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EVALUATION OF MULTIDISCIPLINARY TEAM ROLE IN MANAGEMENT OF ISCHEMIC DIABETIC FOOT ULCER PATIENTS

By

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ABSTRACT

Background: Referring to Diabetes mellitus in Egypt, it is required to establish a multidisciplinary (MDT) diabetic foot department, aiming to controlling amputation numbers. In addition, MDT foot department could detect and optimize early diabetic foot complications.

Objective: To evaluate the impact of multidisciplinary team management of ischemic diabetic foot patients in comparison to traditional management regarding limb salvage, amputation rate, and recurrence.

Patients and Methods: We started a MDT Diabetic Foot project in October 2017 at Al- Hussein and Sayed Galal University Hospitals of Al-Azhar Faculty of Medicine, Cairo, Egypt. Before October 2017, we retrospectively collected 50 patients admitted with ischemic diabetic foot ulcers prior to the establishment of MDT diabetic foot clinic and prospectively data were collected.

Results: No statistical difference was found regarding age and sex distribution and associated comorbidities from the beginning of establishment of our MDT foot project. There has been an increase in limb salvage due to increased endovascular interventions. Increase in angioplasty was 16% and bypass operation was 12%. In addition, there has been a decrease in the rate of minor amputation 12%. Significant decrease in major amputations also decreased by 22% with p value 0.02. while there was a non-significant increase in healing rate 12 % with p value 0.221. Recurrence rate of DFU in MDT group was 10% of total 5 cases, while was not assessed in retrospective group due to shortage of data.

Conclusion: By set up of MDT diabetic foot project, we can identify and correctly manage diabetic foot complications at its early stage aiming to reduce these complications. In addition, more education and early referral from primary health care providers needed to control and reduce amputation and recurrence rates.

Keywords: Diabetic foot, foot ulcers, MDT, Foot protection service; Amputation.

INTRODUCTION

Diabetes mellitus (DM) is one of the major risk factors of peripheral arterial occlusive disease and a significant risk factor for progression of asymptomatic disease or claudication into critical limb ischemia (CLI). Critical limb ischemia (CLI) is the most advanced stage of peripheral arterial occlusive disease (PAOD). The prognosis is poor, with amputation rates up to 30% and mortality up to 25% after 1 year. *(Thiruvoipati et al., 2015).* Globally, over 170 million people have been diagnosed with DM, and by the year 2030, the prevalence is estimated to raise 2.5-fold *(Armstrong et al., 2013)* Diabetic patients who develop

CLI are more prone to ischemic events with an impaired functional status, as nearly 30% will undergo major amputation with a 6-month mortality rate of 20%. Approximately,80% of diabetes related lower limb amputations are preceded by a diabetic foot ulcer (DFU) *(Hingorani et al., 2016)*. The multifactorial pathology of DFU necessitates utilization of a multidisciplinary approach to address the specific and varying etiologies that combine to create lower extremity ulceration infection and subsequent amputation (Fitzgerald et al.,2010). Taking the "team approach" often involves intricate communication and cooperation with a multitude of medical specialties. There are many possible members of the diabetes team. This team may include endovascular specialists, vascular surgeons, endocrinologists, orthopedic surgeons, infectious disease specialists, orthopedists, plastic surgeons, psychiatrists/psychologists and radiologists. Additional members may include allied health practitioners such as dieticians, orthotists and wound care nurses *(Guy et al., 2010)* Treatment of CLI aims at wound healing, improvement in quality of life, limb loss prevention, and prolonged survival. Current strategies propose open or endovascular revascularization of infra-popliteal arteries with runoff through the ankle, but not specifically targeted to the location of the ischemia. *(Bosanquet et al., 2016)*. To achieve healing of an ischemic foot ulcer and save the leg from amputation, revascularization, endovascular or open surgery, with sufficient wound perfusion is necessary.

This study aimed to evaluate the impact of multidisciplinary team management of ischemic diabetic foot patients in comparison to traditional management regarding limb salvage, amputation rate, and recurrence.

PATIENTS AND METHODS

This study included 100 of ischemic diabetic foot patients (50 prospective and 50 retrospective) who presented to Vascular Surgery Department of Al-Azhar University Hospitals, Cairo, Egypt, during the period from April 2017 till April 2018. They were distributed to group A where data is collected retrospectively and treated by traditional methods of treating DFU, and group B who underwent DMT management and their data were collected prospectively.

