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Risk Factors For Major Amputation In Diabetic Foot Patients

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Abstract

Objectives : this study to identify the clinical and laboratory factors associated with the risk factors of major amputation in diabetic foot patients.

Patents, materials and method: this is cross sectional study carried out in Basra general hospital between November 2013 to June 2016. 100 diabetic foot patients evaluated for duration of the illness, type of diabetes, socioeconomic state, smoking history, previous amputation, retinopathy, nephropathy, neuropathy, cardiac disease, foot deformities. The foot ulcers were classified according to Wagner classification, foot ischemia was assessed by Doppler study, baseline laboratory investigations done include Hb%, WBC, ESR, Fasting blood sugar, Hb A1c, blood urea, serum creatinine, serum albumin, ECG, Chest x-ray.

Results: number of risk factors found to be associated with risk of major amputation in diabetic foot patient include male sex, age>60 years, nephropathy, retinopathy, neuropathy, foot deformity, previous amputation, duration of diabetes >15 years, low socioeconomic state, Hb<10gm/dl, ESR>80, Hb A1c>8%, serum albumin<2.5gm/dl, Doppler score>6, high Wagner score.

Conclusion:

1. **Wagner grade 4 and 5 are the major independent risk factor for major amputation.**
2. **WBC count is poor predictor for the severity of diabetic foot.**
3. **Scoring system can be arranged for each patient according which appropriate decision can be made amputation and conservative treatment.**

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Table 1: Diabetic Foot Scoring System

Number	Risk factor	score
1	Male sex	1
2	Age > 60 year	1
3	DM duration > 16year	1
4	Wagner grade 4 and 5	One for each
5	Smoking	1
6	Low socioeconomic state	1
7	Neuropathy	1
8	Nephropathy	1
9	Retinopathy	1
10	Cardiac disease	1
11	Previous amputation	1
12	Foot deformities	1
13	Hb<10gm/dl	1
14	Albumin level<2.5gm/dl	1
15	Fasting blood sugar	1
16	Doppler score	1
17	ESR>80	1
18	Doppler score >6	1
19	Total score	23

Introduction:

Diabetic foot are the major reason for lower extremity amputation, fifteen percent of diabetic foot patients develop foot problems during their life and significant number of individual with diabetic foot required a lower extremity amputation(3).

Diabetic foot ulcer proceed non traumatic lower extremity amputation in 85% of diabetic patients, furthermore, the risk of lower extremity amputation is 15 to 46 times higher in in diabetics than in non-diabetics(3,5).

Diabetic patients with inadequately controlled blood glucose level at a significant risk for serious complications affecting lower limbs. The most common risk factor for ulcer formation is altered foot sensation, foot deformities, trauma, peripheral

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vascular disease, and previous foot ulcer or amputation(2).

Despite well-defined risk factors in development of diabetic foot there are limited data on factors that predict amputation. Ischemia, osteomyelitis, foot gangrene are considered predictors for amputation in diabetic foot. Additional that have been linked to amputation risk are older age and macro and microvascular comorbidities(5). The management of diabetic foot include evaluation of vascular status and assessment of infection. Antibiotic therapy, surgical debridement, metabolic control of diabetes and amputation when necessary. It is very important for clinician to know which clinical and laboratory finding at admission are associated with poor outcome.

Patients material and method:

this a prospective study carried out on 100 diabetic foot patient in Al- Basra general hospital from November 2013 to June 2016. All patients were managed by the same managing team. Complete history taking including age, sex, type, duration, treatment of diabetes, previous amputation, cardiac, renal, retinal disease, smoking, socioeconomic state, complete neurological examination, assessment of foot vascularity ,Doppler US and scoring of the artery stenosis as show below:

Artery	<50% stenosis	50-75% stenosis	>75 stenosis	Complete obstruction
Femoral artery	0	1	2	3
Popliteal artery	0	1	2	3
Posterior tibial artery	0	1	2	3
Dorsalis pedis artery	0	1	2	3

The foot lesion classified according to Wagner classification. Laboratory parameter measured include first fasting blood sugar, Hb%, WBC count, ESR, absolute lymphocyte count, serum albumin, HA1c, blood urea, serum creatinine, funduscopic examination.

