

Non-Traumatic Lower Extremity Amputation (The Common Causes)

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Abstract

Objective: **Lower Extremity Amputation (LEA):** is defined as the complete loss in the transverse plane of any part of the lower limb, and categorized as⁽¹⁾: (1) Minor (i.e. at or below the ankle joint). (2) Major (i.e. above the ankle joint).

Method & patients: The aim of this study is to determine the common causes of non-traumatic L.E.A. It is a retrospective study of (138) patients, with 149 lower limbs treated by amputation for different causes in Al-Hussein general and Al-Abass private hospitals in Karbala, in the period between Sep, 2002 through Sep, 2007, excluding cases due to trauma, military and army attacks.

Results: Diabetes is a major risk factor for LEA and form (78.5 %) of cases with different presentations. The important risk factors were infected deep ulcer in neuropathic foot (26 cases), late stages of infected foot (38 cases) and arteriosclerosis (51 cases) presented as gangrene in one toe or more. Patients with loss of protective sensation, loss of education and preventive program and neglect the ulcer or mild injury to complicate and presented in late stages end with amputation. Non-diabetic peripheral vascular disease (17%) is the 2nd cause; it is either arteriosclerosis or Beurger disease. Other rare causes were primary malignant bone tumor (3%) and other miscellaneous causes such as non-diabetic chronic osteomyelitis (1.5%). Minor amputations were 61 limbs (i.e.41%) but major amputations were 88limbs (59 %). (19) Patients from diabetic group had history of previous major amputations in the same side or other limb, and (11) of them done during the study period, so considered as risk factor.

Conclusion: Diabetic foot is the most common cause of LEA, and reduction in the number of amputation can be achieved if the patient is directed to foot-care programs. The diabetics need comprehensive care, included good endocrine control, education on endocrine control, yearly foot screening by multidisciplinary foot-care team. The patients should instructed to pay meticulous attention to foot wear, foot hygiene, to cutting nail and daily foot inspection to reducing the risk of an injury that can lead to heel ulcer and amputation.

Key words: Lower extremity amputation, Diabetes, peripheral vascular disease, foot ulcer, gangrene, peripheral neuropathy and infection.

Introduction

Amputation is the most ancient disease of all surgical procedures.⁽²⁾ LEA is defined as the complete loss in the transverse plane of any part of the lower limb⁽¹⁾, the highest incidence in the 50-75yrs.⁽²⁾; predominantly (75%) are males. Amputation should be considered when part of a limb is Dead, Dangerous and Damn

nuisance (i.e. worse than no limb)⁽³⁾. Peripheral Vascular Disease (P.V.D.) with or without diabetes mellitus account for almost of all amputation^(2,4). Other rare causes are sepsis (lethal or recurrent), malignant tumor and sever gross malformation⁽⁴⁾.

L.E.A. either (1) minor (limb save), mean remove one or more toes alone (digital amputation) or with metatarsal bones (ray

amputation) (2) major amputation (limb loss), is through ankle joint (e.g. Syme's) or Below Knee Amputation (B.K.A.) or Above Knee Amputation (A.K.A.)⁽¹⁾.

A high incidence of amputation can reflect a higher disease prevalence, late referral, limited resources, or a particularly interventionist approach by specialist team⁽⁵⁾. Conversely, a low incidence of amputation can indicate a lower prevalence or severity, good management of diabetes in primary and secondary care.⁽⁵⁾

Method & Patients

It is a study of (138) patients with 149 of non-traumatic L.E.A. for different causes done in Al-Hussein general hospital and Al-Abass private hospital in Kerbala in a period between sep.2002-sep.2007 were analyzed. (excluding cases due to trauma, military and army attacks)

Patients age, sex, the disease and mode of presentation, type of amputation, its site and side, history of previous amputation in the same limb or in the contra lateral one.

P.V.D. was defined from the history of ischemic features such as claudication pain, skin colour changes and/or absence of peripheral pulses, and Doppler or arteriography (if performed). D.M. was considered from the history and blood sugar level, and its presentations were divided as sepsis (subdivided into chronic localized osteomyelitis, and acute deep extensive infection), deep non-healing ulcer, Charcot osteoarthropathy or gangrene (dry or wet). Diabetic patients with superficial ulcers, abscess and cellulitis that responded to conservative treatment and minor surgical procedure were excluded from this study. Malignant bone tumours were diagnosed from presentation, radiological signs, and histopathological results.

