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Surgery

A Clinical Study of Surgical Complications of Diabetic Patients Admitted To Surgical Wards of Basaveshwar Hospital

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Abstract: Diabetes and its long term major complications include septic, vascular (either microvascular or macro vascular) and neuropathic lesions, which affect the various anatomical regions of the body. Majority of admissions to surgical wards is due to these surgical complications of diabetes. So this is a study of these surgical complications of diabetes, their outcome and management modalities. This is a study of a series of 144 patients, who were admitted to surgical wards of BASAVESHWAR TEACHING AND GENERAL HOSPITAL from December 2015 to June 2017. A proforma is filled up regarding the necessary details of the diagnosis, investigations and management. The compiled data is then analyzed and compared with the data available in the literature. It was found that the average incidence of these complications occurs in the age of 51-60 years and men who worked outdoors were commonly affected. These patients are usually known diabetics on irregular treatment. The common lesions are septic lesions of the foot in the form of ulcers, cellulitis and gangrene, followed by vascular and neuropathic lesions. Most of them were managed conservatively. Gangrenous lesions required surgical intervention in the form of either, minor or major amputations. It was concluded that trivial injuries in the known male diabetics on irregular treatment who work outdoors usually present with lesions requiring admission and intervention. Commonly affected site is lower limb followed by upper limb.
Keywords: Septic, vascular, neuropathic, ulcer, gangrene, diabetes.

INTRODUCTION

"Diabetes Mellitus" is a syndrome with metabolic, vascular, neuropathic components that are interrelated [1]. Metabolic syndrome is due to alterations of

- Carbohydrate
- Fat
- Protein metabolism

Secondary to absent or markedly diminished insulin secretion or ineffective action of insulin. Vascular syndrome consists of abnormalities in both large vessels (macro angiopathy) and small vessels (micro angiopathy). Macroangiopathy causes cerebrovascular accidents (strokes), cardiovascular (MI) and Peripheral vascular diseases. The neuropathic changes are due to metabolic alteration as well as vascular causes. Once regarded as a single disease, diabetes is now seen as a heterogeneous group of diseases, characterized by a state of chronic hyperglycaemia resulting from a diversity of etiologies, environmental and genetic acting jointly [2].

It is a long term disease with variable manifestations and progression. Diabetes is an "Ice berg" disease. Recent estimates across worldwide is 4% in adults i.e., 145 million now affected. By 2025, it is projected to be 5.4% amounting to an alarming 300 million. Major burden is occurring in developing nations like India. At present, incidence is 2.4% in rural, 4-11% in urban population of India[3].

Diabetes is leading cause of peripheral vascular disease

A person with diabetes is

- 20 times more likely to develop gangrene
- 30-40 times at risk of a major amputation

The cost of health care and burden over the families is huge, eventually causing a staggering economic instability to the nation. Hence it is worthwhile to know more about diabetes, its implications, and its surgical aspects in depth.

Diabetes exhibits following points from surgical point of view

- Surgical conditions which are etiologically related to diabetes (like carbuncles).
- Surgical conditions whose symptoms, course and management are altered by diabetes (traumatic ulcer).
- Surgical condition which are associated with diabetes but not related to it (like elective surgery in diabetes).

So the objectives and aim of the study is to know more about the mode of presentation, clinical features and outcome of management of surgical complication of diabetes mellitus.

OBJECTIVES

This study "Surgical complications of diabetes mellitus" is a study of clinical and management aspects of surgical complications among diabetic patients admitted to surgical wards of basaveshwar teaching and general hospital, gulbarga. Though diabetes is a physician's domain, surgeon plays an important part in the management of surgical complications. Infact many admissions to surgical wards are due to surgical complications of diabetes mellitus.

AIM AND OBJECTIVES

- To study the age, sex, regional pattern, socio-economic pattern, nutritional status of the patients presenting with complications of diabetes.
- To study the mode of presentation, type of lesions, duration of diabetes prior to the onset of lesions and the risk factors like hypertension, etc.
- To study the various anatomical distribution of the lesions.
- To study the various modalities of treatment available in the hospital.
- To study the outcome of each modalities practiced in the hospital.
- To study the pre-operative and post-operative management of diabetic patients during surgery.

MATERIALS AND METHODS

Patients presenting to surgical wards with surgical complications of diabetes from December 2015 to June 2017 at Basaveshwar Teaching and General Hospital, Gulbarga were included in the study. A series of 144 cases were compiled for this study during this period. Analytical data obtained was compared and discussed with the data available in the literature. Statistical Data Analysis is done using SPSS 16.0 version software.