Inclusion criteria: All diabetic patients with ischemic diabetic foot ulcer as defined by University of Texas Health Science Center classification having stage C and D, Patients with CLI with all TASC classification, written and signed consents were obtained from the patients

Exclusion criteria: non-ischemic diabetic foot ulcer as defined by University of Texas Health Science Center classification having stage A and B which were non ischemic DFU, acute on top of chronic ischemia, poor general condition (decompensated heart failure, stroke, bed ridden), acute ischemia, patient with rest pain without diabetic foot ulcer, chronic lower limb ischemia (claudicant patients)

Clinical examination:

As initial clinical presentation full history was taken from every patient and the clinical data were name, age, sex, smoking habits, diabetes mellitus,

hypertension, myocardial disease (rhythmic, ischemic, myopathies, clinical examination and diagnosis based on presence or absence of ulcer (with ulcer characteristics recording). Preoperative assessing of patient according to University of Texas Health Science Center classification of diabetic foot ulcer, peripheral pulsation Ankle Brachial Pressure Index (ABPI), doppler signals at ankle and pedal arteries, orthopedic assessment (osteomyelitis, Charcot joint), tissue loss and extension of infection also patients were investigated by Radiological (X ray foot, Duplex US and Computed Tomography Angiography "CTA")

Procedure:

Every case was studied individually and according to the mentioned criteria. The endovascular technique was done at the Angio suit under complete aseptic condition, using non-ionic contrast medium. At the end of each procedure the details of technique were documented. 30 cases 60 % underwent angioplasty of tibial vessels without stent placing these vessels are the primary vessels to be affected by diabetes and other 20 patients 40% underwent surgical bypass 14 of them femoral -distal bypass a 6 pop-distal bypass saphenous graft was the major conduit for 17 patients and 3 patients by synthetic PTFE graft.

Minor amputations at level of toes and forefoot, surgical offloading and excision of metatarsal bones done for 25 patients 22 of them their ulcers were class D with deep infection and osteomyelitis and other 3 patient post procedure during follow up, 20 patients where ulcer class was C, and they required surgical debridement for soft tissue , we used new trends in wound dressing, 33 patients managed by negative wound pressure therapy (vacuum device) and other 17 patients by chemical and enzymatic debridement agents.

Skin graft used to close wound of 16 patients, others healed by 2ry intentions after vacuum therapy.

Exercise program, treatment of peripheral neuropathy and total contact cast (TCC) done for all of patients.

Follow up conducted in MDT outpatient clinic at 1,3 and 6 months regarding: Assessment of vascular condition, wound healing, and recurrence.

Statistical methodology: The collected data were tabulated and analyzed using statistical package for the social sciences.

Descriptive statistics: Number (No.), percentage (%), mean (X). Qualitative data were compared by Chi2 test. $P<0.05$ was considered significant.

RESULTS

The study included 100 patients, data collected retrospectively from 50 patients with (27 males and 23 females) with a mean age of 62.14 ± 10.66. and 50 patients prospectively with (27 males and 23 females) with mean age 58 (±10.9) All patients were diabetic. The mean BMI for traditional group 27.94 ± 4.58 and for MDT group 28.92 ± 4.99, smoking ratio for traditional group 68.0% and for MDT group 58.0% distribution of diabetes was 6, 44 patients for type I, type II consecutively for traditional group and 9 ,41 patients for type I, type II consecutively for MDT group, and regarding ABI there as a primary assessment for vascular condition there were no significant statistically difference between 2 groups as p value 0.116 and all over there were statistically non-significant difference regarding demographic characteristics and risk factor distribution between 2 groups are shown in **(Table 1)**.

Table (1): Baseline demographic characteristics of patients

Groups / Demographics	Pre MDT patients (No.)	Post MDT patients (No.)
Age range (average)	30:81 62.14 ± 10.66	35:77 58.74 ± 10.79
Male (%)	27(54%)	27(54%)
Female (%)	23(46%)	23(46%)
Risk factors		
Diabetes - type I	6(12%)	9(18%)
Diabetes - type II	44(88%)	41(82%)
Hypertension	29(58%)	33(66%)
smoking	16(32%)	21(42%)
Ulcer class		
Class C	21(42%)	23(46%)
Class D	29(58%)	27(54%)
ABI	0.3 – 1.5 0.48 ± 0.23	0.2 – 2 0.63 ± 0.56

This study done on 100, patients 50 patients with MDT comparing them to previous 50 patients. There was an increase in limb salvage due to increased endovascular interventions [increase in angioplasty 16% and bypass operation 12%. In addition, was a decrease in the rate of minor amputation 12%. Significant decrease in major amputations also decreased by 22% with p value 0.02. Also, there was not significant increase in healing rate 12 % with p value 0.221. Recurrence rate of DFU in MDT group was 10% of total 5 cases, while it was not assessed in retrospective group due to shortage of data. Further review of the major amputation patients at the studied group revealed most of major amputees underwent major amputations due to progression of the disease or due to delayed non-reconstructable disease with severe sepsis **(Table 2)**.

Table (2): Interventional procedures and their results

Groups / Interventional procedure	Pre MDT patients (No.)	Post MDT patients (No.)
Angioplasty	22(44%)	30(60%)
Bypass	14(28%)	20(40%)
Minor amputation	32(62%)	25(50%)
Major amputation	23(46%)	12(24%)
healing	27(54%)	33(66%)

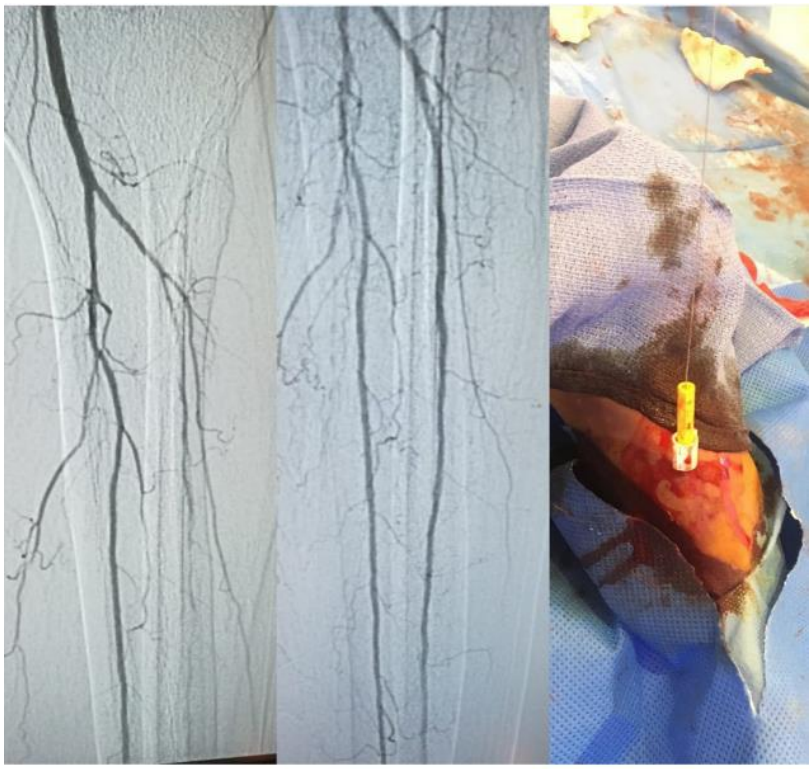

Figure (1): Pre and post tibial angioplasty with access site and wire

Figure (2): Infected heel post revascularization without wound management then healed post negative pressure wound therapy

DISCUSSION

Foot care is the most important issue for diabetic patients and their care givers. diabetic foot as the most serious complications in this high-risk population can lead to a cascade of negative drawbacks ends by loss of limb and life. The risk for foot ulceration in people with diabetes is 15 to 25%. About 85% of amputations initially caused by a neuropathic foot ulcer. After a lower-limb amputation, people with diabetes not only suffer the clinical and psychological consequences of limb loss, but also have a five-year mortality rate of 50%. This is a higher mortality rate than is seen in breast cancer in females, prostate cancer in males or lymphoma *(Armstrong et al., 2017)* This study was a prospective cohort study to evaluate the impact of multidisciplinary team management of ischemic diabetic foot patients in comparison to traditional management regarding limb salvage, amputation rate, and recurrence. We found that in comparison between traditional and MDT regarding age, sex, BMI, smoking, DM, HTN and ulcer class, there was no statistically significant difference found between two groups. Baseline demographic, clinical and vascular data were reported. 100 patients were included with mean age 58.74 ± 10.79 years, 46 (48.7%) were male, 54 (52%) were female, 85 patients were affected by type 2 diabetes with smoking prevalence in males. Male sex was significantly higher among cases regardless the type of treatment. This may be contributed to the additional risk of male sex to vascular events and being more prone to ischemia.

Another factor is that smoking which is more common among males in our Arab communities carries an additional risk of all vascular complication. One study reported 1.4-fold increase in the prevalence of all diabetic complications among men comparing to woman, while other studies reported effect of male sex on occurrence of diabetic foot in diabetic patients. In contrast, some other studies found no difference in the prevalence of diabetic foot among male and female patients. *(Jayesh et al., 2012)* The Prevention of Progression of Arterial Disease and Diabetes (POPADAD) trial recommends the assessment of ABI as a first line non-invasive test in patients with symptoms or signs of peripheral arterial disease. If ABI was more 1.4 is also considered as abnormal, and usually means that vessel is calcified as in diabetic patients. ABI was also reported as important marker of vascular diseases and death *(Curry et al., 2018)* We found in our study that there was no statistically significant difference found between two groups regarding ABPI before intervention. Thus, the previous study didn't agree with our results. Regarding the type of treatment for ischemic diabetic foot, we compared between the traditional and MDT methods in relation to distal pulse, ABI, wound healing or granulated or not healed at 3 intervals 1 month, 3 month and 6 months We found that the distal pulse has no significant statistically difference, while ABPI has significant difference between the two groups and the healing of the wound increased in the studied cases. To achieve best outcome in terms of amputation reduction due to diabetes, the multidisciplinary team concept must be adopted for both the general management of diabetes and the management of associated complications including foot ulcers *(Rerkasem et al., 2019)*. In this study, we achieved a limb salvage rate greater than 80 % and a complete healing rate greater than 66%via a multidisciplinary team approach involving vascular surgeons as leaders and center coordinators. Therefore, these data reaffirm that the organization of care is one of the main determinants of the outcome of diabetic foot ulcers. Regarding the type of treatment for ischemic diabetic foot and their final outcome, we found that there was no statistically significant difference found between two groups regarding Bypass and Angioplasty, and there was statistically significant difference found between two groups regarding Final outcome, and there was statistically significant difference found between two groups regarding other intervention and Wound intervention. Like our study, another study comparing skin grafting and standard dressing in the management of DFUs found better results in skin graft group in terms of decreased healing time and length of hospital stay. DFUs with exposed tendon, ligament or bone require coverage with muscle flaps. Flaps can be either local for smaller wounds or free flaps for large area *(Mahmoud et al., 2018)*.

CONCLUSION

The initial results of that study suggest that a fully established MDT diabetic foot clinic benefits patients and improved outcomes related to the avoidance of hospital admissions, limb salvage procedures major amputation and recurrence, we recognize that time and

education were needed to see its full effects.

