

Management of Diabetic Foot at Tertiary Care Hospital

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Abstract

Introduction: Quite often, Diabetic patients present with uncontrolled infection, ulcerations leading to compromise of part of foot. Thus there was a need to study various measures to prevent these complications.

Methodology: All operative and medical management findings were noted and patients were followed up at intervals. All the data received during this procedure are placed in a special pro-forma that is prepared for the said purpose.

Results: Out of 50 cases, 21 cases couldn't turn up for a follow up and so the prognosis could not be evaluated for these cases. Satisfactory local healing was achieved in 11 cases including 2 cases of gradel and 9 cases of toe amputation after 6 weeks of follow up. 1 case of transmetatarsal amputation came for check-up and a satisfactory healing with no pressure complications was noted at the time of follow-up.

Conclusion: HbA1c control was found to be poor (>8%) in a very high percentage of patients conforming the risk relation between glycosylated hemoglobin and diabetic foot infections.

Keywords: Diabetic Foot; Amputation; Management.

Introduction

The term diabetes mellitus describes a metabolic

disorder of multiple etiology, characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. The effect of diabetes mellitus includes long term damage, dysfunction and failure of various organs. Diabetes mellitus may present with characteristic symptoms such as increased thirst, polyuria, blurring of vision and weight loss. Long term effects of diabetes mellitus include progressive development of the specific complication such as retinopathy, nephropathy, neuropathy, with risk of foot ulcers, amputation, charcot joints and features of autonomic dysfunction, including sexual dysfunction. Diabetes are at increased risk of cardiovascular, cerebrovascular and peripheral vascular disease (WHO, 1999) [1].

In 1975, Wash et al described 47 newly diagnosed diabetic patients presenting specifically with a neuropathic foot lesion. During follow up, 26 died within 5-15 years. Mortality was higher (83%) among elderly patients having ischemia contribution to their foot problem.

About patient mobility in the study of Christine J. Moffatt et al (1992) [2] found that 55% of patients freely mobile, 36% could walk with aid and 7.4% were chair-bound.

ShPendsey (1994) [3] found in an epidemiological study of diabetic foot that survival at 2yr after major amputation was 83.4% vs 30% (western series).

25-51% of diabetic amputees require amputation of the second leg within 5 years following an initial amputation. The mortality rate in patients with diabetic foot ulcer is also high and is approximately twice that of patients without ulceration. Five years mortality following amputation was 39%-68% in various studies (ReiberGEetal, 1995) [4]. Over 50% of

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diabetic patients who survive a major amputation die within 1 year.

It is reported that one in six persons with diabetes suffer from diabetic foot ulcer worldwide and 5-10% of diabetic foot ulcer result in amputation. More than 50% of non-diabetic lower limb amputations are done among diabetic group of individual.

It is unfortunate that no country succeed in meeting the targets of either the St. Vincent declaration or the USA Dept. of Health, namely to reduce the amputation rate among diabetic patients by 50% before 1995 or even by 40% by 2000 (Department of Health and Human Services. Healthy People, 2000).

Anne Carrington from Manchester, England presented data from a 6 year longitudinal study of 169 subjects that examined predictive risk factors for ulcers and amputation, which specifically focused on a variety of neurologic parameters measures at baseline within 6 years, 19.5% of the combined diabetes group developed a new foot ulcer, 11.2% had an amputation and 18.3% died (Carrington AL et al 2001) [5].

The HbA1c test measures the amount of sugar that is attached to the hemoglobin in red blood cells, the percentage that occurs in people without diabetes is usually about six percent. Because red blood cells live in the bloodstream for about four months, the HbA1c test shows the average blood sugar for the past several months.

Unlike your regular blood sugar test, the HbA1c test is not affected by short-term changes. So even though you may have had high blood sugar on occasion, a good glycosylated hemoglobin result can show that, overall, you are doing a good job of controlling your diabetes.

In former years, amputation was the usual outcome and even today foot problems cause more inpatient bed occupancy than all other complications of diabetes put together. As a matter of fact, diabetic foot lesions become the main cause of disability, suffering, absence from work, frequent hospital visits, hospitalisation and increase in expenditure.

Quite often, Diabetic patients present with uncontrolled infection, ulcerations leading to compromise of part of foot. Thus there was a need to study various measures to prevent these complications.