Inclusion criteria

- Patients with history of diabetes mellitus and those diagnosed on admission
- Patients presenting with septic complications of diabetes like ulcers, cellulitis, abscess, carbuncle, furuncle
- Patients presenting with neuropathic complications
- Patients presenting with ischemic lesions like gangrene

Exclusion criteria

Non diabetic patients having the above mentioned complications

Each case was studied in detail starting with an elaborate history, a thorough general physical examination along with meticulous examination of the local lesions. Relevant lab investigations were carried out as depicted in the proforma. Each patient was treated according to the respective problem. Generally, all the patients admitted for surgical complications were first made to get fasting blood glucose. In case the patient was detected a diabetic for the first time, plain insulin of appropriate dosage was started according to the fasting blood glucose level. If the patient was a known diabetic on oral hypoglycaemic agent, he/she was switched over to plain insulin. All these patients were required to have a eighth hourly urine sugar chart for monitoring the effectiveness of insulin therapy. In required cases, daily fasting blood sugar was also done.

Patients who presented with features of ketoacidosis were treated appropriately with aggressive insulin therapy, IV fluids, antibiotics. And once stabilized, patients received subcutaneous 8th hourly insulin dose. A strict diabetic diet was advised to the patients. A diet enriched with vitamins B, C, and E was given along with supplementation of minerals like zinc and chromium. In cases of patient who were anaemic, either oral iron supplementation or blood transfusions were done to improve the general condition. Broad spectrum antibiotics like cefotaxime, gentamycin and metronidazole combination usually was initiated. In case of ischaemic lesions, vasodilators like complamina retard (Xanthinol), pentoxifylline were started. Antiplatelet drugs like ecosprin 75 mg once daily, clopidrogrel 75 mg OD were initiated to improve local blood circulation.

In patients with septic lesions like abscess, furuncles, and carbuncles incision & drainage, excision was done either under local anaesthesia or under general anesthesia. Pus was taken for culture and sensitivity. Ulcers were treated according to their merit. A thorough debridement which included slough excision was done. Wounds were dressed with gauzes medicated with glycerin mag sulfate. This reduced the inflammatory edema and helped in separation of slough. Dirty ulcers were also treated with hydrogen peroxide solution to help in separating the slough. In some ulcers with adherent slough, a collagenase preparations like salutyl was used. For some ulcers infected with pseudomonas as evidenced by the colour of discharge and pus culture sensitivity report, were treated locally with diluted vinegar (diluted acetic acid solution). Clean ulcers were dressed with povidone iodine solution preparations. Ulcers with healthy granulation tissue which were ready for grafting were dressed with wet saline dressings.

Severe foot infections, spreading cellulitis, osteomyelitis of the bone, and gangrene of the toes and the feet were subjected to surgical treatment. For instance, for cellulitis of the foot extending to the leg, multiple incisions were made. Minor amputations like toe amputation, disarticulation of the toes were done for gangrene of the toes. In case of gangrene with spreading cellulitis of foot, fore foot amputation was done. In severe cases of infections and gangrene spreading to the foot and to the leg, major amputations like below knee / above knee or hip disarticulation was done. At the time of discharge, counselling was given regarding foot care, preventions of ulcer. Patient was asked to follow up regularly for residual ulcers. Patients were also asked to report to diabetic clinics for further diabetic management and treatment.

Fig-1: Carbuncle in the back

Fig-2: Cellulitis of the hand

Fig-3: Forefoot gangrene

Fig-4: Healthy ulcer ready for grafting

Fig-5: Above knee amputation stump

Fig-6: Healing ulcer

Fig-7: Ulcer after grafting

RESULTS AND DISCUSSIONS

The analysis of the study of 144 cases is as follows

Age of 144 cases studied the youngest patient was 18 years of age who was a juvenile diabetic and oldest was 85 years. Average age of incidence was in the group of 51-60 years and the highest number of cases seen was also in 51-60 years.

Table-1: Age incidence

Age in years	Number of patients	Percentage
0-10	0	0
11-20	2	1.38
21-30	8	5.5
31-40	26	18.05
41-50	40	27.77
51-60	42	29.16
61-70	200	13.8
71-80	4	2.70
81-90	2	1.38

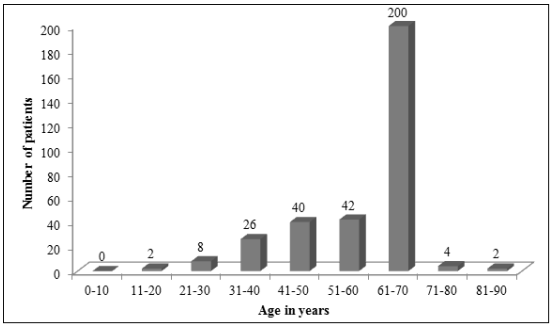

Fig-8: Age distribution chart

International study done by Wheel-lock and Root [4] according to this the youngest patient was 32 years and oldest patient was 89 years.

