.09%) ؛الزوائف *Pseudomonas spp.* (٩,٤٣%) ؛ انتيروباكتري *Enterobacter spp.* (٧,٥٤%) ؛ والعصيات القولونية *Escherichia coli* (5.68%).بينما كانت العزلات اللاهوائية متمثلة ببكتريا البكترويد *Bacteroides spp.*(5.68%).

وكذلك اظهرت نتائج فحص الحساسية للعزلات الاكثر تواجدا تجاه المضادات الحيوية المستعملة في المستشفى ،ان عقار السيبروفلاكساسين Ciproflaxacin وعقار الجنتاميسين Gentamycin هما اكثر المضادات الحيوية

⁺ Received on: 8/5/2004 - Accepted on: 12/2/2005

* Lecturer / Technical Institute -Al-Nasseria

المستخدمة تأثيرا في البكتريا المعزولة،بينما اظهرت المضادات الحياتية من مجموعة البيتا- لاكتم Lactame -b
تأثير اقل .

Introduction

Diabetic foot infection remains one of the most common reasons for hospital admission ,Epidemiological studies have shown that the relative frequency of foot cellulitis is more than nine times greater in diabetic compared with non diabetic patients[1].

Ulceration of the foot is the most common event for infection , perhaps 40-80% of the ulcers will become infected. Fortunately, most infections will be superficial, but about 25% will spread contiguously from the skin to the deeper subcutaneous tissues, including bone[2].

Infection may be due to a single microorganism (monomicrobial), or more than one (polymicrobial) .The predominant bacteria of normal skin are Gram-positive aerobes, particularly the low-virulence coagulase negative *Staphylococci*, β -hemolytic *Streptococci* and *Corynebacteriae*[3].

When the skin is diseased or when the patient has certain underlying disorders , the colonizing flora change to pathogens [4].

[5] demonstrated that diabetic foot infections can increase in severity in a matter of days, or even hours. Infection should be suspected at the first appearance of a foot problem (e.g. pain, swelling, ulceration) or a systemic disorder (e.g. fever, malaise, poor glycemic control).

In addition to proper cleansing , debridement and local wound care ,foot infections in diabetic patients require carefully selected antibiotic therapy, serious infections necessitate hospitalization for initial parental broad-spectrum antibiotic therapy[6,7].

The aims of this study is to determine the prevalence of the pathogens causing the diabetic foot infections ,and their antibiotics susceptibility to treat these infections.

The case notes : All diabetic patients were admitted with foot infection to surgical departments of General Al-Nasseria Hospital between 15 October 2001 to 30 June 2002.

Forty two deep swabs were obtained from forty two patients underlying diabetic foot infections, each patient's record was queried for information to include age, gender, preexisting illnesses, site of infection, blood glucose and drugs.

All wound swabs were cultured directly on two blood agar and two MacConky agar plates under aerobic and anaerobic conditions at 37C° for 24-48hr.

The pathogenic bacteria were identified by culture characteristics,through Gram stain and biochemical reaction , on the other hand API 20 E test was used to confirm the identification of microorganism in this study[8].

Antibiotic sensitivity tests were carried on Muller-Hinton agar by using the disc diffusion method [9] . 12 types of the available antibiotics discs (used in the hospital) were used in order to evaluate the sensitivity of isolated bacteria to antibiotics.

Results and Discussion

Forty two patients with diabetic foot infections (31 males and 11 females) were studied during work period. Their mean age was 55 years (table 1).

Table (1) : The distribution of diabetic foot infections in males and females

Gender	No.	%
Males	31	73.92
Females	11	26.18

Twenty four patients were insulin dependent ,and 18 patients non-insulin dependant.

The most common aerobic isolates from diabetic foot infections were *Proteus spp.*(24.52%),*Staphylococcus aureus* (16.98%), *Klebseilla spp .(15.09%)*, *Streptococcus spp. (15.09%)*, *Pseudomonas spp.*(9.43%),*Enterobacter spp.* (7.54%) and *Escherichia coli* (5.66%) respectively ,while anaerobic isolates with low frequency were such as *Bacteroides spp.*(5.66%),(table 2).

Table(2):The total pathogens were isolated from diabetic foot infections.

Erobic pathogens	No.	%
<i>Proteus spp.</i>	13	24.52
<i>S.aureus</i>	9	16.98
<i>Klebseilla spp</i>	8	15.09
<i>Streptococci spp</i>	8	15.09
<i>Pseudomonas spp</i>	5	9.43
<i>Enterobacter spp</i>	4	7.54
<i>E. coli</i>	3	5.66
Anaerobic pathogen		
<i>Bacteroides spp.</i>	3	5.66
Mixed growth	11	20.75
Total	53	100

Moreover, table (2) shows mixed growth shat represents (20.75%) of total isolates.

