



CLINICOPATHOLOGICAL EVALUATION AND MANAGEMENT OF DIABETIC WOUNDS

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ABSTRACT

To study the bacteriology, pathophysiology of diabetic wound, various wound salvage procedures and outcome, different treatment modalities and newer techniques wherever applicable to prevent complications and to minimize the progression of occurred complications. 50 patients admitted with wound with diabetes presenting with lesions selected for the present study with detailed history taking, clinical examination, investigations, relevant special investigations and with conservative management and if needed surgical interventions and its outcome by prospective cohort study which follows over the time a group of similar individuals who differ with respect to certain factors under study to determine how these factors affect rates in certain outcome. Males are almost four times more affected than females, duration of diabetes from 1 year to 22 years and many patients were diagnosed after admission. Trivial trauma of some kind was the initiating factor in more than half of the cases, commonest presenting lesion was Ulcer in 10% of cases. Conservative management in these patients comprises of control of diabetes, treatment of neuropathy with methyl cobalamine, and wound care with appropriate dressings. Surgical management of patients comprises of secondary suturing, split skin graft, disarticulation of joints and below and above knee amputations.

KEYWORDS :

INTRODUCTION

Diabetes is a worldwide problem¹. Diabetic incidence is 1.2% in India. A good number of diabetic patients develop wound in their course of illness. Patients who developed wound required hospitalization for their management. The causes of diabetic lesions are multiple. The reasons for Diabetic foot are:

- Foot is the most prone site for trauma.
- Peripheral neuropathy particularly in diabetes and ischemia due to microangiopathies of arteries.
- Prevalence of diabetes is increasing over past few years. According to WHO statistics increment in diabetes will be from 135 million to 300 million by the year 2025. For diabetes mellitus Crude Prevalence Rate is 9% in urban and 3% in rural areas.
- In India Impaired Glucose Tolerance is a mounting problem.
- The prevalence of impaired glucose tolerance test is 8.7% in urban and 7.9% in rural areas.
- In India diabetes appears in earlier age of life that's why complications are more common
- In diabetic patient problems such as ulceration, infection, gangrene are common.
- These complications leads to hospitalization and morbidity even mortality
- Overall 50% non-traumatic amputations are due to diabetes.
- So the study was taken up to identify the complications using newer techniques wherever possible

This study was carried out

1. To study the bacteriology in diabetic wound
2. To study various wound salvage procedures and outcome.
3. To study different treatment modalities and newer technique wherever applicable to prevent complications and to minimize the progression of occurred complication

Material and methods

The patients admitted with diabetic wound in the department of surgery, NIMS hospital, jaipur from January 2015 to June 2016. 50 patients clinically presenting with diabetic wound admitted and treated in department of surgery, NIMS hospital, jaipur. Patients

with diabetes mellitus presenting with wound i.e. ulcer, blister, abscess, gangrene or post-operative wound complications were included in the surgery. Patients with chronic wound due to cause other than diabetes such as traumatic, arterial, trophic, TB, syphilitic, malignant ulcer are excluded from study were excluded from the surgery. Data was collected by taking detailed history, clinical examination, investigations (routine laboratory investigations), relevant special investigations, result of management, deformity and complications, death.

RESULTS AND ANALYSIS

An analysis of 50 cases of Diabetic wound was done. Out of these 50 cases, 25 cases were postoperative clean cases which underwent infection. These cases were admitted and treated in different surgical units in NIMS hospital, jaipur, from January 2015 to June 2016.

Age distribution:-

Out of 50 cases studied, Youngest patient was 35 years and oldest was 79 years of age. Highest number of cases was found in 51-60 years of age (34%) followed by 61-70 years of age (26%).

Sex distribution:-

Of the 50 cases studied in this series, 39 (78%) cases were male and 11 (22%) cases were female.

In this study 40 cases were traumatic and 10 cases were non-traumatic. As per Wegner's classification of the diabetic foot lesion, different stage wise presentation of the cases has been laid down. Out of the 25 cases of diabetic foot, 11 cases presented with grade 2 lesion, 8 cases with grade 4 lesion, 4 cases with grade 3 lesion, 1 case with grade 1 lesion, 1 case with grade 5 lesion and no case of grade 0 limb.

In present study, 50% lesions are found in lower limb only and remaining half lesions are found in postoperative patients.

