

A Study of Diabetic Foot Ulcers in Relation to Depth , Location of the Ulcer and Patient's, Age and Sex.

Ryath S.AL-Hemedawi,Suhaila M AL-Salloum,Saad S.AL-Azawi

ABSTRACT:

BACKGROUND:

Over a nine months period, extending from October, 2002 through July 2003, microorganisms were isolated and identified from foot ulcer infections of diabetic patients. The foot ulcers were clinically identified as superficial (dry, wet) or deep ,the depth of both superficial (wet, dry) and deep foot ulcers in relation to location, patient age and sex were studied from 60 patients of surgical wards.

METHODS:

The depth of different diabetic foot ulcers were measured by sterile cotton tip applicator inserted from the surface to the deepest point of the ulcer base.

RESULTS:

It was demonstrated that the superficial ulcers were mostly wet, the site of the ulcers were mainly in the right foot more than in left foot, mostly the toes. The incidence of deep ulcers were mostly in males, while the prevalence of both superficial and deep ulcers increase with advancing age.

CONCLUSION:

The present study showed a different classification of foot ulcers (superficial & deep) from past literature studies.

KEY WORDS: diabetic foot ulcers, deep and superficial.

INTRODUCTION:

The diabetic foot can be defined as a condition that includes infection, ulceration and destruction of superficial and deep tissues associated with neurological abnormalities and peripheral vascular disease in lower limbs¹. There are three main factors that lead to ulceration and necrosis in the diabetic foot, namely ischemia, neuropathy, and infection². Ischemia resulted from atherosclerosis of the leg vessels, in which the diabetic foot patient is often bilateral, multi-segmental and distal involving the popliteal, the tibial, and the peroneal arteries³. Foot ulcers may be classified as superficial or deep. (Grayson)⁴ classified foot ulcers infections based on clinical severity, into ,mild, moderate "potentially limb threatening", and severe. "potentially life threatening"⁵.

(Armstrong)⁶, used diabetic wound classification system based on assessment of wound depth, sensory neuropathy, vascular insufficiency and infection. Infected foot ulcer constitutes grades 2 and 3 of the modified Wagner classification. The deep infections of the bone and soft tissues (grade 3) are particularly important as they often threaten the limb⁷.

PATIENTS AND METHODS:

The present study consisted of sixty diabetic foot patients (31 female, 29 male) of different ages , weights and marital status. The patients age was

ranged between 20-29 years. The depth of the ulcer was measured by the skin to the deepest point of the ulcer by cotton tip applicator⁵. The description of depth of both superficial (wet & dry) and deep foot ulcers in relation to location, patients age and sex were studied according to the clinical examination for the patient and compared that with previous research.

RESULTS:

The results of this study were obtained from sixty patients with diabetic foot ulcers, 25 (41.6 %) with superficial ulcers and 35 (58.3%) with deep ulcers. The mean depth of superficial ulcers was 0.74 ± 0.7 cm, ranged between 0.4-1.5cm & for deep ulcer was 2.2 ± 0.5 cm, which range from 2.0-3.0cm. The data obtained from this study were analyzed using descriptive statistical method. Table (1) demonstrates the description of depth & location of dry and wet – superficial foot – ulcers with patients age and sex. According to types of superficial ulcers , out of (25) cases, 10 patients(40%) were dry ulcers & 15 cases (60%) were with wet ulcers. The mean depth of superficial ulcers was 0.74 ± 0.7 cm ranged between 0.4-1.5cm. The sites of superficial ulcers were 20 of them (80%) were in the right foot which were distributed in the following parts of the foot, 9 cases (45%) in the toes, 6 cases (30%) in the dorsum, 3 cases (15%) in the lateral side ,one case (5%) in venetral & one case (5%) in the heel of the right foot. Five cases (20%) of superficial ulcers were in the left foot,

Department of Medical Microbiology, Teaching laboratories, Medical City.

DIABETIC FOOT ULCERS

4 cases (80%) in the toes & one case (20%) in the dorsum of the left foot. According to the age groups there were 10 cases (40%) out of 25 patients at age group (50-59) years, followed by 7 cases (28%) at age group (60-69) years & 4 cases

(16%) at age group (40-49) years. For the other age groups there was a single case (4%) for each of them. Concerning the patients sex, there were (17) females patients while (8) males with superficial foot ulcers.