The Susceptibility test results to antibiotic of all isolates are shown in table 3 . Ciproflaxacin , Gentamycin were highly effective against most isolates , while resistance to Ampicillin and Cephalosporin was mostly encountered with *Klebseilla* ,*Pseudomonas* ,*Proteus* and *S.aureus*

Table(3): The suscepiblity pattern (percentage) of 0common isolates agents antibiotic

Isolates	AK	AML	AMP	CIP	CTX	GM	KF	NA	RD	SXT	TE	TOB
<i>Proteus</i> 13	62	54	46	100	38	92	54	69	77	62	46	62
<i>S.aureus</i> 9	78	67	56	89	67	89	56	44	7	67	34	78
<i>Klebsiella</i> 8	63	38	25	100	38	100	38	75	75	50	38	63
<i>Streptococcus</i> 8	NT	88	75	88	63	75	88	63	75	75	75	NT
<i>Pseudomonas</i> 5	80	40	20	100	40	100	20	60	60	80	40	80

AK:Amikacin,
CTX:Cefotaxime,
RD:Refampcin,

AML:Amoxicillin ,
GM:Gentamycin,
SXT:Trimethoprine,

AMP:Ampicillin,
KF:Cephalosporin,
TE:Tetracycline,

CIP:Ciprofloxacin
NA:Naldix acid
TOB:Tobromycin

From the results there is a male predominance (73.92%) in this study ,this agrees with results of several investigatos ,that can be explained by poor foot care in males or that males are subjected to more foot trauma than females who are mostly at home or that males are less complaining of their anti-diabetic treatment [10 ,11].

The most common isolates from diabetic foot infections were aerobic Gram-negative pathogens ,this is agreed upon by several studies [11,12,.].

Table (2) shows the predominant isolates with frequencies such as *Proteus* ,*Staph.sureus* ,*Klebseilla* ,*Streptococcus* ,*Pseudomonas* , *Enterobacter* and *E.coli* . However anaerobic pathogen such as *Bacteroides* was isolated with low frequency, this goes with results from researchers other , who found the aerobic pathogens is the most common isolates from diabetic foot infections [12, 13].

Moreover, mixed growth of pathogenic bacteria was isolated from diabetic foot infections (20.75%),this is in agreement with Al-Sarray [13] who found that about 20% of these infections were with mixed growth (growth of more than one pathogen) ,common mixed growth showed the isolation of *S.aureus* and *Proteus* ;*Klebsiella* and *Proteus* .

On the other hand, it appears from the results , that Ciprofloxacin and Gentamycin are the most suitable antimicrobial agents for the treatment of serious Gram-negative and Gram-positive pathogens, this is in agreement with results obtained by McIntyre *et al.*[1], Boulton *et al.* [3] and Lipsky [4] who found the common aerobic pathogens are highly sensitive to Gentamycin , and Ciprofloxacin .Moreover resistance to β -lactame antibiotics *in vivo* transfer of resistance from pathogen to other can occur, due to plasmid transfer [7].

References

1. McIntyre , B.R. and Deitch,E.A.. “Diabetic Foot Infections : Pathophysiology and Treatment” .*Surg. Clin. Am.*,Vol. 74: pp. 537 –555, 1994.
2. Cook, T. A. ;Rahim, N. ;Simpson, H.C.R. and Galland, R.B. “Magnetic Resonance Imaging in the Management of Diabetic Foot Infections,”*Br. J.Surg.*,Vol. 83.pp. 245-248,1996.
3. Boutton,A.J. and Vileikyte ,L. “Pathogenesis of Diabetic Foot Ulceration and Measurements of Neuropathy . Wounds ,Vol.12 (Supp.B).pp.12B-18B,2000.
4. Lipsky, B. A.; Pecoraro, R. E. and Wheat, J.L. “The Diabetic Foot : Soft Tissue and Bone Infection” .*Infect.Dis. Clin. N. Am.*,Vol.4.pp. 409-432,1990.
5. Chantelaue, E.; Tanudjaja, T; Altenhofer, F.; Ersanli, Z.; Lacigova, S.; and Metzger, C. “Antibiotic Treatment For Uncomplicated Neuropathy For foot ulcers in Diabetes. A Controlled Trial .*Diabetic Med.* ,Vol.13.pp. 156-159, 1996.
6. Currie, C. J.; Morgan, C. L. and Peters,J.R. “The Epidemiology and Cost of in Patient Care for Peripheral Vascular Disease,”*Infection, Neuropathy and Ulceration in Diabetes” .Diabet. Care* ,Vol. 21.pp. 42-48,1998.
7. Lipsky,B.A. “Evidence-Based Antibiotic Therapy of Diabetic Foot Infections,” *F.E.M.S. Immun. Med. Microbiol.*,Vol.26.pp. 267-276,1999.
8. Holt,J.G. ;Krieg,N.R.; Sneath ,P.H.A.;Staley, J.T. and Williams, S.T. Bergeys *Manual of Determinative Bacteriology* . 9th edn. William. Wilk., Maryl.1994.
9. Bauer, A.W.;Kirby,W.M.;Sherris, J.C. and Turk, M. *Antibiotic susceptibility testing and immunity* .16th edn. Arnold London. 1975.
10. Horowitz, J. D. ; Durham, J. R.; Nease, D. B.; Lukens, M.L.;Wright,J.G. and Smead ,W.L. “Prospective Evaluation of MRI in the Management of Acute diabetic Foot Infections ,” *Ann. Surg.*,Vol.7.pp .44-50,1993.
11. Viswanatham, V.; Jasmine ,J. J.; Snehalatha, C. and Ramachandran ,A. “Prevalence of Pathogens in Diabetic foot Infections in South of India type 2 diabetic patients”. *J. Assoc. Physicians India.*,Vol. 50.pp .1013-1016,2002.
12. Altman,M.I. and Altman K.S., “The Pediatric Assessment of The Diabetic Lower Extremity,”*Special Considerations .Wounds*, Vol. 12(6 Suppl B).pp 64B-71B,2000.
13. Al-Sarray ,S.J. *Isolation and Diagnosis of Aerobic Pathogenic Bacteria from Superficial Wound Infection of Diabetic Foot Patients*. H.Dipl. Thesis Coll. Med. Health Tech. 30. 2001.