Table-2: **Age of the patient**

Study	Youngest age	Oldest age
Wheel-lock and Root series	32	89
Present study	18	85

The data available in our study is almost similar to that of the international study regarding the age incidence.

Sex of 144 cases of study 98 cases were men while 46 were women.

Male incidence is higher for the following regions.

- Men are bread winners, work in the fields, farms and hence exposed to trauma.
- Smoking habits are higher in men and hence peripheral arterial disease coexist with diabetes which flare up the lesions.

Table-3: Sex distribution

No. of cases studied	Males	Females
144	98	46
Percentage	68.05	31.94
Ratio	2.13	1

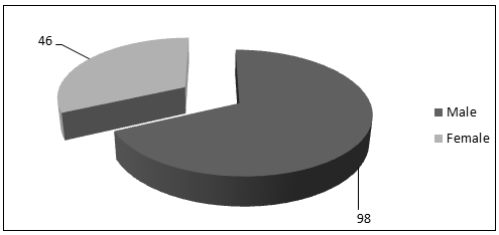

Fig-9: Sex distribution

Socio-economic status

Nearly about 65% of patients were from lower socioeconomic status basically farmers. Though in western literature incidence is higher in higher state of society.

Region

80 cases were from urban area whereas 64 cases were from rural area.

Table-4: Regional Distribution

Total cases	Cases	Percentage
Urban	80	55.55
Rural	64	44.44

This is in confirmation with western literature which says that urban population are more prone for diabetic complications [5].

Occupation

It was seen that these complications occurred in group who were prone to injuries like agriculturists.

Table-5: Incidence in Occupation

Occupation	No. of patients	Percentage
Agriculture	50	34.72
Manual labourers	30	20.83
Housewife	22	15.27
Clerks	10	6.94
Teacher	10	6.94
Retired	8	5.55
Tailor	6	4.16
Student	4	2.77
Businessmen	2	1.38
Peon	2	1.38

It is self-explanatory that complications occur in group which are prone to trauma and injuries. Series also says that the diabetic complications can occur in sedentary groups, as in housewives who constituted 15% of cases.

Obesity

In our study the number of patients who were obese were 42 while remaining 102 were malnourished.

Table-6: Nutritional status

No. of cases	Obese	Non obese
144	42	102

According to literature diabetes is more common in obese but in our study non obese patients were more common as most of the patients were of lower socio-economic status.

Past history of diabetes

Table-7: Past history of diabetes

No. of cases	Known diabetics	Diagnosed after Admission
144	100	44

The known diabetics were 100 whereas 44 were detected after admission. The duration of disease varied from 3 months to 25 years and around 40% of patients were on irregular treatment for diabetics who were usually on oral hypoglycaemic agent. Patients with longer duration of previous history of diabetes ware likely to develop arteriosclerosis and acceleration of atherosclerosis and prone to neuropathies. So these led to ischaernic limbs and ulcers of the foot.

History of trauma

Nearly 116 patients in this series of 144 had past history of trauma and subsequently lesions developed. Preceding trauma is most often the cause for problems due to

- patients are unaware of trivial injury due to neuropathy.
- poor blood supply leads to diminished healing.
- a state of hyperglycaemia acts as a good nidus for infection.

Duration of onset

In our study the minimum period for onset of lesion was two days to 40 days. The, average duration was 2-3 weeks. The delay in seeking treatment is due to ignorance of patients.

Mortality

Out of 144 patients, 6 patients expired due to

- cerebrovascular / cardiovascular accidents
- ketoacidosis
- septicaemia

Duncan series [6] showed mortality rate of 10.1%.