Results

Disease	No. of Pt	Presentation		No. of limbs	Sex		Type of Amputation			
					M	F	Minor		Major	
							Dig.	Ray.	BKA	AKA
Diabetes Mellitus	107 pts	Sepsis (35)	Ch. OM	27	19	8	13	11	3	--
			Acute inf.	11	8	3	--	--	2	9
		Ulcer (26)	Heel ulcer	15	10	5	--	--	15	--
			Forefoot ulcer	11	8	3	7	4	--	--
		Gangrene (51)	Dry localized	21	14	7	13	8	--	--
			Dry Extensive	16	12	4	--	--	12	4
			Wet gangrene	14	9	5	--	--	3	11
Charcot' arthropathy (2)	2	2	---	--	--	2	--			
P.V.D.	24 pts	Arteriosclerosis		22	15	7	3	--	5	14
		Beurger' disease		3	3	---	---		3	
Malignant	5	osteosarcoma		4	1	3	--	----	----	4
		Ewing's tumor		1	1	---	---	---	---	1
Ch. O.M.	2	Ch. Discharging sinus		2	2	---	1	1	---	---
Total	138			149	104	45	34	27	45	43
					149		61		88	
Male (104), Female (45). i.e. M/F 2.3/1 The mean age was (59) yrs (ranged 15 -- 92 yrs).										

(149) lower limbs for (138) patients were treated by amputations for different reasons were studied. Male (96), female (42). The mean age was (59) yrs (ranged from 15 to 92 yrs). Diabetics were (107), non-diabetic

P.V.D. (24), malignancy (5) and (2) patients were non-diabetic chronic osteomyelitis.

Diabetic patients presented either as (1) sepsis (38) limbs or (2) gangrene (51) limbs with signs of P.V.D. or (3) non-healing

ulcers (26) and (4) tow patients with Charcot's osteoarthropathy. Diabetics with sepsis either (a) chronic osteomyelitis of metatarsal bones and / or toes (+-) non-healing discharging sinuses (27) limbs (four of them diagnosed as diabetes mellitus for the first time) and usually treated by minor

amputations after failure of conservative measures or (b) acute deep extensive infection (11) cases (unresponsive to antibiotics and surgical debridement) needed major amputations. Those with deep non healing ulcer (grad 2-3 of Wagner's classification) were (26) limbs.

0	High-risk foot	(a) pre-ulcerative lesion (b) bony deformity
1	Superficial ulcer, with partial or full-thickness skin involvement but does not include tendon, capsule or bone.	
2	(a) Deep ulcer penetrating to tendon, bone, or joint. or fascia (b) No abscess or <u>Osteomyelitis</u>	
3	Deep ulcer with abscess or osteomyelitis	
4	Localized gangrene.(portion of forefoot)	
5	Extensive gangrene (the entire foot) requiring a major amputation	

Wagner's classification ⁽⁶⁾

The ulcer site either in the heal (15 cases) (fig 1) and usually complicated with infection, ended with major amputation or in the forefoot (11 cases) (fig. -2-) and treated



Fig 1.

Diabetics with signs of P.V.D. either (a) dry localized gangrene of toes alone (21) cases (fig.-3-) (three of them diagnosed as diabetes for the first time) or (b) dry extensive gangrene (16) cases (fig.-4-)



Fig 3.



Fig 4.



Fig 2.

treated by major amputations or (c) gangrene involving part or whole foot with infection (wet gangrene)(14) cases (fig.-5-) treated by major amputations.



Fig 5.

Non-diabetic P.V.D. were either (a) arteriosclerosis (22) cases presented with foot gangrene and (5) of them had history of

vascular surgery (failed) (b) Beurger disease (3) cases not improved by lumber

sympathectomy and presented with sever rest pain.

Primary malignant bone tumor were (5) cases, four of them were osteosarcoma and the 5th was Ewing's tumor and usually treated by major amputation.

