



“A STUDY ON FACTORS INFLUENCING THE CLINICAL OUTCOMES OF RAYS AMPUTATION IN DIABETIC FOOT PATIENTS”

General Surgery

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ABSTRACT

The study was conducted on 50 diabetic foot patients who underwent Rays amputation in the Department of General Surgery, Chengalpattu Medical College Hospital from April 2021 to July 2021. The aim of our study was to “evaluate the factors for re-ulceration, re-amputation in diabetic foot patient following rays amputation”. The study was conducted after performing Rays amputation in diabetic patients after satisfying the inclusion and exclusion criteria

In this study, Diabetic foot patients with Rays amputation was more common among the male population with mean age group being 60 – 69 years of age. Long duration of diabetes mellitus, diabetic ulcer patient with co morbidities had poor outcome. Early identification of diabetic ulcer patients with co- morbidities could assist clinicians in determining which patient mostly require reamputation. These patients should undergo aggressive and frequent preventative care including regular foot care visits, blood sugar control, regular treatment and follow up for co-morbidities, diabetic foot education, specialized footwear, and evaluation for other complications.

KEYWORDS

Rays amputation, re-amputation, re-ulceration, Diabetic foot.

INTRODUCTION:

Diabetes is a chronic disease which is a major cause of blindness, kidney failure, heart attacks, strokes and lower limb amputation. The global prevalence diabetes among adults over 80 years of age has risen from 4.7% in 1980 to 8.5% in 2014⁽¹⁾. Diabetic foot causes substantial morbidity, impaired quality of life, engender high treatment cost and most important risk factor for lower extremity amputation⁽²⁾. About 15% diabetic patients developed foot ulcers in their lifetime and amputation precedes in 85% of cases. It is the most common cause of non- traumatic lower limb amputation⁽³⁾. For diabetic foot Major amputation (below-knee, Above-Knee) or Minor Amputation (Ray amputation, Trans-metatarsal amputation, Chopart's, Lisfranc's amputation) done depending on the MEGGIT & WAGNER classification of diabetic ulcer^(4,5). Among the minor amputation Rays amputation is one of the commonest procedures. The indication for a Rays amputation includes wet gangrene of toe, osteomyelitis of the proximal or distal phalanx and soft tissue infection of whole toe⁽⁶⁾. Many epidemiological reports have published data regarding the incidence of amputation after lower extremity amputation^(7,8). However, the relative outcomes and activities of daily living after amputation in diabetic patients have been rarely studied.

MATERIAL&METHODOLOGY:

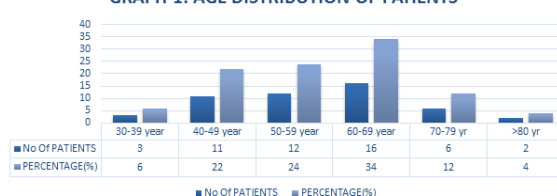
In this Prospective observational study 50 consecutive Diabetic foot patients (who fulfilled Inclusion and exclusion criteria) underwent Rays amputation in General Surgery department at Chengalpattu Medical College from were studied. Since the required number of sample size was obtained prior to the mentioned study period the study period was shortened to April 2021 to July 2021 from April 2021 to September 2021. Preliminary details were collected from patient about age, sex, duration and type of diabetes, co-morbidities (Hypertension, H/O Cerebrovascular disease, Myocardial infarction), adverse social habits (Smoking, Alcoholism) were recorded. Clinical examination about vascular status (peripheral pulse, delayed capillary filling) was done. Diabetic ulcer was classified according to MEGGIT & WAGNER Classification pre- and post-operatively. Preoperative investigations (CBC, ESR, CRP, FBS, PPBS, wound Culture & Sensitivity) were done. All the patient were followed during their post-operative period for complication such as re-ulceration and need for re-amputation following rays amputation which was also recorded. Outcomes were mentioned as Good or Poor outcome. A Good clinical outcome implies one whose amputation healed and does not develop any complication during the follow up period. A Poor clinical outcome implies one who require re-amputation and develops re-ulceration following Rays amputation during the monthly follow-up for next 3 month.

INCLUSION CRITERIA	EXCLUSION CRITERIA
- Diabetic foot ulcer patient with indication for Rays amputation - Age >18 years <85 years	- Age group < 18yr and > 85yr - Pregnancy - Traumatic cause of Rays amputation - Isolated Peripheral Vascular Disease - Septic Arthritis of distal phalanx - Patients not willing for surgery - Patient who refuses informed written consent.