Table-8: Mortality

	Duncan's series [6]	Present study
No. of cases studied	364	144
No. of cases expired	36	6
Percentage	10.1	4.16

Different Anatomical sites affected

Table- 9: Anatomical distribution of lesions [7]

Sites	Number of cases	Percentage
Lower limb	108	75
Upper limb	14	9.72
Back	8	5.55
Periurethral	6	4.16
Neck	4	2.77
Chest wall	2	1.38
Perianal	2	1.38

Present study shows that the commonest site for lesions was lower limb constituting 75% of cases followed by upper limb with 9%, then back, periurethral abscess with 4%. Two patient presented with perianal abscess. Lower limb affliction is more due to many factors.

lschernia due to atherosclerosis and arteriosclerosis

- Neuropathy
- Prone to trivial injury like shoe bites, corns, callosities and most of the patients in present study walked bare foot.

Signs and symptoms

Patients presented with various symptoms usually with non-healing wounds, claudication of the limbs, rest pain, and gangrene of extremities [8, 9].

Surgical complications of diabetes

In present series the major surgical complications of diabetes were recognized as a) septic b) ischaemic c) neuropathic [10, 11] though most of these lesions had overlapping. In present study it was seen that septic lesions was the leading complication with 136 patients. However in more than .35% of patients more than 2 types of complications were seen. In septic lesions various types of lesions were seen.

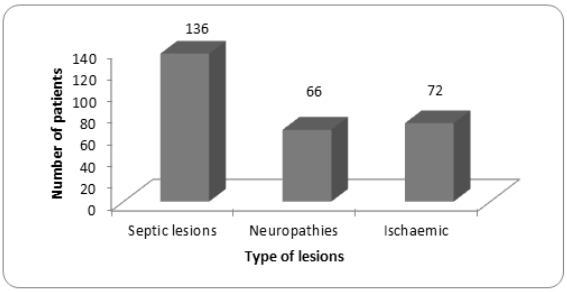

Fig-10: Types of surgical complications

Table-10: Types of septic lesions

Lesions	Number of patients	Percentage
Ulcers	47	34.55
Cellulitis	36	26.47
Gangrene	31	22.79
Abscess	18	13.23
Carbuncles	6	4.41

So it can be seen that ulcers formed the majority of septic lesions in our study with 34% followed by cellulitis with 26%, and then gangrene 22%, abscess and carbuncles.

So in present study the incidence of septic lesions [12, 13] is very high as compared to the available data. This is due to that majority of patients are ignorant about the nature of disease and delay in seeking treatment.

Table -11: Incidence of septic lesions

Series	Warren Lecompton (1969)	Pennsylvania Hospital (1969)	Present study
No. of cases	818	614	144
Septic lesions	213	358	136
Percentage	26	58.3	94

Organisms isolated from septic lesions

Majority of septic lesions yielded staphylococcus aureus and then pseudomonas followed by E.coli, Klebsiella and proteus. Pus and culture sensitivity was done and most of the organisms were resistant to ampicillin, gentamycin, penicillin, mild sensitivity to ciprofloxacin, moderately sensitive to cephalosporin like cefotaxime, amikacin.

Neuropathic lesions

In this series of 144 cases of surgical complications of diabetes 66 patients were found to have peripheral neuropathy clinically. The age of patients varied from 40-80 years and the average age of incidence is around 55 years. All these patients were known diabetics with past history of diabetes ranging from 3 months to 25 years. Patients gave history of paraesthesia, hyperaesthesia, tingling numbness and weakness of the feet [14]. On examination, trophic changes of the toes, absent sweating, absent sense of fine touch, vibration, pain, sensory modalities was seen[15,16].

Table-12: Number of cases presenting with neuropathic lesions

	Root series (1955)	Bonkalo series (1960)	Duncan's series (1969)	Present Study
Total no. of cases	3174	150	354	144
No. of cases with Neuropathy	1206	74	125	66
Percentage	37.99	49.33	35.3	45.83

Table shows different signs elicited in all these patients and it is compared with Rundle [15] series and it can be seen that both the series had almost similar results.

Table-13: Signs of neuropathy

Signs	Rundle series		Present study	
	No. of cases	Percentage	No. of cases	Percentage
Poor achille's tendon Reflex	125	99	65	98
Poor patellar reflex	117	93	60	91
Decreased cutaneous Sensations	63	50	34	51
Impaired vibrating sense	57	46	26	39

In all these cases other causes of neuropathy like leprosy, syphilis and spinal cord disorders were excluded by

- Absence of nerve thickening
- VDRL — test
- Plain X-ray evaluation of the joints.

Peripheral neuropathy [17] is a major cause of foot lesions due to diabetic microangiopathy; vasa nervosa of the digital nerves are involved resulting in demyelination. Hence decreased cutaneous sensation, proprioception, pain perceptionand joint sense. It also affects the motor fibers resulting in atrophy of intrinsic muscles and loss of arches of the foot. Autonomic fibers are involved resulting in loss of sweating and temperature regulation. Due to all these features trivial injury are left unnoticed which get infected and cause non healing trophic ulcers.

