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Dr. Munji Gururaj

Assistant Professor,

Department of Surgery,

Vishwabharathi Medical College,

Kurnool, Andhra Pradesh, India

Dr. Anantha Yadava

Assistant Professor,

Department of Surgery,

Vishwabharathi Medical College,

Kurnool, Andhra Pradesh, India

Treatment Modalities in management of diabetic foot complications at a Tertiary Care Hospital

Dr. Munji Gururaj and Dr. Anantha Yadava

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Abstract

The feet are one of the most used parts of the body, are necessary for daily activities pertaining to locomotion, and are therefore subject to repetitive trauma. Trauma, in turn, may lead to open lesions that allow ingress of pathogenic microbes. In the diabetic person, the pathogenesis of foot infections is multifaceted. Out Of 100 cases studied in 20 cases the wound healed well, and patients were discharged without any complications. While in 8 cases the resulting raw area needed split thickness skin grafting. In 27 cases the wound remained as chronic ulcer without any signs of healing. Out of 38 amputations(35 BKA & 3 AKA) 27 stumps healed well, while 9 of them ended in dehiscence and the remaining 4 cases of amputation died due to other associated comorbidities. Out of the 100 cases in 14 cases the patient died because of other associated comorbidities of diabetes.

Keywords: Diabetic Foot, Complications, Treatment Modalities

Introduction

It has been recognized that persons with diabetes are prone to foot problems. Recent advances in molecular biology have added substantial insight into the pathophysiology of the disease and opened new avenues for treatment.

Enhanced non-enzymatic glycosylation of lipoprotein has been shown to impair the binding of glycosylated LDL to the LDL receptor. Glycosylated LDL enhances the formation of cholesteryl ester and accumulation human macrophages – formation of foam cells characteristic of the early atheromatous lesion ^[1].

It is also noted that, vascular smooth muscle cells exhibit increased growth on exposure to high glucose in vitro.

Blue toe syndrome is sudden onset of pain in the toe with bluish discoloration associated with leg/thigh myalgia and a sharp demarcated gangrenous toe is seen in diabetic foot. This is due to cholesterol emboli that break off from an ulcerated atheromatous plaque in the proximal vessels. Warfarin is used in treatment ^[2].

Peripheral neuropathies are found in 55% of diabetics. The incidence of neuropathies increases with duration of disease and episodes of neuropathies increases with duration of disease and episodes of hyperglycemia. Peripheral neuropathy clearly renders the patient to unrecognized injury, which potentiates the risk of bacterial invasion and infection ^[3].

The feet are one of the most used parts of the body, are necessary for daily activities pertaining to locomotion, and are therefore subject to repetitive trauma. Trauma, in turn, may lead to open lesions that allow ingress of pathogenic microbes. In the diabetic person, the pathogenesis of foot infections is multifaceted. Vascular insufficiency, neuropathy, and decreased resistance to infection, possibly from metabolic imbalance, have all been implicated. In the individual patient, the relative contribution of each of these factors can vary. The presence of peripheral neuropathy can lead to an insensate foot, to impaired ability of the foot to sweat, in turn leading to drying, fissuring, and cracking, and to deformities arising from poorly perceived microfractures. These changes, in the presence of the diabetic state, with or without significant vascular impairment, can set the stage for the entry of bacterial pathogens and the progression of the infections process ^[4].

Diabetic patients also represent around 60 percent of nontraumatic foot or leg amputations, the majority of which are secondary to infectious complications.

Corresponding Author:

Dr. Anantha Yadava

Assistant Professor,

Department of Surgery,

Vishwabharathi Medical College,

Kurnool, Andhra Pradesh, India

Defects in immune function have been described as occurring in diabetics. White cell dysfunction in diabetes's, adherence, and chemotaxis, phagocytosis, and killing ability has been described in diabetic patients. In general, these defects are aggravated by poor glucose control. Poor granuloma formation and poor healing have also been seen in diabetic mice [5].

Salvapandian reviewed the different types of foot infections and their characteristics in 1982. These infections can occur in nondiabetic as well as diabetic persons, although the presence of the diabetic state can aggravate the risks and themorbidity associated with these infections. Foot infections can occur in the wake of acute or chronic trauma.

Methodology

Source of Data

This study was conducted comprising of 100 patients of Diabetic foot in the Department of Surgery at Medical College.

Inclusion Criteria

All the patients with Diabetes Mellitus presenting with foot ulcers, infection of foot and gangrene of foot.

Exclusion Criteria

- 1) Patients with foot infections without Diabetes.
- 2) Patients with ulcer and Gangrene of foot other than Diabetic etiology.

Methods of Collection of Data

- Detailed history taking.
- Clinical examination
- Investigations (Routine Laboratory investigation)
- Relevant special investigations.
- Conservative management with meticulous dressing and if needed major surgical interventions with its outcome.

Results

Majority of the septic lesions yielded Staphylococcus aureus on culture of pus. Other organisms that were isolated are, Pseudomonas, Klebsiella, E. Coli, Proteus. Most of them were sensitive to Ampicillin, Gentamycin, and Amikacin. Some cultures yielded more than one type of bacteria.

Table 1: Culture and Sensitivity

Bacterial	No of Cases	Percentage (%)
Staphylococcus aureus	44	44
Pseudomonas	14	14
Klebsiella	20	20
Coliform	10	10
Proteus	8	8
Non-Haemolytic Streptococci	4	4

Table 2: Type of Lesions

Type of Lesion	No Of Patients	Percentage
Neuropathy	60	60
Vasculopathy	23	23
Combined	17	17

In the present study 60 (60%) cases were found to have neuropathy. Patients with neuropathy varied from 35-80 years. Majority had history of diabetes of more than 5 years. This shows that peripheral neuropathy is common in long standing diabetic patients. 23 (23%) patients had Gangrene.

