

Original Research Article

Definitive surgical treatment for diabetic forefoot ulcer

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ABSTRACT

Background: Diabetic foot ulcers are common among 15% of the diabetic population, at one stage of life that may progress to minor or major amputation, because of not healing with all modalities of the treatment. Since recurrent rate is >90%. But the surgical treatment of the forefoot ulcer so-called surgery offloading will heal the ulcer within a short time and prevent minor or major amputation. The purpose of this study was to compare different outcome measures in the audit of the management of diabetic foot ulcers.

Methods: Totally 20 diabetic patients were included in the study. The study was conducted in the department of plastic surgery, Government Mohan Kumaramangalam Medical College Hospital, from 2016-2018. Followed 20 patients with a surgical procedure called surgical offloading is by removing pressure element in head and neck of metatarsal bone involved.

Results: Among the 20 patients wound healed, in about 12 patients within 4 to 5 week and its remaining 5 patients wound healed in 5 to 6 weeks are in other 2 patients it takes. More than 6 weeks to heal. We followed the patients for the past 1 year, out of 20 patients, 2 patients have developed an ulcer in another site, not the same site. In all other patients wound healed completely without any recurrence.

Conclusions: In our study reducing the foot pressure by doing an excision of head and neck metatarsal surgically will completely remove the foot pressure over the ulcer site that helps to heal the ulcer without recurrence.

Keywords: Forefoot ulcer, Head and neck of metatarsal bone excision, Recurrence, Surgical management

INTRODUCTION

Diabetes is one of the most prevalent chronic diseases: in 2010, one study reported that 285 million adults worldwide had diabetes and this figure is projected to rise to 439 million by the year 2030. Such a profound demographic shift is likely to yield a corresponding increase in the prevalence of diabetes chronic complications, including those in the lower extremity, the diabetic foot.¹ Foot ulcers are the common and devastating and feared complication of the diabetic population. Among foot ulcer forefoot ulcer is common. Among that 15% of the diabetic patients through one stage of life, suffer from forefoot ulcer.² Fore foot ulcer is common among the patients with neuropathy which alter

the biomechanics of the foot/curvature of the foot/loss of metatarsal pad of fat overheads of the metatarsals.³ Bone is prominent which produce increased, plantar pressure points over the forefoot that producer ulcer, once ulcer formed there remains always ulcer. Because of its recurrence rate is high with all modalities of the available treatment, like daily dressing with saline gauze, silver ionic gel, platelet growth factor, offloading shoes and TCC. It is estimated that 85% of these amputations are preceded by an infection.⁴ It is estimated that the rate of amputation can be diminished by 49-85% through implementation of an effective evidence-based prevention program, patient education, foot ulcer treatment by a multidisciplinary team, and periodic surveillance despite the efforts of conservative therapy there will always be a

percentage of wounds that will require surgical intervention in order to heal the wound.⁵ Typically this involves elimination of infection, surgical procedures designed to offload areas of increased pressure, improving diminished vascular flow or a combination of all of these. The peripheral arterial disease can lead to critical limb ischemia, either alone or when combined with an injury like a foot ulcer.⁶ The diabetic foot ulcer requires adequate circulation to heal. When this circulation is impaired and the oxygen demand exceeds supply from the arterial system, critical limb ischemia ensues, risking the loss of limb. There is often a common pathway that leads to amputation in those with diabetes.⁷ This pathway begins with the disease itself and usually progresses with a patient who develops peripheral neuropathy leading to foot ulceration.⁸

METHODS

Totally 20 diabetic patients were included in the study. The study was conducted in the department of plastic surgery, Government Mohan Kumaramangalam medical college hospital, from 2016-2018. Followed 20 patients with a surgical procedure called surgical offloading are by removing pressure element in head and neck of metatarsal bone involved.

Inclusion criteria

Inclusion criteria were patient of all age, no sex differentiation, no fixed duration of the ulcer.

All these 20 patients underwent all types of conservative methods with results of not healing completely. Followed 20 patients with a surgical procedure called surgical offloading is by removing pressure element in head and neck of metatarsal bone involved.

Surgical procedure

- Under ankle block with a dorsal vertical incision over the corresponding shaft of the metatarsal bone.
- Extensor tendon identified and lateralized from the bone.
- Hand with the neck of corresponding metatarsal bone removed.
- Haemostasis obtained.
- Wound closed with 4-0 nylon.
- For the plantar side of ulcer wound debrided thoroughly without suturing, thorough wash gave hemostasis obtained, non-adhesive dressing done. POP applied.
- A simple technique is done under local, without any morbidity, easily once can follow and understood.
- Results in me more satisfactory and rewarding.

Statistical analysis

The results are presented in tables and expressed by relative values and mean value, unpaired t-test) were applied. The level of statistical significance was $p < 0.05$.

RESULTS

Certain predicted local changes were observed. Eight patients had gangrene, phlegmon seen in 4 patients, 3 had an ulcer with osteomyelitis, 3 had severe ulceration, 2 had phlegmon. Among the commonest causes of these pathways, it's possible to consider some triggers such as peripheral neuropathy, foot deformity, abnormal foot pressures, abnormal joint mobility, trauma, peripheral artery disease. Both macro- and microvascular diseases are believed to contribute to the consequences of the peripheral vascular disease, resulting in the inability of the ischemic limb to heal itself properly.

Table 1: Local changes.

Local changes	No. of patients
Gangrene	8
Phlegmon	4
Ulcer with osteomyelitis	3
Severe ulcer	3
Phlegmon	2

Table 2: Grade and duration of healing.

Forefoot ulcer	No. of patients	Duration of healing
I	12 patients	4 weeks
II	5 patients	<6 weeks
III	3 patients	>6 weeks



Figure 1: View of common site involved in diabetic foot ulcer.

Among the 20 patients wound healed, in about 12 patients within 4 to 5 week and its remaining 5 patients wound healed in 5 to 6 weeks are in other 2 patients it takes. More than 6 weeks to heal. We followed the patients for the past 1 year, out of 20 patients, 2 patients have developed an ulcer in another site, not the same site. In all other patients wound healed completely without any recurrence. Following an injury to the skin, a set of complex biochemical events take place in a closely orchestrated cascade in order to repair the damage. The natural healing process can be divided into four stages: inflammation, granulation, epithelialization, and

maturation. However, when a wound becomes delayed in healing, these four stages are interrupted and a large number of changes occur that result in the wound becoming chronic, lasting sometimes for years without healing. Unstable diabetes and colonization of bacteria are two of the primary causes of this chronicity.

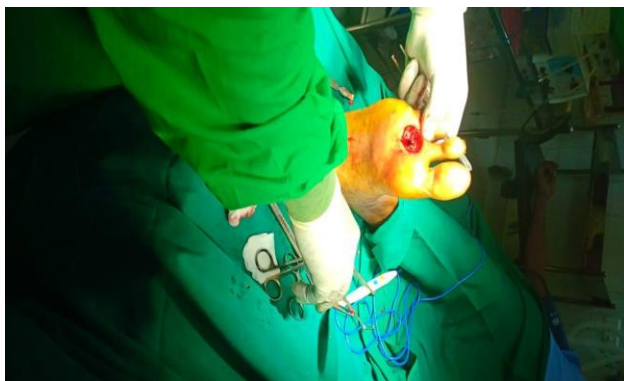


Figure 2: Operative procedures for healing measures.



Figure 3: Healing process after 6 weeks of surgery.

DISCUSSION

Diabetes mellitus (DM) is a group of metabolic diseases in which a person has high blood sugar. The incidence of DM is 3.3% in a human population with equal rates in females and males.⁹ Diabetes mellitus increases the risk of long-term complications. Diabetic foot complications are the most common cause of nontraumatic lower extremity amputations in the industrialized world. The risk of lower extremity amputation is 15 to 46 times higher in diabetics than in persons who do not have diabetes mellitus.¹⁰ The vast majority of diabetic foot complications resulting in amputation begin with the formation of skin ulcers. Severe infections pose an immediate threat to the leg and, potentially, to the patient's life. Thus, prompt surgical intervention is needed.¹¹ Severe infections can occur when a mild to moderate infection is complicated by critical ischemia or when an adequately perfused foot shows a marked local involvement (e.g., necrotizing fasciitis or an infection with anaerobic gas-forming organisms) or systemic signs

and symptoms (fever, hypotension, and vomiting, suggestive of bacteremia).^{12,13} Necrotizing fasciitis is a severe illness with a mortality rate of 24%-33%. It has classically been connected with b-hemolytic streptococci, but a recent review of 163 cases found that 71% of those with a positive result of tissue culture had polymicrobial infections. Several reports have documented an association of necrotizing fasciitis with diabetes mellitus.¹⁴ The presence of severe pain with a deep plantar foot infection in a diabetic patient is often the first alarming symptom, especially in a patient with a previously insensate foot. Several factors may lead to quick deterioration and its attendant complications. Most ulcers occur on the plantar surface of the foot, at the head of the metatarsal bones.¹⁵ With infection and subsequent cellulitis, edema can develop in the underlying compartment, resulting in a compartment syndrome. When the pressure in a compartment exceeds capillary hydrostatic pressure, micro vascular circulation is impaired. Patients with diabetic neuropathy may have higher compartment pressures than do no diabetic patients. This may result from the sorbitol pathway in the diabetic patient leading to an excess of split products; these, together with the hydrophilic sorbitol molecule, may lead to edema. Moreover, the oxygen concentration may be lowered by the greater oxygen affinity of glycosylated haemoglobin.¹⁶ The resulting increased capillary permeability leads to edema and high compartment pressure. This leads not only to tissue necrosis but also to thrombosis of the small arteries, resulting in a more extensive deep necrosis, even in a well-vascularized foot.¹⁷ In this research, the results of the treatment of diabetic foot were significantly different in relation to the approach. Prior to the adoption of a single multidisciplinary approach to the treatment of diabetic foot, there had been a much higher frequency of amputations compared to the second period, which is in relation with results of other authors.¹⁸

CONCLUSION

Infection of the foot in diabetic patients is a serious complication that may lead to a major amputation. Early recognition and proper treatment are mandatory to avoid poor outcomes. Surgery must always be combined with antibiotics, and revascularization may also be necessary. The surgeon must have a thorough knowledge of the foot anatomy but also must be familiar with the defects in wound healing caused by diabetes. The outcome of surgery largely depends on the skill, care, and experience of the surgeon.

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