Ischaemic lesions

In this study of 144 cases 72 patients had ischaemic lesions. Out of them 34 cases had gangrenous lesions of the toes and foot, either dry or wet gangrene. The youngest patient age was 30 years whereas oldest was 85 years.

Table-14: Age presentation of ischaemic lesions

Age	Present series	Wheel-lock and Root series
Youngest age	30	34
Oldest age	85	89
Average	58	68

It can be seen that the average age in present study is lesser than that of the series in the literature whereas the youngest and the oldest age presentation is almost similar.

Table-15: Incidence of ischaemic lesions

	Pennsylvania Hospital series	Present study
No. of cases	614	144
No. of ischaemic lesions	275	72
Percentage	44.78	50

Table–16: Incidence of gangrene

	Bell's series	**Present study**
No. of cases studied	946	144
No. of cases with gangrene	236	36
Percentage	24.9	25

The incidence of ischaemic lesions in 144 cases was 50% i.e., accounted to 72 patients. The incidence in present study is higher. In present study the incidence of gangrene amongst male is almost similar as compared to the western literature while the incidence of gangrene in female is higher as compared to the literature.

Table-17: Sex distribution of gangrenous lesions

No. of cases studied	Bell's series	Present study
Male	446	98
Incidence of gangrene	116	22
Percentage	26	22.45
Female	500	46
Incidence of gangrene	120	14
Percentage	24	30.43

Treatment

In present study, 60 cases were treated conservatively with meticulous debridement, slough excision, regular dressing with povidone, glycerine mag sulfate. Appropriate antibiotics were given, insulin therapy was started, diabetic diet enriched with vitamins was given, and strict diabetic control with everyday FBS, 8th hourly urine sugar chart was maintained. 26 cases underwent incision drainage and came for regular follow up, 20 cases underwent disarticulation of toes, and out of this two patients underwent disarticulation of left metacarpophalangeal joint of left hand. 8 patients underwent below knee amputations whereas 16 patients underwent above knee amputations and 14 patients needed split skin grafting for covering of raw area.

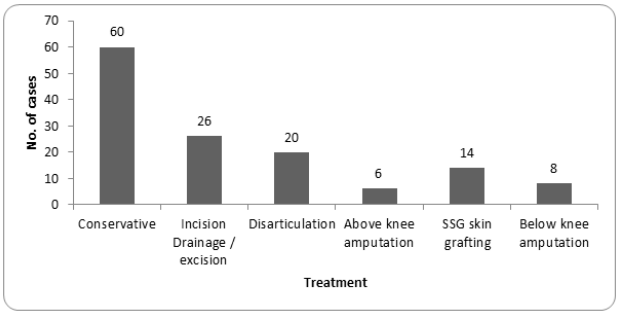

Fig-11: Various treatment modalities

Amputation rate

24 cases out of 36 cases of gangrene needed amputation that amounts to 67%. This rate is higher compared to the Cohen's [18] series due to the following reasons.

- Patient coming to our hospital are usually ignorant about the nature of disease. So the gangrene was spreading and life threatening.
- The number of patients with gangrene in present study is 36 as compared to 215 in the literature.

All the patients, post amputation were referred to rehabilitation centres and were provided with prosthesis and crutches.

Table-18: **Amputation rate**

	Collen's series	Present study
No. of cases with gangrene	215	36
No. of amputations	83	24
Percentage	38.6	67

CONCLUSION

- Surgical complications are more prevalent in the age group of 51-60 years. Male individuals are more prone as they are usually working outdoor and are exposed to trauma. Also complications are more prevalent in urban individuals.
- Majority of patients who develop complications are known diabetics on irregular treatment and who give the history of trivial injury before the onset of lesions and have a longer hospital stay.
- Mortality of these patients is mainly due to septicemia, ketoacidosis and cardiovascular diseases.
- Lower limbs are most commonly involved followed by upper limbs.
- Septic lesions are common complications followed by ischaemic lesions and neuropathic lesions.
- Among septic lesions, ulcers constitute the major bulk, followed by cellulitis, gangrene and then abscess.
- Conservative management is the primary modality of treatment for ulcers, followed by I & D, excision of carbuncles respectively. Disarticulation of toes and fingers which were gangrenous formed the 3rd modality. Finally when lesions failed to respond to conservative treatment or if it was found that it was spreading gangrene, major amputations were done.

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