Methodology

Based on Wagener's classification, all the cases were graded and treated according to the following

criteria.

Amputation of Gangrenous Toe

Following amputation / disarticulation of the gangrenous toe, the wound is left open and allowed to granulate. Primary suture is undertaken only if the bleeding at operation indicates the presence of reasonably good blood supply and if the edge can be approximated without tension.

Transmetatarsal Amputation

When the area of gangrene extends proximally beyond the toes on to the dorsum of the foot, amputation of the leg is the only reliable method of treatment.

Below-Knee Amputation

The operation is done through a circular incision 7 inches below the knee. The skin is reflected up very gently for 2 inches and the muscles are divided by a guillotine incision at this level. Blood vessels are ligated and the dissection continued in the subperiosteal layer until a 4 inch tibial stump is obtained.

The stump is bound up with jelonet and the skin edges being turned in over the raw area. Then the limb is supported on a plaster extending well up to the thigh. If there is any doubt about sepsis, healing is allowed to take place by granulation, a delayed primary suture is carried out. Healing in this case is expected in about three weeks.

All cases were discharged with advice to attend the surgical out-patient department for follow-up after 2, 4, 6 weeks and 2, 3, 4 & 6 months. The following protocols were followed during follow-up.

1. A thorough clinical examination of the patient including bilateral foot examination.
2. The glycaemic status at the time of follow-up are noted.
3. Any reappearance of ulcer or abscess in the previously affected area or other areas of feet or gangrene in other toes is noted.

Results

In the present series, 44 (88%) patients with poor glycaemic control have the diabetic foot infections, 5 (10%) patients with fair glycaemic control have the diabetic foot infections and the 1 (2%) patient who had a good control (<7%) of HbA1c had a small ulcer

Table 1: Glycosylated hemoglobin and symptomology

Symptoms	Glycaemic Control		
	Good (<7%)	Fair (7-8%)	Poor (>8%)
Ulcer	1	3	4
Abscess		1	7
Gangrene			29
Gangrene with Abscess			5
Total	1	5	44

Table 2: Current ulcer duration:

Duration in weeks	No of cases	Percentage (%)
3-<6weeks	44	88
6-<12 weeks	5	10
12-<18weeks	1	4
>18weeks	0	0
Total	50	100

Table 3: Patient's mobility:

Grade	Description of Grade	No of cases	Percentage (%)
1	Unrestricted	2	4
2	Limited mobility beyond home	18	36
3	Homebound	6	12
4	Walk's with Aid	18	36
5	Chair bound	6	12
	Total	50	100

Table 4: Glycosylated hemoglobin

HbA _{1c} Control	Plasma glucose value(in mg/dl)	No. of cases	Percentage
Good (<7%)	<154	1	2
Fair(7-8%)	155-183	5	10
Poor (>8)	>183	44	88

Table 5: X-ray of foot

Findings	No of cases	Percentage (%)
Normal	37	74
Osteomyelitis	8	16
Soft tissue swelling	5	10
Total	50	100

Table 6: Management

Interventions	No of cases	Percentage (%)
Debridement & dressing	5	10
I & D & dressing	10	20
Skin grafting (SSG)	3	6
Toe amputation	30	60
Trans-metatarsal amputation	1	2
Below-knee amputation	1	2
Total	50	100

on dorsum of the left foot.

In the present series, 44 cases (88%) were presented with diabetic foot for less than 6 weeks duration, 5 cases with 6-12 weeks duration and 1 case more than 12 weeks and none with >18 weeks duration.

In the present study, 36% had limited mobility beyond home, 36% could walk with aid and 6% were chairbound.

The associated complications include retinopathy in 7 cases (14%), nephropathy in 9 cases (18%) and hypertension in 7 cases (14%).

Out of 50 cases, 10 cases (20%) have never smoked cigarette/bidi where as 40 cases (80%) were smokers. Out of this 40 cases 8 cases (16%) had stopped smoking where the rest 32 cases (64%) were continuing with the habit of smoking.

Out of 50 cases, 12 cases (24%) consume alcohol

occasionally.

In this study, highest number of patients had { 44 cases (88%) } poor glycaemic control.

The X-Ray foot-AP and Lateral views of the affected side was done in all the cases of diabetic foot. Out of 50 cases, 37 cases (74%) X-Ray findings were normal. 8 cases (16%) in this series revealed osteomyelitis with bone resorption and the rest 5 cases (10%) were revealed soft tissue swelling.

The specimens for Pus culture were obtained in all the cases of diabetic foot by curetting the base of the ulcer after debridement. Single pathogen (usually staphylococcus or streptococci) Staph aureus 31 cases (62%), streptococci 9 cases (18%) and mixed 10 cases (20%) in the present series.

In the present series proteinuria was detected in 7 cases (14% out of 50 patients).

Five cases had clinical evidence of peripheral vascular disease. Doppler study of both legs was done in cases which reveal features suggestive of diabetic angiopathy involving small peripheral branches whereas the other cases could not afford to carry out the investigations due to financial matters.

Besides glycaemic control by oral hypoglycaemic agents or Human Insulin (Actrapid), wound care by debridement and dressing and antibiotics coverage to combat infection, different surgical interventions were instituted as per the requirement of the cases.

In the present series of 50 cases of diabetic foot, besides glycaemic control and antibiotics 5 cases (10%) were treated by regular dressing only.

In the present series of 50 cases of diabetic foot, besides glycaemic control and antibiotics, 10 cases (20%) were treated by I&D with regular dressing.

In the present series of 50 cases of diabetic food, besides glycaemic control and antibiotics, 3 cases (6%) were treated by SSG.

In the present series of 50 cases of diabetic food, besides glycaemic control and antibiotics, 30 cases (60%) were treated by amputation of the toe / toes with regular dressing.

In the present series of 50 cases of diabetic foot, besides glycaemic control and antibiotics, 1 case (2%) were treated with trans-metatarsal amputation with dressing.

In the present series of 50 cases of diabetic food, besides glycaemic control and antibiotics, 1 case (2%) were treated with below-knee amputation with dressing.

The complications following surgical interventions

include non healing ulcer in 9 cases (18%), septicemia in 3 cases (6%), renal failure in 3 cases (6%) and 1 patient expired.

In the present series of 50 cases of diabetic foot, 1 patient expired during hospital stay due to complications. 32 patients were discharged with an advice to attend surgery OPD after 2nd, 4th, 6th weeks and after 2nd, 3rd, 4th, and 6th month and 17 cases were discharged on request due to domestic and financial problems.

Out of 50 cases, 21 cases couldn't turned up for a follow up and so the prognosis could not be evaluated for these cases. Satisfactory local healing was achieved in 11 cases including 2 cases of gradel and 9 cases of toe amputation after 6 weeks of follow up. 1 case of transmetatarsal amputation came for check-up and a satisfactory healing with no pressure complications was noted at the time of follow-up.

Discussion

Glycaemic Control

In this study, 44 cases (88%) had poor glycaemic control. Nighatakbar and Nighat Bilal (2004) [6] in their study of 36 patients, 33 patients (91.6%) had poor glycaemic control.

Dronge A.S. et al (2006) [7] showed in a series of 647 patient who underwent major noncardiac surgery with good preoperative Glycaemic control (HbA1c levels <7%) is associated with a decrease in infection complications across a vareity of surgical procedures. In our observation also we have seen that diabetic foot infection was associated with a poor prehospital Glycaemic control (HbA1c levels >8%).

Nighat Akbar and Nighat Bilal (2004) [6] has shown that when HbA1c level is poor (>8) development of diabetic foot lesions is high. according to them when it is from 8.1- 9% the frequency is 85%, when it is from 9.1-10% it is 90%, and when it is between 10.1-11% or >11% the frequency is 100%. But there is a great heterogeneity in the literature in reporting Glycosylated hemoglobin to micro and macrovascular complication of diabetes. But the risk relation is justified by many authors like De vejt et al (1999) [8].

X-Ray of Foot

In the present study, 8 cases (16%) had osteomyelitis i.e less than one- third of diabetic foot. Underlying osteomyelitis is present in one-third to

two-third of diabetic patients with moderate or severe foot infections (Grayson ML, 1995) [9].

Proteinuria

In the present series proteinuria was detected in 7 cases (14%). William et al (1990) [10] in their study of 39 cases reported the incidence of proteinuria to be 13.5%.

Glycosylated Hemoglobin Estimation

Estimation of Glycosylated Hemoglobin done in all patients in that 44 patients out of 50 (88%) had a poor Glycaemic control.

Patient's Mobility

In the present study, 36% had limited mobility beyond home, 36% could walk with aid and 6% were chairbound. The study of Christine J. Moffatt et al (1992) [11] found 55% of patients freely mobile, 36% could walk with aid and 7.4% were chair-bound.

Management

Besides glycaemic control by Insulin or Oral hypoglycaemic agents and antibiotic coverage to combat infection, different surgical interventions were instituted as per the requirement of the cases.

Surgical Interventions

In the present series, surgical interventions instituted are Debridement and dressing in 5 cases (10%), I & D with regular dressing in 10 cases (20%), Skin grafting in 3 cases (6%), Toe amputation with dressing in 30 cases (60%), Transmetatarsal amputation in 1 case (2%) and Below-knee amputation in 1 case (2%). Pecoraro et al (1990)¹² in their study of 80 cases from Seattle reported 35% toe amputation, 6.25% trans-metatarsal amputation, 43.8% below-knee amputation and 15% above-knee amputation. Deerochanawong et al (1992) [13] from their study of 48 cases from Newcastle reported 31% toe amputation, 6% transmetatarsal amputation, 46% below-knee amputation and 17% above-knee amputation.

It has been seen that most of the patients (30%) with diabetic foot infections need toe amputation in our series contrary to a need of high amputation in the series of earlier years.

Proper glycaemic control, awareness of the patients about possible foot infections, advancement in surgical care and development of podiatric might be

the reason behind this observation.

Perhaps a day will come when number of minor amputations will also come down more. Prevention remains as very important element in the management of foot infections in all diabetic patients.

Conclusion

1. The treatment of diabetic foot should be expectant and early, with an attempt to contain the pathological as well as clinical progression of the disease. This requires a multidisciplinary team approach. Tight control of hyperglycemia, rest, antibiotics, correction of anemia if any, and surgical intervention as and when necessary constitute the main stay of diabetic foot management.
2. Individuals at high risk for lower limb amputation must be identified, evaluated and treated according to the risk status.

References

1. World Health Organization. Definition, Diagnosis and classification of Diabetes Mellitus and its complication, 1999.
2. McCollough NC: Principles of amputation surgery in vascular disease. In Evarts CM (ed): Surgery of the Musculoskeletal System. NY, Churchill Livingstone, 1983; 4:5-42.
3. Pendsey, Editorial, International Journal of Diabetes in developing countries, 1997; 14(2):36.
4. Reiber GE, Boyko EJ, Smith DG. Lower extremity foot ulceration and amputations in diabetes. Diabetes in America, 2nd Ed. Bethesda, MD: National Institutes of Health, 1995.p.409-428. NIH publication No. 95-1468.
5. Carrington AL, Shaw JE, Van Schie CH, et al Small and large nerve fiber dysfunction predict foot ulceration and amputation in diabetes. Program and abstracts of the 61st scientific sessions of the American Diabetes Association: June 22-26, 2001; Philadelphia, Pennsylvania. Diabetes.: 2001; 50(Suppl 2): Abstract 61-OR.
6. Neil et al. Diabetes in the elderly: the Oxford Community Study. Diabetic Med. 1989; 6:608-613.
7. Dronge A S, Perkal M F, Kanier s et al (VA Connecticut Health care System, West Haven, Yale Univ, West Haven Conn); Arch surg 2006; 141:375-380.
8. Delbridge et al. Limited joint mobility in the diabetic foot: relationship to neuropathic ulceration. Diabetic

- Med. 1998; 5:333-337.
9. Grayson ML, Gibbons GW, Habershaw GM et al. Use of ampicillin/sulbactam versus imipenem/cilastatin in the treatment of limb-threatening foot infections in diabetic patients. *Clin Infect*, 1994; 18:683-693.
 10. William et al. Foot ulcers in previously undiagnosed diabetes mellitus. *But. Journal of Med.* 1990; 300:1046-1047.
 11. Collen W.S., Vlahos E, Dobkin G.B., Neumann E. Conservative management of gangrene in the diabetic patient. *JAMA* 1962; 181:692.
 12. Pecoraro R.E., Reiber G.E., Burgess E.M., Pathways to diabetic limb amputation: basis for prevention. *Diabetes Spectrum* 1990; 5:329-334.
 13. Deerochanawong et al. A survey of the lower limb amputation in diabetic patients. *Diabetic Med.* 1992; 9:942-946.
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