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Management of Diabetic fore Foot Chronic Non Healing Ulcers

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ABSTRACT:

Diabetic foot ulcer is a major health issue globally. About 34% life time risk of developing foot ulcer in diabetic patients. Majority of amputation can be prevented by managing these ulcers early. Forefoot ulcers mainly seen in the subungual region, interphalangeal joint region and head of metatarsal bone region in the plantar aspect of foot. The causes of ulcers are mainly Diabetic Neuropathy, Vasculopathy and limited joint mobility.There is callus formation at high pressure point due to the abnormal joint mobility.These changes along with neuropathy and defective circulation lead to chronic non-healing ulcers. These ulcers are classified by Wegner's classification and around 41 patients with ulcers at various sites of forefoot are managed and results are discussed in detail. The exact bio-mechanics of each site ulcers were addressed and surgical offloading was done. After surgery these patients were under follow-up and the ulcer has healed well.

I. INTRODUCTION:

The prevalence of diabetic foot ulcers are 6.3% around the world. In Asia it is 5.5% highest in Belgium 16.6% and lowest in Australia 1.5%. In India diabetic foot ulcer were found in 4.54% of the newly diagnosed Type 2 Diabetes Mellitus patient. Of these neuropathic etiology was in 46.1%, ischemia in 19.7% and neuroischemic foot ulcer in 34.2%. The life time risk of foot ulcer in Type I, II diabetes mellitus patients are as high as 34%. Majority of foot ulcers in India occur due to neuropathic foot.These ulcers are responsible for spreading infections, life threatening limb cellulitis, Necrotizing Fasciitis and finally theseresults in from minor toe amputation up to major above knee amputation.The WHO estimates that every 30 seconds a leg is lost in the world somewhere due to diabetes. Majority of these amputations can be prevented by early treatment of these ulcers in the foot. In this we are going to discuss about the management of ulcers which occurs only in the fore foot.

The forefoot ulcers in diabetic patients occur in three important sites.
These are,

1) Plantar subungual ulcers.
2)Interphalangeal joint ulcers.
3) Ulcers occur under the metatarsal heads.

These ulcers were not healing even with many types of local ointment applications, medical managements and surgical method. Recently various pathophysiological causes has been identified for these various site ulcers. The understanding of various underlying causes and managing with appropriate surgical procedures resulted in healing of these ulcers.

II. CASES REPORT:

All these diabetic patients were coming with complaints of non-healing ulcers in the fore foot since few months.

1) There were 10 patients presenting with non-healing ulcer in the head of metatarsal region. Out of these 5 patients were with ulcers in the 1st MTB head region. 3 patientswith ulcer in the 3rdMTB head region and 2 patients with the ulcer in the 5th toe MTB region.
2) There were 9 patients with ulcer in the great toe interphalangeal joint region.
3) There were 22 patients with ulcer in the various toes subungual region.

All these patients were in regular follow-up with the Diabetologist and on regular medications. All of them were prepared for surgery with initial pre-op workup which includes CBC, BT, CT, Blood sugar F/PP, Urea, Serum Creatinine, HIV, HbsAg, HCV, ECG, X-ray – Chest and ECHO.

X-ray of foot was taken for all to rule out any osteomyelitis in the bones around ulcer region. Clinical assessment examination done thoroughly to see palpable pulsations in the limbs, joint ankylosis, deformity in the toes, foot and ankle region.
Anesthetist and Physician fitness obtained. