

Hand sepsis in patients with diabetes mellitus

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ABSTRACT

الأهداف: عرض الفحص السريري وعوامل الخطر المحتملة المؤدية إلى إبتان اليد، والبتير، والمؤشرات في مرضى السكر الذين تم تشخيصهم في مركز أمراض السكر لجميع تخصصات في الخرطوم.

الطريقة: أجريت دراسة وصفية استيعادية لجميع المرضى الذين تم تشخيصهم بإبتان اليد خلال الفترة من سبتمبر 2002 حتى مارس 2008م - مركز جابر ابو العز للسكر - الخرطوم - السودان.

النتائج: هناك 119 مريض مصاب بإبتان اليد في JADC. لم يكن سبب الإصابة معروف في 48.7%، كانت الإصابة بسبب الورم في 42.9%، كان التشخيص الأكثر شيوعاً هو التهاب الأغشية 36.1%، وفي 29.5% كان الخراج داخل الأغشية. كان هناك فقد للإحساس باليد في 22.7% عند استعمال النايلون 10 جرام. كان هناك التهاب مصاحب في القدم في 13.4% حدث بتر لأصبع أو للأصابع في 17 مريض 14.3%، ولم يتمكن من تجنب بتر اليد كاملة في 2 مريض 1.7%. حدث التئام للجرح في 79%. لم تكن هنالك حالة وفاة.

خاتمة: يعتبر إبتان اليد في مرضى السكر من المضاعفات الخطيرة، ولكن التشخيص المبكر ومرفق رعاية السكر المتخصص يساعد في إنجاز النتائج المقبولة.

Objectives: To report on the clinical presentation and possible risk factors leading to hand sepsis, amputation, management, and outcome in diabetic patients presenting to a multidisciplinary diabetic center in Khartoum, Sudan.

Methods: This is a retrospective descriptive study of all diabetic patients presenting with hand sepsis between September 2002 and March 2008 to Jabir Abueliz Diabetic Centre (JADC) in Khartoum, Sudan.

Results: A hundred and nineteen diabetic patients with hand sepsis were managed in JADC. The causative agent was unknown in 48.7%, and due to

trauma in 42.9%. The most common presentation was cellulitis in 36.1% of patients and deep seated abscess in 29.5%. In 22.7% there was significant sensory neuropathy with loss of perception to 10 gm monofilament nylon. An associated foot ulcer was present in 13.4% of patients. One or more digits amputation was carried out in 17 (14.3%) of patients and hand amputation was unavoidable in 2 (1.7%). Complete healing with good function was achieved in 79%. There was no mortality in this series.

Conclusion: Hand sepsis in diabetics is a serious complication, but with early presentation to a specialized diabetic care facility, satisfactory outcome could be achieved.

Saudi Med J 2009; Vol. 30 (11): 1454-1458

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Received 27 April 2009. Accepted 24th September 2009.

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Diabetes associated sepsis is a well recognized cause of morbidity and mortality in diabetic patients.^{1,2} Hand infections in diabetics, although hardly mentioned as a specific complication of diabetes, results in marked functional disability and even fatal consequences.³⁻⁵ On the other hand, diabetes is known as the most common comorbid illness in patients with hand sepsis.⁶ Trauma was found to be the main predisposing factor in many studies,^{7,8} however, other reports had failed to recognize the underlying cause among such patients.⁹ Many risk factors for hand sepsis in diabetic patients have been postulated, but yet the lack of preventive care and difficulty in gaining access to the proper medical service may be the major factor of late presentation and

hence the poor outcome in the tropics.^{4,10} This study aimed at highlighting the clinical presentation and possible risk factors leading to hand sepsis, amputation, management, and outcome in diabetic patients.

Methods. This is a retrospective, descriptive, hospital based study performed in JADC in Khartoum, Sudan. This is a multidisciplinary center offering various services to diabetics including medical and surgical clinics in addition to educational sessions. Currently, more than 30, 000 diabetics are registered in the center, of whom >5000 have a diabetic foot, and where wound care, foot care, offloading and other related services are available. The surgical load is covered by 2 general and 2 plastic surgeons with special interest in the diabetic foot. The studied group included diabetic patients who presented with hand infection in the period from September 2002 to March 2008. The data were collected from the patients' records, which include the history, clinical examination, diagnosis, procedures carried out, investigations and clinical course data. These data include the cause, the site of infection, the anatomic location, the microbiology reports, associated illnesses, the treatments provided, and the final outcome. The records were obtained and reviewed. The inclusion criteria were being a diabetic with hand infection. Any patient with insufficient clinical records was excluded from the study. It is a routine to have patient consent for utilization of data for research purpose and publication. Ethical approval was obtained from Sudan Medical Specialization Board Ethics Committee.

Data were processed and analyzed using the SPSS 11 program. Chi square test was performed to calculate the statistical significance of digit and/or hand amputation in relation to age, clinical presentation, comorbidities and isolated organisms. Correlated *p*-value of less than 0.05 was regarded as statistically significant. The confidence interval for this sample size with a confidence level of 95% is calculated to be 8.98.

Results. One hundred and nineteen patients were studied, 67 (56.3%) were males and 52 (43.7%) were females. The age ranged between 23 to 85 years with a mean age \pm SD of 52.82 ± 12.35 years. Fifty-one patients (42.8%) were housewives, 19 (16%) employees, 18 (15.1%) manual workers, 11 (9.2%) retired from job, 9 (7.6%) self-employed and farmers each and 2 (1.7%) were non-specified jobs. The cause of hand infection was unknown in 58 (48.7%) patients, trauma in 51 (42.9%), burn in 3 (2.5%) and due to other causes in 7 (5.9%) patients. The right hand was involved in 68 (57.1%) and the left hand was affected in 51 (42.9%) patients. There was no simultaneous bilateral hand involvement. The thumb was involved in 30 patients

(25.2%), the middle finger in 28 (23.5%), the index finger in 25 (21.1%), the ring finger in 21 (17.6%), and little finger in 15 patients (12.6%). Multiple fingers involvement was found in 7 (5.9%) patients. The most common major clinical presentation was cellulitis in 43 (36.1%), followed by deep-seated abscess involving a digit or dorsum of the hand in 35 (29.5%) (Figures 1 & 2), paronychia in 32 (26.9%), and pulp space abscess in 6 (5%). Only 3 (2.5%) patients presented with gangrene (Figures 3 & 4). Twenty-seven patients (22.7%) had peripheral neuropathy as evidenced when using 10 gm monofilament nylon. Sixteen patients (13.4%) had an associated or a previous foot ulcer. Renal impairment was found in 4.2%, and 5% had cardiac disease. Thirty patients were treated as inpatients (25.2%) where drainage, débridements, intravenous antibiotics, and control of diabetes were undertaken. Patients presenting with fever and necrotic local hand wounds required in addition to the aforementioned, careful daily wound care and debridement. The hospital stay ranged between 1-40 days with a mean of 7.9 ± 10.4 days. Simple drainage under local anesthesia as an outpatient procedure was carried out in 52 patients (43.7%). Wound care was the only needed method of treatment in 32 (26.9%) who already had minor surgical drainage in other health facilities. One or more digit amputation was carried out in 17 (14.3%) patients, and hand amputation was unavoidable in 2 (1.7%). There was no mortality in this series. Wound swabs for culture was recorded in 107



Figure 1 - Left hand thenar abscess with proximal extension.



Figure 2 - Right index sepsis in a diabetic patient.



Figure 3 - Right diabetic hand syndrome with wet gangrene.



Figure 4 - Left diabetic hand syndrome with extensive gangrene and sepsis.



Figure 5 - Right hand dorsum ulcer in a diabetic patient, a) before and b) after split skin graft.

(90%) patients. *Staphylococcus aureus* was isolated in 51 (47.6%), various other bacteria in 22 patients (20.7%), mixed growth in 9 (8.4%), and no growth in 25 (23.3%). All patients received antibiotics. Intravenous third generation cephalosporins were used in 51 (42.9%) patients who presented with constitutional symptoms and/or forearm cellulitis and orally in 68 (57.1%). Only seven patients (5.9%) underwent reconstructive procedure, either split/full thickness graft or flap (Figure 5). All these patients resulted in complete healing without impaired hand function. The number is too small to draw out any reliable significant statistical conclusions. Complete healing without residual disability was achieved in 94 (79%) of patients, 25 (21%) had an impaired hand function following completion of treatment or amputation and were referred for physiotherapy. Patients more than 40 years constitute 18 out of 19 who underwent digit and/ hand amputation; however the statistical difference is insignificant (Table 1). Patients who presented with deep seated hand abscess or gangrene of the digits and/ or hand are more vulnerable to amputation with a significant statistical difference, (Table 1). Renal impairment is associated with a high risk of amputation; however the

Table 1 - Digit and/or hand amputation in relation to age, clinical presentation, comorbid illnesses, isolated organisms.

Causes of burns	No. of patients	Digit and/or hand amputation
<i>Age group</i> [*]		
20-30 years	5	0
31-40 years	6	1
41-50 years	24	5
51-60 years	38	7
>60 years	46	6
<i>Clinical Presentation</i> [†]		
Cellulitis	43	3
Deep abscess	35	10
Paronychia	32	2
Pulp space abscess	6	1
Dry or wet gangrene	3	3
<i>Comorbidity</i> [‡]		
Peripheral neuropathy	27	1
Diabetic foot ulcer	16	2
Renal impairment	5	3
Myocardial disease	6	1
No morbidity	56	12
<i>Isolated organisms</i> [§]		
<i>Staphylococcus aureus</i>	51	5
Other organisms	22	6
Mixed growth	9	5
No growth	25	3

^{*}p=0.481, [†]p=0.16, [‡]p=0.16, [§]p=0.05, confidence interval= 8.98.

difference is statistically insignificant (Table 1). Isolation of gram negative and/or anaerobes or mixed cultures is associated with a higher risk of amputation, (Table 1).

Discussion. It is well observed that hand sepsis in diabetic patients has a relatively high prevalence in the tropics generally, and sub-saharan Africa in particular as most published studies were generated from that area.^{1,5,8,11,12} This study shows that there is a slight male predominance in contrast to reports from northern Nigeria, Tanzania, and Libya where females were more affected.^{3,11,13} On the other hand, comparing this fact with gender predilection of diabetic foot ulcers to male gender, it seems that males are at utmost risk of both foot and hand complications. Whereas the cause of hand sepsis is unknown or spontaneous in nearly half of the cases in this study, trauma is the major known cause in the rest of patients. It is well understood that in such immunocompromised patients, trauma is an important route of sepsis and may be the major one in the absence of other sepsis risk factors like neuropathy and peripheral vascular disease. This fact is replicating almost the same results in different reports.^{14,15} The clinical presentation of hand infections was varying from cellulitis of a digit to the most severe form of wet gangrene, or what is known in tropics as diabetic hand syndrome. However, the pattern is not different from that seen in hand infections affecting normal non-diabetic patients. This is well reflected by only 2.5% of patients in this study presenting with an advanced septic picture of wet gangrene, necrotizing fasciitis, and septicemia. Diabetic hand syndrome remains the only recognized specific diabetes related hand infection within this context. Deep infections of the hand in diabetic patients is an expected complication; however, we have reported 0% mortality in contrast to the high mortalities of nearly 19% encountered in infections of the upper extremity in diabetic patients.¹⁶ The same fate applies when we examine the rate of amputation due to hand infection in diabetic patients in our series and other similar studies and compare it with the normal population. In the normal population with deep hand infections, severe sepsis that leads to necrosis and amputation of a digit/s, hand, or forearm may reach 13% compared to 16% in our series and 23% in similar studies.^{16,17}

Diabetic hand sepsis in our series contrasts with the grave presentation of the diabetic hand syndrome, which was described in some African countries.⁵ We reported 14% finger amputation and no mortality in the whole series. The early presentation to JADC is partly due some degree of awareness from previous visits to the center where they were offered education

on prevention of complications. The wound care management coupled with the specialized service from both general and plastic surgeons had a role in this favorable outcome. *Staphylococcus aureus* is known to be the predominant isolated microorganism in hand infections.¹⁸ Moreover, the incidence of isolating *Methicillin-resistant Staphylococcus aureus* is increasing in these patients.⁶ In this series it is found that the trend of microorganisms isolation in diabetes patients with hand infections did not differ from that of the normal population; being mainly *Staphylococcus aureus*. However, we had an isolated polymicrobes more frequently than was previously reported in the literature of Sudanese patients,⁸ but similar to what is reported in similar studies in other nationalities.^{18,19} Hand dysfunction in the form of stiffness, soft tissue destruction and contractures is a real challenge facing workers with hand infections. Although reported in our series as affecting only 21% of patients after completion of hand therapy, however, it still remains a problem of concern and very much encountered following severe necrotizing infections subjected to multiple débridements.

In conclusion, hand sepsis although regarded as a less frequent complication that might develop in diabetic patients, represents a diagnostic and therapeutic challenge. Risk factors for poor outcome and amputation include presentation with diabetic hand syndrome or deep hand infection and infection with gram negative, anaerobes or polymicrobial cultures. The clinical picture may not be different from that in non diabetic patients, but a severe form that may lead to loss of digits and/or the hand should be considered in every case to avoid disastrous outcomes. The number of patients who were reconstructed was small; however, it is worth noting that involving plastic surgeons in the management of these patients will contribute to a less debilitating outcome. Training of specialized staff and approaching such patients with multi disciplinary teams will minimize the poorer consequences, and provide better quality of life for sufferers.

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Ethical Consent

All manuscripts reporting the results of experimental investigations involving human subjects should include a statement confirming that informed consent was obtained from each subject or subject's guardian, after receiving approval of the experimental protocol by a local human ethics committee, or institutional review board. When reporting experiments on animals, authors should indicate whether the institutional and national guide for the care and use of laboratory animals was followed.