REFERENCES

1. **Armstrong DG, Boulton AJM and Bus SA, (2017):** Diabetic foot ulcers and their recurrence. New Eng J Med., 376:2367-2375.
2. **Armstrong DG, Kanda VA, Lavery LA, Marston W, Mills Sr JL and Boulton AJ, (2013):** disparity between research funding and costs of care for diabetic foot ulcers. Diabetes Care J., 36(7): 1815-1817.
3. **Bosanquet DC, Wright AM, White RD and Williams IM, (2016):** A review of the surgical management of heel pressure ulcers in the 21st century. Int Wound J., 13:9-16.
4. **Curry SJ, Krist AH, Owens DK, Barry MJ, Caughey AB, Davidson KW, Doubeni CA, Epling JW Jr, Kemper AR and Kubik M, (2018):** Screening for peripheral artery disease and cardiovascular disease risk assessment with the ankle–brachial index: US preventive services task force recommendation statement. JAMA., 320(2):177–183.
5. **Fitzgerald RH, Mills JL, Joseph W and Armstrong DG, (2010):** The diabetic rapid response acute foot team: 7 essential skills for targeted limb salvage. Eplasty 9: 138-145.
6. **Guy R. Pupp DP, and Desiree SC, (2010):** Evaluating And Refining The Team Approach To Limb Salvage Podatory today J 23:32-37
7. **Hingorani A, LaMuraglia GM, Henke P, Meissner MH, Loretz L and Zinszer KM, (2012):** The management of diabetic foot: a clinical practice guideline by the Society for Vascular Surgery in collaboration with the American Podiatric Medical Association and the Society for Vascular Medicine. J Vasc. Surg., 35-215.
8. **Jayesh GB, Dinesh S, Nainesh PB, Uday RS and Salil P, (2012):** A study of socio demographic and clinical profile of cases of diabetic foot. national journal of medical research., 2(3):279-281.
9. **Mahmoud SM, Mohamed AA, Mahdi SE and Ahmed ME, (2018):** Split-skin graft in the management of diabetic foot ulcers. J Wound Care,17: 303-306
10. **Rerkasem, N. Kosachunhanun, S and Tongprasert, K, (2019):** A multidisciplinary diabetic foot protocol at Chiang Mai University Hospital: cost and quality of life Int J Low Extrem. Wounds., 8: 153-156
11. **Thiruvoipati T, Kielhorn CE and Armstrong EJ, (2015):** Peripheral artery disease in patients with diabetes: epidemiology, mechanisms, and outcomes. World J Diabetes., 6(7):961-969.

تقييم دور فريق متعدد التخصصات في مناجزة مرضي قرح القدم السكري ذوي القصور الدموي

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خلفية البحث: بالنظر إلى داء السكري في مصر ومضاعفاته وأشهرها قرح القدم السكرى كان من الضروري إنشاء فريق متعدد التخصصات لمناجزة هذه المضاعفات للحد من نسب بتر الطرف السفلي ولتحسين نسب الشفاء وكذلك للسيطرة على هذه المضاعفات في مراحل مبكرة.

الهدف من البحث: مقارنة مناجزة قرح القدم السكرى بواسطة فريق متعدد التخصصات بالنسبة إلى الطريقة التقليدية اعتمادا على نسب الشفاء ومعدلات بتر الطرف السفلي كهدف للتقييم.

المرضي وطرق البحث: دراسة مقارنة مستقبلية أجريت على 50 مريض يعانون من قرح قدم سكري و قصور دموي تم علاجهم عن طريق فريق متعدد التخصصات يتكون من أطباء جراحة أوعية دموية، جراحة عظام، جراحة تجميل، غدد صماء و علاج طبيعي كذلك فريق من التمريض المتخصص في العناية بقرح القدم السكري و ذلك عن طريق إعادة التروية الدموية و استئصال جيد للعظام الملتهبة و الأنسجة التالفة و طرق حديثة في الضمادات و إغلاق الجروح تم مقارنتهم مع 50 مريض قد تم علاجهم بالفعل بالطرق التقليدية لعلاج قرح القدم السكري.

نتائج البحث: لم توجد فروق ذات دلالة إحصائية فيما يتعلق بتوزيع العمر والجنس والأمراض المصاحبة كما أظهرت النتائج إرتفاع ملحوظ

فـــي نســـب إجـــراء عمليـــات القســـطرة التداخليـــة بنســـبة 16 % و كـــذلك الوصـــلات الشـــريانية الجراحيـــة بنســـبة 12 % ممـــا أدي إلـــى إرتفـــاع ملحـــوظ فـــي نســـب الشـــفاء بنســـبة 12% p=0.01 كمـــا لـــوحظ انخفـــاض فـــي نســـب إجـــراء البتـــر بنوعيـــه علـــى مســـتوي القـــدم و الســـاق بنســـبة 12 و 22 % علـــى التوالي.

الاســـتنتاج: بإنشـــاء وتطبيـــق دور فريـــق متعـــدد التخصصـــات فـــي عـــلاج قـــرح القـــدم الســـكري يمكـــن ملاحظـــة وعـــلاج قـــرح القـــدم الســـكري فـــي مراحـــل مبكـــرة ويمكـــن تحقيـــق معـــدلات أعلـــى فـــي التئـــام الجـــروح وكـــذلك تقليـــل نســـب البتر و انتكاس المرض.

الكلمـــات الدلاليـــة: القـــدم الســـكري، قـــرح الأقـــدام، فريـــق متعـــدد التخصصات، البتر.