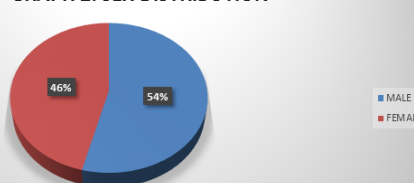
RESULTS:

In our study out of 50 patients, 27 (54%) are Male and 23 (46%) are Female. The most common affected age group was between 60-69 years (16,32%). The age and sex distribution are represented in the Graph 1 and 2 respectively.

GRAPH 1: AGE DISTRIBUTION OF PATIENTS



GRAPH 2: SEX DISTRIBUTION



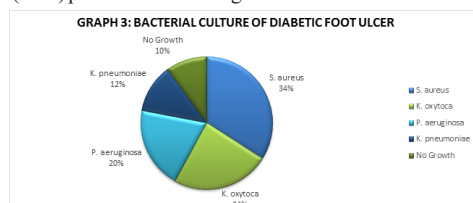
All our patients were known case of Type 2 diabetes mellitus (50, 100%). Among them 16(32%), 18(36%), 12(24%) and 4(8%) patients were Diabetic for less than 5 years, between 5 to 10 years, between 10-15 years and more than 15 years respectively.

Except for diabetes mellitus, co-morbid conditions of our patients are tabulated in the Table 1. 39(78%) patients had one additional co-morbid condition and remaining 11(22%) had more than two co-morbid condition in addition to diabetes mellitus.

Table 1: other associated co-morbid conditions with diabetes mellitus.

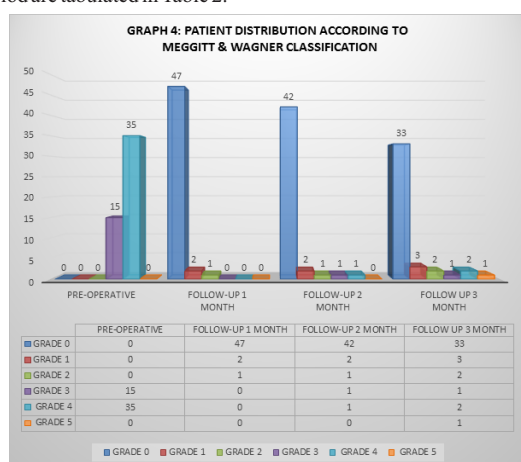
CO-MORBID CONDITION	NO. OF PATIENTS	PERCENTAGE (%)
Systemic Hypertension	8	16
Obesity	11	22
Myocardial infarction	8	16
Cerebro-vascular disease	4	8
Chronic kidney disease	4	8
Hypothyroidism	4	8
Multiple co-morbid conditions	11	22

For all the patient's distal peripheral pulse were present. According to Meggitt & Wagner classification, pre-operatively and post-operatively patient ulcer are classified. During pre-operation evaluation about 15(30%) patients, came under the Grade 3 and remaining 35(70%) fell under Grade 4 group which is represented. Microbiological evaluation of the ulcer (i.e.: Culture and sensitivity) represented in the Graph 3 showing that 17(34%), 12(24%), 10(20%) and 6(12%) patients had infection with *Staphylococcus aureus*, *Klebsiella oxytoca*, *Pseudomonas aeruginosa* and *Klebsiella pneumoniae* respectively. Other 5(10%) patients showed no growth.



Pre-operative blood investigation was done for all the patients. In 27(54%) patients were found to have haemoglobin less than 11g/dl, 40(80%) had elevated total leucocyte count, 32(64%) had high level of C-Reactive Protein. 18(36%), 17(34%) and 15(30%) patients had Random blood sugar level between 201-300mg/dl, 301-400mg/dl and >400 mg/dl respectively.

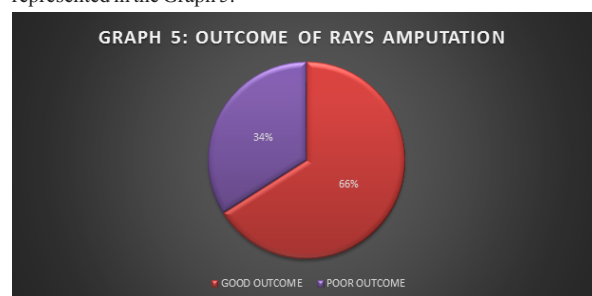
After pre-operative evaluation, all the patients underwent Rays amputation. Out these 50 patients, about 3(6), 5(10%) and 9(18%) patients during their follow-up period on 1 month, 2 month and 3 month developed Re-ulceration respectively. The recurrent ulcers are classified according to the Meggitt & Wagner classification, which is represented in the Graph 4. About 7(14%) patients underwent Re-amputation during their follow-up. 1(2%), 2(5%) and 4(8%) patients underwent Re-amputation during 1 month, 2 month and 3 month respectively. The re-ulceration and re-amputation during the follow-up period are tabulated in Table 2.