Mode of presentation:

- Out of the 50 cases, 10 cases presented with ulcer, 7 cases with Gangrene of toe or limb, 4 cases with Cellulitis, 1 case with

Abscess and 25 cases with postoperative complications (superficial and deep) of routine surgeries .

Duration of Diabetes

Duration is not accurately known, as few patients were unaware of being diabetics and were diagnosed as suffering from diabetes on admission with complaints of non-healing ulcers.

In our study 20% were diagnosed to have diabetes on admission. Only 2 patients had diabetes of more than 20 years of duration. Maximum patients in our study were diabetics of 6 -10 years duration (30%).

Culture and Sensitivity

Bacteria	No of cases	Percentage (%)
Staphylococcus aureus	18	36%
Pseudomonas	10	20%
Klebsiella	8	16%
E-Coli	6	12%
Proteus	5	10%
Non haemolytic streptococcus	3	6%

Majority of the septic lesions yielded Staphylococcus aureus on culture of pus. Other organisms that were isolated are, Pseudomonas, Klebsiella, E.Coli, Proteus etc. Most of them were sensitive to Ampicillin, Ceftriaxone, Gentamycin, Imipenem, Meropenem and Amikacin

Neuropathy with duration of Diabetes

In the present study patients were investigated with tuning fork test and Monofilament test to test for the presence of neuropathy.

In the present study 7 cases were found to have neuropathy with the above investigations. Patients with neuropathy varied from 50-80 years. Majority had history of diabetes of more than 10 years. This shows that peripheral neuropathy is common in long standing diabetic patients.

Ischemia

In the present study, the patients underwent investigations to look for the vascularity of limb with Audio Doppler, Color Doppler .These investigations showed atherosclerotic changes with low volume flow in the anterior and posterior tibial arteries in 5 patients and 2 patients had thrombosis in the blood vessel.

Duration of Hospitalization:

In this study minimum stay in hospital was 6 days and maximum was 66 days. This long duration of hospitalization can be explained by the refractory to treatment of the lesions owing to the diminished resistance of the body, hyperglycemia, impaired hormonal defense mechanisms and multidrug resistance of the organisms to antibiotic therapy.

Comparison of grade of lesion relation to duration of hospitalization

No. of days hospitalization	Grade of lesion					
	0	1	2	3	4	5
Mean/Average days	0	10.75	30.86	31.61	33.37	30

Treatment

In this series 50 cases were managed by daily dressing (e.g. Betadine, Hydrogen peroxide, Eusol, Glycerine Magnesium Sulphate, Normal Saline, Amorphous Hydrogels and use of VAC in 2 cases) and secondary suturing (in all postoperative patients), wound debridement, and slough excision.

3 patients under went incision and drainage of abscess and fasciotomy.

4 healthy wounds were treated with split skin graft.

6 cases who presented with Gangrene of toes and phalanges, were treated with disarticulation.

1 cases needed below knee amputation

Appropriate Antibiotics were administered after culture and sensitivity, 6 patients needed blood transfusion for correction of anemia, along with supportive therapy almost in all cases in the form of vitamins, iron and protein preparations.

Diabetes was controlled with Insulin and Oral hypoglycemic agents.

In this series, patients presented with uncontrolled diabetes therefore it was initially controlled with Insulin so as to facilitate control of infection and to promote healing process of the wound. Neuropathy treated with Methyl Cobalamine and 5 cases with Pregabalin. General nutrition was maintained.

Offloading of pressure points done in Neuropathic ulcers with the help of total contact cast.

In most of the cases, limb was salvaged by conservative treatment or minor amputations however in some of the cases amputations were also required.

Post operative wound infection

Name of surgery	No. of cases
Exploratory Laparotomy	11
Obstructed hernia	04
Open cholecystectomy	04
Open appendectomy	05
MRM	01
Total	25

- Out of 50cases, 25 clean cases are reported in which postoperative wound infection seen.

Diabetic lesions are a significant health and socioeconomic problem, having adverse effects on quality of life and imposing a heavy economic burden on the patient; it can result in prolonged hospitalization and the need for rehabilitation and home care services. If we can prevent foot lesions in patients with diabetes and control the risk factors, patients will have an acceptable quality of life. To prevent amputations and the consequent adverse impact on the patient's daily activities, the first requirement is strict control of diabetes, which is the primary disease. Early detection and treatment of lesions and regular foot care is also important. The importance of identifying these risk factors is that such knowledge is useful for developing methods to detect them at an early stage and thus prevent limb amputation. Whenever risk factors are detected, relevant advice can be given to the patient.