Minor amputations were (61) cases including digital amputations (34) limbs and ray amputations (27) cases. Other (16) cases needed revisions of procedures from minor to

major amputation within a 3-months period were considered as major amputation.

Major amputations were (88) cases including (45) BKA and (43) AKA. (19) Patients from diabetic group had history previous major amputations in the same side or other limb, and (11) of them done during the study period, so considered as risk factor.

Table 2. Show the incidence of amputation sides

The disease		Rt	Lt
Diabetes	Sepsis	20	15
	ulcer	16	8
	Gangrene	21	25
	Charcot's	1	1
PVD	arteriosclerosis	8	11
	Beurgar	2	3
		2	3
Malignancy			
Ch. osteomyelitis		1	1

Discussion

The loss of a limb is a personal tragedy, and is associated with a deterioration of functional status and residential status, decreased life expectancy⁽⁷⁾ with significant number requiring long term care⁽⁶⁾.

Most reports agree that the number of amputation performed increase each year⁽⁸⁾, this is primarily the result of an aging population with a high incidence of D.M. and P.V.D⁽⁹⁾. Although male/female ratio varied from 1:1⁽¹⁰⁾ up to 2:1^(6,4), in this study, there was male predominance (2.3/1) that can be explained by males more subjected to more foot trauma by wearing shoes and walking. Agree with other studies, there was no difference between Rt and Lt sides,⁽¹¹⁾ although some author found higher prevalence of Rt lower limb amputation in diabetic patient⁽¹²⁾.

Diabetes is a significant factor in LEA.⁽¹³⁻¹⁵⁾ and in US, 75.000 people lose their foot, leg, or toe due to diabetes each year⁽⁸⁾. L.E.A. is one of the most disabling complication of diabetics⁽¹⁶⁾, and its

incidence is increased from 10 to 15 folds in people with diabetic^(17, 18).

In our series the commonest indication for L.E.A. was diabetic foot (78.5%) and this agree with incidence in the united state (50-75%)^(19, 20) and Saudi Arabia⁽²¹⁾, but more than the incidence in U.K. (20-50%)⁽¹³⁾. We think the important causes for this high incidence are inadequate patient education and lack of foot-care programs.

The pathologic changes that necessitate LEA in diabetic patients are related to several problems including peripheral neuropathy, P.V.D., infection and poor wound healing⁽²⁰⁾. Diabetic neuropathy is common complication and leading risk factor for LEA⁽²²⁾. Diabetic neuropathy include (a) motor, lead to abnormal foot muscles mechanism and to structural changes (hammer toe, prominent metatarsal heads, and claw toe)⁽²⁰⁾ (b) sensory, resulting in the loss of protective sensation⁽²⁰⁾ and minor trauma may lead to skin break and ulceration⁽¹⁴⁾. (c) autonomic neuropathy causing abnormal blood flow regulation leading to dry skin and fissure formation⁽¹²⁾

that provides a potential port of entry for micro-organism, thus predisposing the skin to infection. Of all the ulcers seen in patients with diabetes, heel ulcers are the most serious and often lead to below-knee-amputation, because the capacity of the heel pad for shock absorption decline with age⁽²³⁾, and with repetitive stress may result in loss of skin integrity, ulceration⁽²⁴⁾ and subsequent infection. Diabetics have 15% chance of developing foot ulcer during the course of the disease^(25, 26) and without proper diagnosis and treatment; these infected ulcers often lead to amputation⁽²⁷⁾. In our series 13% of diabetic patients were with non-healing heel ulcer, complicated with deep infection that extended to calcaneus bone or along tissue planes proximal to the ankle joint and needed major amputation. Early detection of foot at risk through regular foot examination, knowledge of foot hygiene, non-weight-bearing exercise and good glycemic control are cornerstone of proper foot care to preventing heel ulceration^(28, 29). Regular curretting of hyperkeratotic tissues around the heel, in addition to gentle cleansing with soap and water followed by the application of topical moisturizer, help maintain healthy skin that can better resist breakdown and injury⁽³⁰⁾. Management of foot ulcers remains controversial, but effective management should include adequate assessment, and off-loading of weight during ambulation to increase the rate of ulcer healing and minimize amputation.⁽²¹⁾ Foot ulcer precede approximately 85% of all non-traumatic LEA in persons with diabetics.⁽³¹⁾

Dr. Karel Bakker, a foot specialist who is a chairman of the International Diabetes Federation, believes that more effective foot care and patient education strategies would render up to 85% of these procedures unnecessary⁽³²⁾.

Foot infections are a major complication of diabetes mellitus, accounting for up to 20% of diabetes-related hospital admission^(17,26), and according to a study led

by Texas A&M University, nine out of 10 non-traumatic LEA are instigated by an infection⁽⁸⁾.

Recent evidence indicates that diabetic patients are at greater risk for infection because of underlying neuropathy, peripheral vascular disease and impaired response to infecting organisms⁽²⁶⁾. Inadequate and inappropriate self-care is also a major factor⁽⁶⁾. Infections may precede or follow ulceration and in either instance, micro thrombi may formed and gangrene of the toes is likely. In our study there were (9%) of diabetic patients presented with acute deep extensive sepsis involving the foot, ankle joint, that did not improved by even extensive debridement and heavy doses of antibiotics. Several studies have elucidated the significance of infection as a predisposing risk factor leading to amputation, often in concert with peripheral neuropathy, PVD, and foot ulceration⁽³³⁾.

Charcot's neuroarthropathy in this study is (2) cases (i.e. 2% of diabetics) which higher than reported by Naghmi (0.12%) and lower than the incidence in Shakel study⁽³⁴⁾. Over 90% of amputation performed in the western world are 2ndary to PVD,^(2,13) and the increased its incidence is only partly explained by increasing number of the elderly⁽⁹⁾. PVD is the major cause of amputation in non-diabetic individual and contributes to approximately half of all amputations in individual with diabetics⁽¹⁸⁾. In our study P.V.D. were (76) (i.e.51% of all cases) divided into (a) without D.M. were (25) cases and (b) with D.M. were (51) cases. In patients with diabetes, PVD typically involve the tibial and peroneal arteries but spares the dorsalis pedis artery⁽²⁰⁾. so that popliteal and even pedal pulses may felt in patient with ischemic toes. (29) patients of (43) A.K.A. were due to P.V.D. and (15) of them (35%) were diabetics. Although some centers of excellence have reported a decrease in amputation rate after aggressive surgical revascularization⁽¹⁸⁾ but controversies

regarding the appropriate assessment and management of PVD exist.

Fifty four cases treated by minor amputation with good prognosis, mostly either localized diabetic sepsis or localized gangrene or forefoot ulcer. Other (16) cases needed revisions of procedures from minor to major amputation within a 3-months period were considered as major amputation.

An individual with D.M. who undergoes one amputation for arteriosclerosis has a 50% chance of having a second amputation within 5years⁽⁹⁾ prior major amputation considered one of documented risk factor⁽²⁾. In our series (19) Patients had history previous major amputations in the same side or other limb, and (11) of them done during the study period, and all were diabetics, except 2 cases (one Beurger and the 2nd arteriosclerosis). so considered as risk factor. **Dr. Craig Walker⁽⁷⁾** said "Among all the complications from diabetes, amputation can be the worst," A number of studies have shown the value of multidisciplinary teams in reducing amputation by up to 50%-85%^(35, 36).

Conclusion

Foot complications, including ulceration, gangrene and infection are the major risk for LEA. Most ulcer heal if managed early, aggressively with appropriate pressure relief, orthoses, wound care, antibiotics when indicated and metabolic control can decrease the number of persons with diabetic who undergo amputation.

Infection in diabetics is potentially serious, so early detection of infection and properly treated can be effective to decrease the incidence of amputation. Reduction in the number of amputation can be achieved if the patient is directed to foot-care programs. The diabetics need comprehensive care, included good endocrine control, education on endocrine control, yearly foot screening by multidisciplinary foot-care team (consist

from expertise in orthopedics, vascular surgery, endocrinology and podiatry. The patients should instructed to pay meticulous attention to foot wear, foot hygiene, to cutting nail and daily foot inspection to reducing the risk of an injury that can lead to heel ulcer.

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