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All patients admitted and receive treatment and classified as 3 groups according to the type of treatment received :

Group 1: conservative treatment

Group 2: minor amputation group (toe amputation, ray amputation, Lis France amputation).

Group 3: Major amputation group (above ankle amputation).

Statistical analysis done using SPSS for comparative analysis of data.

Results:

Table 2: Number of patients in each treatment group . P value<0.001

Group 1 **21 patients**	**Type of treatment**	**Number**
	Local care	**7(7%)**
	Abscess drainage	**3(3%)**
	Ulcer excision	**11(11%)**
Group 2 **31 patients**	**Toe amputation**	**11(11%)**
	Ray amputation	**15(15%)**
	Trans metatarsal amputation	**3(3%)**
	Lis France amputation	**2(2%)**
Group 3 **48 patients**	**Below knee amputation**	**32(32%)**
	Above knee amputation	**16(16%)**
	Total number	**100(100%)**

Table 3: relation between patient gender and type of treatment. P value<0.001

Treatment	**Male**	**female**	**total**
Major amputation	**33 (64.7%)**	**15(30.6%)**	**48(48.0%)**
Minor amputation	**11(21.6%)**	**20(40.8%)**	**31(31%)**
Conservative treatment	**7(13%)**	**14(28.6%)**	**21(21.0%)**
Total number	**51(100%)**	**49(100%)**	**100(100%)**

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Table 4: mean age of the patients(years). P value<0.001

Treatment	Mean age	No. of patients	Minimum age	Maximum age
Major amputation	62.70	48	44	73
Minor amputation	57.29	31	33	79
Conservative treatment	57.09	21	33	72
Total number	59.85	100	33	79

Table 5: type of DM in different groups. P value<0.001

Treatment	Type 1 DM	Type 2 DM	Total
Major amputation	2(33.3%)	46(48%)	48(48%)
Minor amputation	2(33.3%)	29(30.9)	31(31%)
Conservative treatment	2(33.3%)	91(20%)	21(21%)
Total number	6(100%)	94 (100%)	100(100%)

Table 6: type of treatment and mean duration of the DM. P value<0.001

Treatment	Mean duration	No. of patients	Minimum duration	Maximum duration
Major amputation	16.43	48	11	25
Minor amputation	15.80	31	5	25
Conservative treatment	12.28	21	0	19
Total number	15.37	100	0	25

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Table 7: Wagner grade in each group. P value < 0.001

Treatment	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Total
Major amputation	0	0	6(20%)	31(88.6%)	11(100%)	48(48%)
Minor amputation	0	8(44%)	19(63%)	4(11%)	0	31(31%)
Conservative treatment	6(100%)	10(55%)	5(16%)	0	0	21(21%)
Total number	6(100%)	18(100%)	30(100%)	35(100%)	11(100%)	100(100%)

Table 8: mean Doppler score. P value <0.001

Treatment	Mean score	NO. of patients	Minimum score	Maximum score
Major amputation	6.52	48	4	10
Minor amputation	3.15	31	2	4
Conservative treatment	1.28	21	2	3
Total number	4.22	100	0	10

Table 9: smoking in different treatment groups. P value<0.001

Treatment	smoker	Non smoker	Total
Major amputation	26(78%)	22(32%)	48(48%)
Minor amputation	4(12.1%)	27(40.3)	31(31%)
Conservative treatment	3(9.1)	18(26.9)	21(21%)
Total number	33(100%0	67(100%)	100(100%)

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Table 10: socioeconomic stat in different treatment groups. P value <0.001

Treatment	Low	Fair	good	total
Major amputation	29(72%)	14(35%0	5(25%)	48(48%)
Minor amputation	10(25%)	13(32.5%)	8(40%)	31(31%)
Conservative treatment	1(2.5%)	13(32.5%)	7(35%)	21(21%)
Total number	40(100%)	40(100%0	20(100%)	100(100%)