**Table 2: Patient Distribution For Re-ulceration & Re-amputation During Follow-up**

POST-OPERATIVE FOLLOW-UP (in Months)	RE-ULCERATION No. of Patients (%)	RE-AMPUTATION No. of patients(%)
1 st MONTH	3(6%)	1(2%)
2 nd MONTH	5(10%)	2(4%)
3 rd MONTH	9(18%)	4(8%)

According to our study out of 50 patients, 33(66%) patients had Good outcome while remaining 17(34%) patients had Poor outcome.

Outcome of Rays amputation in diabetic foot ulcer among our study is represented in the Graph 5.



DISCUSSION:

Diabetic patients prone to multiple complication one among them is diabetic foot ulcers. about 20% of hospitalised diabetic patients are due to diabetic foot ulcers⁽⁹⁾. The lifetime risk to a person developing foot ulcer could be high as 25%⁽¹⁰⁾ and the primary factors in the development of these lesions are vascular insufficiency and peripheral neuropathy. Approximately 20% of diabetic patients with foot ulcers primarily have inadequate arterial blood flow, 50% will primarily have neuropathy and approximately 80% will have both the condition^(11,12). Diabetic foot ulcers can lead to infection or gangrene or amputation and even death is necessary care not taken. In our study male predominance (54%) of diabetic ulcers common and this is supported by Erdnic Acar et al⁽¹³⁾ and most common affected age group is 60-69. The most common organism grown in culture is *Staphylococcus aureus*. (34%) knowledge about common isolation of organism used planning appropriate treatment of diabetic ulcer patients prior to getting susceptibility reports. we found that obesity is the most common co-morbidities associated with diabetic ulcer patients leads to rays amputation at meta tarsophalangeal joint. diabetic ulcer patients with co-morbidities (obesity, systemic hypertension, myocardial infarction, cerebrovascular disease, chronic kidney disease, hypothyroidism) who undergo rays amputation had increased chance of poor outcome (re-ulceration and re-amputation) and this is supported by Erdnic Acar et al⁽¹³⁾. peripheral neuropathy, high mechanical pressure in insensitve foot due to autonomic neuropathy and inadequate arterial perfusion associated with micro and macro vascular disease contribute to chronicity of diabetic ulcer⁽¹⁴⁾. Hypertension and cigarette smoking increased the risk of peripheral arterial disease and accelerate the re ulceration in diabetic ulcer patients⁽¹⁴⁾. The damage resulting from neuropathy, ischemia (micro or macro vascular disorder) predispose to infection. Diabetic patients do not feel the progression of ulceration and sign and symptoms of infection (temperature, tachycardia) are not manifested until too late. The wagner-meggitt classification used for grading of diabetic ulcers and it is strongly associate with wound healing in diabetic ulcer patients^(15,16). In our study 33 patients (66%) had good outcome and 17 patients (34%) had poor outcome. In patient with multiple co-morbidities poor outcome noted and they progress to reulceration and re amputation. During follow up in 1st month 3 patient (6%) developed reulceration and one patient need re amputation due to progression of disease. In remaining 47 patients 5 patients (10%) developed re ulceration of those 2 patients (4%) needed re amputation in 2nd month of follow up. During 3rd month follow-up 9 patients (18%) developed re ulceration and 4 patients (8%) progressed to re amputation. During follow up 3 month period of 50 patients 17 patients (34%) developed reulceration .of those 7 patients(14%) needed re amputation. Patients with reulceration or reamputation were had more than one comorbidities with diabetic ulcer. Reamputation rates are also likely depend on the time of follow up period. Tukekmez et al⁽¹⁷⁾ reported reamputation rate of 24.2% in 62 patients for 7 year follow up period. Ohsawa et al⁽¹⁸⁾ reported 42.8% re amputation for 27 patients with 35 limbs for 10 years follow up period. Izumi et al⁽¹⁹⁾ reported reamputation in 277 patients of 27% at first year, 48% at third year and 60 % over fifth year.

CONCLUSION:

In conclusion male gender, long duration of diabetes mellitus, diabetic ulcer patient with co morbidities had poor outcome. Diabetic ulcer management is a multimodal approach. partial amputation or previous amputation predispose to increased foot pressure which will further increase the risk of ulceration and amputation^(20,21,22). In our study good outcome of rays amputation 66% and poor outcome is 34%. Diabetic ulcer patient with co-morbidities increased chance of developing re

ulceration and re amputation. Early identification of diabetic ulcer patients with co- morbidities could assist clinicians in determining which patient mostly require reamputation. These patients should undergo aggressive and frequent preventative care including regular foot care visits ,blood sugar control, regular treatment and follow up for co-morbidities ,diabetic foot education, specialised footwear, and evaluation for other complications.

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