Table (1) . Description of depth & location of wet and dry superficial diabetic foot ulcers with patients age & sex.

Ages Group (years)	Sex		Type of ulcer		Depth (cm)	Site of foot ulcers
	Male	Female	Dry	Wet		
20-29	1			1	0.5	Base of the 5 th left toes.
40-49		4	2	2	0.6* 1.0*-1.5	First toe of the right foot (2) Cases in the dorsum of right foot. Multiple ulcers in ventral right foot
50-59	4			4	1.5 0.5-0.8*	(5) cases in toes of right foot. (3) cases in dorsum of right foot.
		6	3	3	1.0* 1.0	(1) base of the left toes. (1) heel of right foot.
60-69	3		1	2	1.5* 1.4* 1.0 0.5-0.7	(2)cases in dorsum right & left foot (2)cases in heel of right foot (1)lateral side of right foot. (2)cases in the toes right foot.
		4	3	1		
70-79		1		1	0.7	First toes of left foot.
80-89		1	1		0.6*	All toes of left foot
90-99		1		1	0.8	Base of 1 st toes of right foot.
Total	8	17	10	15	0.74 ±0.7	

* Represent the depth of the dry ulcers.

Table (2) , shows the relation between location & depth of the deep ulcers with patient age & sex. According to the sex, there were 21 patients (60%) male, 14 cases (40%) females, out of the total 35 patients. Ranged the sites of the ulcers there were 23 patients (65.7%) their deep ulcers were in the right foot, which were distributed as followed, 10 cases (43.5%) in the toes, 5 cases (21.7%) in the dorsum, 4 cases (17.4%) in the metatarsal, 2 cases (8.7%) in the ventral side & 2 cases (8.7%) in the lateral side of the right foot . Twelve (34.3%) out of 35 cases of deep ulcers were in the left foot

which were distributed as followed 7 patients (58.4%) in the toes, 3 cases (25%) in the heel, one case (8.3%) in the ventral side & one case (8.3%) in the dorsal side of the left foot. The mean depth of the deep ulcers was 2.2 +0.5cm, which range from 2.0-3.0cm According to the age there were 10 cases (28.6%) at age group (60-69) years followed by 7 cases (20%) at age group (50-59) years , 6 cases (17.2%) at age group (40-49) years, 5 cases (14.3%) at age group (70-79) years , 3 cases (8.6%) at age group (30-39) years &2 cases (5.7%) for the other age groups.

Table (2) , description of depth & location of deep diabetic foot ulcers with patients age & sex.

Ages Group (years)	sex		Depth (cm)	Sites of foot ulcers
	male	Female		
20-29	2		2.5 2.0	Multiple ulcers in the dorsum of metatarsal of right foot. Multiple ulcer in the dorsum of right foot.
30-39	3		2.0 3.0	(2) amputated of three toes of right foot & left foot. perforated ulcer in metatarsal of right foot.
40-49	3	3	2.5 2.0 2.0-2.5	(2) amputated of right foot in to metatarsal (1) amputated of 1 st toes left foot. (3)dorsum, ventral & latral side of right foot.
50-59	4	3	2.0 2.0-2.5	(3)cases in heel, ventral side between toe of left foot. (4)cases in ventral, lateral side & toes of right foot.
60-69	7	3	2.0 2.0-2.5 2.0-2.6 2.0	(4) cases in toes of right foot. (3)cases in the dorsum of right foot (2) dorsum, toes of left foot. (1) heel of left foot.
70-79	2	3	2.5 2.0-2.5 2.0	(2)cases 1 st & 2 nd toes of right food extended to metatarsal. (2)cases in toes of left foot extended to metatarsal. (1) heel of the left foot
80-89		2	2.0	(2) toes of right foot extended into metatarsal.
Total	21	14	2.2 ±0.5	

DISCUSSION:

The economic, social and personal costs of foot infections in diabetic patients are considerable. The increased susceptibility to foot infection was attributed to several factors^{8,9} among these factors are immune dysfunction, neuropathy and vascular insufficiency. The most typical sites of involvement are the metatarsal heads and the proximal portion of the proximal phalanges¹⁰. Caputo¹¹ explained that the non-limb threatening infections generally are superficial extending from less than 2cm from an ulcer, and have no evidence of necrotizing infection or systemic toxicity. Limb – threatening infections generally present with one or more of the following features, more than 2cm of cellulitis , full thickness ulceration, systemic toxicity, gangrenous soft tissue, gas in the tissue and abscess formation. In the present study and in an effort to evaluate the depth and location of diabetic foot ulcers with patients age & sex. It was demonstrated that the superficial ulcers were, mostly wet, the site of the ulcers were mainly in the

right foot, more than left foot, mostly in the toes and the incidence of ulcers were mostly in females & increasing with advancing age. These findings is in agreement with the findings of other studies^{1,10,12}. The mean depth of superficial ulcers was 0.74±0.7cm. ranged between (0.4-1.5cm) , these finding are in agreement with that reported by other study¹¹, but disagree with other studies by ⁵, whom they considered that the depth of superficial ulcers is >2cm. The result of present study shows that the incidence of deep ulcers are mostly in males than females of the tested population & mainly in the right foot and the incidence of both deep & superficial ulcers increase with advancing patients age. The majority of the deep ulcers are located in the right foot & mostly in the toes of right & left foot these findings are in agreement with other studies by carried out^{1,10,12}.

The mean depth for deep ulcers was 2.2 ± 0.5 cm, which ranged between 2.0-3.0 cm, these findings are in agreement with that reported by other^{5,11}.

According to modified Wager classification it was considered grade – 1, superficial ulcer, clinically non infected, while according to the previous study, it was observed that no ulcer remain un-infected, and this should be noted in our classification of foot ulcers(Ryath *et al* unpublished data).

CONCLUSION:

The conclusion and classification of foot ulcers of diabetic patients which were followed in this present work were according to resembling study¹³. We suggest that less 0.5 cm depth of non-limb threatening ulcer infection which has no evidence of necrotizing infection or systemic toxicity generally should be considered as superficial ulcer. While limb-threatening infection deep ulcer should not be limited by depth only but generally more than 0.5 cm with one or more of the following features : full thickness ulceration rapid progression over hours or days, systemic toxicity, gangrenous soft tissue, gas in tissue and abscess formation, generally should be considered as deep ulcer. It can be concluded that the types, sites and causes of ulcers are related to outcome and must be considered when treatment strategies are chosen¹.

REFERENCE:

1. Apelqvist JM, Pinchera AX, Vier YB *et al.* : The diabetic foot. *Endocrinology and Metabolism* 2001, 636-639 .
2. Jackson WP, Vinik AI : The Cardio – Vascular system and diabetes .The Foot diabetes mellitus clinical and metabolic. A short text book 1979, 96-103.
3. Standness DE, Priest RE ,Gibbons GE : Combined clinical and pathology study of diabetic and non-diabetic peripheral arterial disease. *Diabetes* 1964, 13, 366-372.
4. Grayson ML, Gibbons GE, Baloghk LE *et al* : Probing to bone in infected pedal ulcers. A clinical signs of underlying osteomyelitis in diabetic patients *JAMA* 1995, 273: 721-3.
5. Camilo AL, Francisco LS, Virginia JG *et al* :-Randomized controlled trial of tropical hyperbaric oxygen for treatment of Diabetic foot ulcers. *Diabetic care* 1988, 11:111-115.
6. Armstrong DG, Lavery LA & Harkless LB: Validation of a diabetic wound classification system. The contribution of depth, infection. And ischemia to risk of amputation. *Diabetes care* 1998,21: 855-9.
7. Pickup JC & Williams G : The history of diabetes mellitus. *Text book of diabetes* 1997, 1:1.1-1.20.
8. Gibbon GW & Elipoulos GM : Infection of the diabetic foot, in management of diabetic foot problems. Philadelphia, WB Jaunder co 1984, 97-102.
9. Sapico FL : Foot infections in patients with diabetes mellitus. *J Am pediat. Med Assoc* 1989, 79:482-490.
10. Bamberger DM, Daus GP, Greding DN: Osteomyelitis in the feet of diabetic patients. 1987, 83: 653-660.
11. Caputo GM, Cavanagh PR, Vibercht Js *et al* : Assessment and management of foot disease in patients with diabetes .*N.Engl. I. Med* 1994, 331 : 854-60.
12. Lipsky BA, Pecoaro RE, Henry M. *et al.* : Diabetic foot infection : Bacteriological analysis. *Arch Intern. Med.* 1989, 146: 1935-40.
13. Gregory MC, Nirmal J and Michael RW : Foot infections in patients with diabetes. *American Family physician Pennsylvania* 1997, 195-202.