Table 11:neuropathy in different treatment groups. P value <0.001

Treatment	Patients with neuropathy	Patients without neuropathy	Total
Major amputation	30(73%)	18(30.5)	48(48%)
Minor amputation	7(17.1%)	24(40.7%)	31(31%)
Conservative treatment	4(9.8%)	17(28.8)	21(21%)/
Total number	41(100%)	59(100%)	100(100%)

Table 12: nephropathy in different treatment groups. P value<0.001

Treatment	Patients with nephropathy	Patients without nephropathy	Total
Major amputation	21	27	48
Minor amputation	5	26	31
Conservative treatment	2	19	21
Total number	82	72	100

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Table 13: retinopathy in different treatment groups. P value<0.001

Treatment	Patients with retinopathy	Patients without retinopathy	total
Major amputation	23	25	48
Minor amputation	4	27	31
Conservative treatment	2	19	21
Total number	29	71	100

Table 14: cardiac disease in different treatment group. P value <0.001

Treatment	Patients with cardiac disease	Patients without cardiac disease	total
Major amputation	27	21	48
Minor amputation	5	26	31
Conservative treatment	1	20	21
Total number	33	67	100

Table15: previous amputation in different treatment groups. P value<0.001

Treatment	Patients with previous amputation	Patients without previous amputation	total
Major amputation	19	29	48
Minor amputation	5	26	31
Conservative treatment	2	19	21
Total number	29	74	100

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Table 16: foot deformities in different treatment groups. P value<0.001

Treatment	Patients with foot deformity	Patient without foot deformity	total
Major amputation	22	26	48
Minor amputation	5	26	31
Conservative treatment	0	21	21
Total number	27	73	100

Table 17:mean Hb level (mg/dl) in different treatment group. P value<0.02

Treatment	Mean Hb level	No. of patients	Minimum Hb level	Maximum Hb level
Major amputation	96.61	48	75.00	124.00
Minor amputation	105.80	31	75.00	130.00
Conservative treatment	116.51	21	95.80	137.00
Total number	103.64	100	75.00	75.00

Table 18: the mean ESR (mm/hour) in different treatment groups. P value<0.002

Treatment	Mean ESR level	No. of patients	Minimum ESR	Maximum ESR
Major amputation	84.75	48	56.00	110.00
Minor amputation	62.74	31	32.00	98.00
Conservative treatment	59.19	21	24.00	90.00
Total number	72.56	100	24.00	110.00

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Table 19: mean WBC count (cell/ml) in different treatment group. P value 0.245

Treatment	Mean WBC count	No. of patients	Minimum WBC count	Maximum WBC count
Major amputation	6239.58	48	1100.00	12000.00
Minor amputation	6509.67	31	3300.00	12000.00
Conservative treatment	7214.28	21	3200.00	13500.00
Total number	6528.00	100	1100.00	13500.00

Table 20: HA1c level (%) in different treatment groups. P value<0.001

Treatment	Mean HA1c%	No. of patients	Minimum HA1c	Maximum HA1c
Major amputation	8.27	48	5	10
Minor amputation	6.45	31	4	10
Conservative treatment	6.19	21	4	8
Total number	7.27	100	4	10

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Table 21: serum albumin level (gm/dl) in different treatment groups. P value <0.001

Treatment	Mean serum albumin	No. of patients	Minimum s. albumin	Maximum s. albumin
Major amputation	2.44	48	2.00	4.30
Minor amputation	2.74	31	2.00	3.80
Conservative treatment	3.08	21	2.80	3.70
Total number	2.67	100	2.00	4.30

Table 22: first fasting blood sugar(FFBS) (mg/dl) in different treatment groups. P value <0.002

Treatment	Mean FFBS	No. of patients	Minimum FFBS	Maximum FFBS
Major amputation	223.56	48	90	415
Minor amputation	185.22	31	80	296
Conservative treatment	183.14	21	104	296
Total number	203.19	100	80	415

Discussion:

Most of the patients are male, consistent with Helaine result(1), may be because the males are more subjected to foot trauma related to the type of employment.