DISCUSSION:

The prevalence of diabetes worldwide was estimated to be 2.8% in 2000 and is projected to be 4.4% in the year 2030, with the total number of people with diabetes expected to rise from 171 million in 2000 to 366 million in 2030.

Postoperative hyperglycemia – with or without reaching the threshold for diabetes – is an independent predictor of surgical site infections.

Epidemiologic studies suggest that 2.5% of diabetic patients develop diabetic foot (DF) ulcers each year and 15% develop DF ulcers during their lifetime.

Patients with postoperative glucose levels of 111 to 140 mg/dL were 3.61 times more likely to develop an infection, and the odds were 12.31 times greater for those with glucose levels higher than 220 mg/dL, Ata and co-authors reported in the September issue of the Archives of Surgery.

If hyperglycemia is confirmed in future prospective studies with better postoperative glucose data to be an independent risk factor for post-surgical infection in general surgery patients, this would give surgeons a modifiable variable to reduce the incidence of postoperative infection.

It has been well established that patients with diabetes have an increased risk of post surgical and other nosocomial infections. The reason is unclear, but hyperglycemia has been suggested as a causative factor.

A surgical site infection is defined as an infection that develops within 30 days after an operation, or within one year if an implant was placed, and the infection appears to be related to the surgery.

Diabetes is a risk factor for nosocomial surgical site infections in patients.

These patients monitored closely in order to enhance surgical site infection control measures.

The development of a foot ulcer is traditionally considered to result from a combination of peripheral vascular disease, peripheral neuropathy and infection. More recently, some factors have been identified that are believed to increase the risk of amputation in these patients.

Early recognition and management of risk factors for foot complications may prevent amputations, especially of the major type and prevent other adverse outcomes.

50 cases of wound with diabetes were studied by Prospective Cohort study at NIMS hospital, Jaipur, from January 2015 to June 2016. The analysis of this study is as follows.

Comparison of Age:-

When compared with Wheel, Lock and Root series and Alping Wang et al. series there is not much difference in the onset of diabetes either in young or old age group patients. This is because of early diagnosis and treatment, patient diagnosed diabetic in early stage. In the present study, out of 25 cases majority were from middle age group i.e. in the 4th and 5th decade of their life. Diabetic foot lesions are commonly found in the middle aged person usually in the 4th and 5th decade of their life.

Comparison of Sex:-

In the present study 39 were males and 11 female cases. The male to female ratio 3.5:1. The incidence is more among males probably as these are the people of the family who mostly working out door, and are more vulnerable for trauma and its sequel and smoking. When compared to other studies number of male patients were more than the female except in Alping Wang et al study where the number of male and female ratio is more or less is same.

Gangrene in lower limb:

The commonest pathophysiological changes that occurred in diabetic wounds are neuropathy, ischemia and infection. In the present study, Neuropathy changes seen in 7 cases. Ischaemic complications noted in 24 cases and 8 cases have both neuropathy and ischaemic changes.

The incidence of gangrene in the present series is comparatively slightly more than that of bell series of 1960, however series of Diabetic Research Center, Chennai shows lowest percentages of ischaemic changes. In our study, it was found that, 7 cases had gangrene, where predominantly 4 cases are because of ischemia, whereas in the remaining 3, the cause was sepsis.

Diabetes also has a major role in delayed wound healing and the development of gangrene. Diabetics have a high risk of atherosclerotic peripheral vascular disease. In combination with peripheral neuropathy and minor trauma it would be a cause of foot

ulceration. The presence of peripheral arterial disease has been by many authors as a risk factor for amputations in diabetics.^(59,60) It is irrefutable that the presence of peripheral vascular disease cause problems in the blood flow; adequate blood flow is essential for healing and for combating the severe infections that attack diabetic foot. Calle-pascaul, reported that 100 percent of the major amputations in their series were associated with peripheral vascular disease.

Amputation:-

The amputation rate in present study is much lower (9%) as compared to Collen's series (38.6%) and Osaka kosainekin Hospital study (52%). This could be due to, availability of better modern modalities, so as to deterioration of lesion due to vascular and neuropathy could be further avoided and further knowledge of different ways and efficacy of appropriate dressing material, combination of antibiotics covering bacteriostatic and bacteriocidal effects, facilitating early healing without any morbidity and mortality.