In this series 18 cases were managed by daily dressing and wound debridment, and slough excision. 11 patients were treated with Split skin graft, 9 patients under went incision and drainage for abscess and some of them fasciotomy, also 8 cases who presented with Gangrene of toes and phalanges, were treated with disarticulation, and Transmetatarsal amputation was done in one case. Below knee amputation was done in 3 cases and above knee amputation in 1 case.

In most of the cases, limb was salvaged by conservative treatment and minor amputations.

Table 3: Treatment

Treatment	No of cases	Percentage (%)
Slough excision and regular dressing	24	24
Fasciotomy	10	10
I&D	4	4
Disarticulation	17	17
Fore Foot Amputation(FFA)	7	7
Below knee amputation (BKA)	35	35
Above knee amputation (AKA)	3	3

Out of 60 case of neuropathy 23(38.33%) needed and daily dressings, Fasciotomy and I & D was done in 13(16.67%) cases, disarticulation in 6(10%) of them, fore foot amputation in 2(3.33%), while 15 (25%) cases ended up having below knee amputation and 1 in above knee amputation.

In Vasculopathic form of diabetic foot (23 cases), majority ended up in having Below knee Amputation., i.e.,15 cases of 23 (65.22%), 3 case underwent disarticulation (13.04%), 4 cases ended in fore foot amputation (17.39%) and 1 case in above knee amputation (4.35%).

Out of 17 cases of mixed neurovascular lesions 8 cases ended in disarticulation, 5 cases in below knee amputation (29.41%),while debrediment, Fasciotomy, fore foot amputation and and above knee amputation was done in 1 case each (5.88%).

Table 4: Treatments Adopted in various Types of Lesions

Treatment	Nueroopathy(60)		Vasculopathy(23)		Combined(17)	
	Cases	%	Cases	%	Cases	%
Slough excision and regular dressing (24)	23	38.33	-	-	1	5.88
Fasciotomy(10)	9	15	-	-	1	5.88
I&D (4)	4	6.67	-	-	-	-
Disarticulation(17)	6	10	3	13.04	8	47.05
Fore Foot Amputation(FFA)(7)	2	3.33	4	17.39	1	5.88
Below knee amputation (BKA)(35)	15	25	15	65.22	5	29.41
Above knee amputation (AKA)	1	1.67	1	4.35	1	5.88

Table 5: End Results of Diabetic foot

End Result	No of Cases	Percentage
Wound Healed Well	20	20
Split skin Graft	8	8
Chronic Ulcer	27	27
Amputation	22	22
Stump Dehiscence	9	9
Death	14	14

Out Of 100 cases studied in 20 cases the wound healed well, and patients were discharged without any complications. while in 8 cases the resulting raw area needed split thickness skin grafting. In 27 cases the wound remained as chronic ulcer without any signs of healing. Out of 38 amputations(35 BKA & 3 AKA) 27 stumps healed well, while 9 of them ended in dehiscence and the remaining 4 cases of amputation died due to other associated comorbidities. Out of the 100 cases in 14 cases the patient died because of other associated comorbidities of diabetes.

Discussion

The commonest pathophysiological changes that lead to diabetic foot are neuropathy, ischaemia and infection Neuropathy changes seen in 52 cases, Ischemic complication was noted in 23 cases And infective complication of foot noted in all cases. . The incidence of gangrene in the present series is comparatively approximately equal to that of Bell series of 1960 and more than that of Diabetic Research center (2005) Chennai

Table 6: Gangrene – Comparison of incidence of gangrene in various series

	No of cases	No of cases with Gangrene	Percentage
Bell series (1960)	964	236	24.9
Pennsylvania Hospital Series	614	274	44.78
Diabetic Research center (2005) Chennai ^[7]	1319	64	5
Present Study	100	23	23

In the present series, 24 cases were treated by slough excision, 10 with fasciotomy, I & D in 4 cases, 17 by disarticulation and fore foot amputation was done in 7 cases. Below knee amputation was done in 35 cases and above knee amputation was done in 3 cases.

Proper control of diabetes is very important in diabetic foot management. Fasting and postprandial blood sugar estimations were well under control. Urine sugar estimation was done twice daily.

Infection was treated with broad spectrum antibiotics. Patients were educated about care of foot and Tab Trental (pentoxifylline) was administered to in-patients with ischemic lesions.

Table 7: Comparison of Amputations in various series

	No of cases	No of amputations	Percentage
Collen's series (1962) ^[8]	215	83	38.6%
Osaka kosainekin Hospital (2005) ^[9]	210	110	52%
Present study	100	38	38%

The amputation rate is much 38% almost equal to that of Collen's series 38.6% in 1962. And less than Osaka kosainek in Hospital (2005) study (52%). After amputation, wound healed

well. The patients were referred to Rehabilitation center for prosthesis.

In neuropathy 38.33% needed and daily dressings, while 25% cases ended up having below knee amputation and 1 in above knee amputation.

In Vasculopathy, majority ended up in having Below knee Amputation 65.22%.

Conclusion:

- The prognosis in diabetic foot patients does not solely depend on local complications of diabetic foot but also on the other associated systemic comorbid conditions like cardiac failure, renal insufficiency, metabolic problems etc.
- Hence the treatment of diabetic foot complications is a team work headed by the surgeon with support from general physicians, cardiologists, nephrologists, physiotherapists, podiatrists, etc.

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