The mean age was 59.85 year, consistent with study of Ramtzmann study (3) (mean age 59 year) may be explained by the fact that with advance age the

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patient become self-caring with decrease immunity. The mean duration of DM was higher in major amputation group and it consistent with study of Lehto(5).; may be explained by more duration means more target organ damage and sensation to trauma. There was strong association between Wagner score and major amputation which reflects degree of atherosclerosis. Ischemic diabetic foot with or without infection is in dependent risk factor for major amputation (2). Target organ damage was significantly higher in major amputation group and it is consistent with result of Sena Yesil(4), Lehto(5). First fasting blood sugar shows a significant association with major amputation, this result consistent with study of Lehto(5). We didn't find significant association between leukocytosis and major amputation, the result is not consistent with study of Sena(4) who found significant association, our result may be explained by immunoparesis.

Conclusion:

from this limited cross sectional study we conclude that major amputation in diabetic foot patients is significantly associated with following factors :male sex, duration of diabetes more than 16 years, Age more than 60 years, grade 4 and 5 Wagner grades, >6 Doppler score, target organ damage, foot deformity, previous non traumatic amputation, smoking, Low socioeconomic state, Hb% <10gm/dl, ESR>80ml/h., Albumin level <2.5gm/dl., First fasting blood sugar >200mg/dl., Wagner stage is independent risk factor for major amputation, WBC count is poor prognostic factor for major amputation.

Recommendation:

1. Using of handheld Doppler as a routine tool in orthopedic word to asses peripheral vascularity of diabetic foot patients.
2. We recommend to enclose table 1 in the case sheath of every diabetic foot patient.

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عوامل الخطورة للبتر الرئيسي في مرضى قدم السكري

الدكتور احسان عوده ياسر –مستشفى الحسين التعليمي-ذي قار

الاستاذ المساعد.د.مدحت محمد مهدي-كلية الطب جامعة البصرة

الملخص

الغرض من الدراسة: تشخيص العوامل السريرية والمختبرية المسببة للبتر الرئيسي في مرضى قدم السكري.

المنهج: شملت هذه الدراسة المستقبلية مائة مريض مصاب بقدم السكري. تم تقييم حالة كل مريض من خلال اخذ التاريخ المرضي الكامل مع التركيز على العوامل التالية: العمر، الجنس، نوع ومدة ونوع علاج داء السكر، الحالة الاجتماعية والاقتصادية، التدخين ،الاعتلال الكلوي او العصبي او القلبي او اعتلال الشبكية، وجود بتر سابق او تشوهات القدم الناتجة من مرض السكر. بعد ذلك تم تصنيف الحالة حسب تصنيف واكثر لقدم السكري مع تقييم الارواء الدموي الوعائي باستخدام جهاز دوبلر.كما تم اجراء فحوصات خضاب الدم. عدد كريات الدم البيضاء الكلي والتفضيلي، معدا ترسب كريات الدم الحمراء، فحوصات وضائف الكلية، قياس اول قراءة للسكر بعد الصيام، قياس خضاب الدم المعسلن ونسبة الالبومين في مصل الدم.

النتائج: تبين من هذه الدراسة وجود عدد من عوامل الخطوره المصاحبة للبتر الرئيسي في مرضى قدم السكري وهي كما يلي:الذكورة، العمر المتجاوز ٦٠ سنه، مدة مرض السكر اكثر من ١٥ سنة، وجود الاعتلال الكلوي او العصبي او القلبي او الشبكي، التدخين، الحالة الاقتصادية المتدنية، وجود تشوهات القدم او بتر سابق ناتج من مرض السكري، نسبة خضاب الدم اقل من ١٠ غم/ديسلتر، معدل ترسب الكريات الحمر اكثر من ٨٠ مللتر/ساعة، فحص الدوبلر الاقل من ٦،خضاب الدم المعسلن الاكثر من ٨%،الدرجة الرابعة والخامسة من تصنيف واكثر.

الاستنتاج:كل العوامل المذكورة اعلاه هي عوامل خطوره مصاحبة للبتر الرئيسي في مرضى القدم السكري .

الدرجة الرابعة والخامسة من تصنيف واكثر تعتبر اهم العوامل الكؤدية للبتر الرئيسي. يمكن ايجلد جدول احترازي يتم من خلاله توقع درجة الخطورة للبتر الرئيسي لمرضى قدم السكري.