Clinical presentation in diabetic foot:-

In the present study, 15 patients had grade 2 and 3 diabetic foot. In a similar study by Dr. Rooh UL Muqim et al 55 patients had grade 2 and 3 diabetic foot. Maximum numbers of patients present with ulcer and pus discharge.

CULTURE AND SENSITIVITY:-

In the present study, all cases had growth in the pus and tissues. Staphylococcus aureus, 36% is the commonest organism in the present study. In a study conducted by European society of clinical microbiology and infectious disease; Helsinki, Finland 16-19 May, 2009 – gram positive cocci is the commonest organism isolated. Staphylococcus accounting for 42%. This is mainly because skin lesions mostly caused by gram positive organisms.

MODALITY OF THE TREATMENT IN DIABETIC FOOT:-

In the present study, all patients required some sort of surgical intervention along with medical treatment for DM.

1. Medical management: - All patients were given injectable insulin and also given antihypertensive as per requirement. All patients were given proper antibiotic after culture and sensitivity report throughout treatment.

2. Surgical management: - In the present study, 3 patients treated as I&D and 14 patients were treated with debridement. Following effective debridement, bigger wounds were treated with skin grafting. In 4 patients, debridement followed by skin grafting solved the problem. In 4 patients debridement failed in achieving healing and amputations were selected as treatment modality.

In a study conducted by Dr. A. H Khan et al⁵, 21.5% required debridement, out of which 48.5% undergone skin grafting and rest 30% required amputation of different levels.

CONCLUSION:

- Conservative treatment consisting of control of diabetes with Plain/Lente insulin, long acting insulin (insulin glargine) along with appropriate oral/IV antibiotics. Patients were also presented with neuropathy and they were treated with methyl Cobalamine and with pregabalin.
- Diabetic foot were managed by daily dressing (e.g. Betadine, Hydrogen peroxide, Eusol, Glycerine Magnesium Sulphate, Normal Saline, Amorphous Hydrogels and VAC) followed by wound debridement, slough excision and disarticulation. Diabetes is a worldwide problem. A good number of diabetic patients develop wound in one point of time or other during the course of their illness. A significant number of such patients required long-term hospitalization and surgical intervention.

- This study conducted at NIMS hospital comprised of 50 cases of diabetes with wound and their surgical management along with its complications.
- Diabetes affects all age groups and mainly manifest in middle part of life.
- Males are almost four times more affected than females. (may be because they are more exposed to trauma).
- The etiopathogenesis of diabetic lesions are multifactorial. Diabetic neuropathies, vasculopathy, poor control of diabetes and bacterial infection are some of them.
- Most common causative organisms were staphylococcus aureus followed by Pseudomonas aeruginosa.
- Surgical complications of diabetes involved soft tissues in postoperative cases with majority of complications in foot.
- Commonest presenting lesion in foot were ulcer, cellulitis and gangrene.
- All the patients with diabetic wound had longer hospital stay as compared to non diabetic patients. The long duration of hospitalization can be explained by the refractory to treatment of the lesions owing to the diminished resistance of the body, hyperglycemia, impaired hormonal defense mechanisms and multidrug resistance of the organisms to antibiotic therapy and amputations in some cases.

REFERENCES:

1. Park's Text Book of Preventive and Social Medicine. 20th edition. Jabalpur, India: M/S Banarsidas Bhanot 2009; 340-342.
2. Gibbons GW. The diabetic foot: amputations and drainage of infection. *Journal of Vascular Surgery* 1987; 5:791-793.
3. John C Donavan, John L Rowbotham. Foot lesions in diabetes mellitus. *Joslin's diabetes mellitus*. Chapter 35. 13th edition. Philadelphia: Lea and Febiger; 7
4. Schadewaldt H. The history of diabetes mellitus. In: Van Englehardt D, ed. *Diabetes, its medical and cultural history*. Berlin: Springer Verlag, 43-100.
5. Evaluation and management of diabetic foot according to wagner's classification a study and cost of foot. *Ulcers in patients with diabetes* by dr. Scott d. ramsay.
5. Approach to Managing Diabetic Foot complications. A Study of 200 Cases KHAN A.H.I, BAJWA G.R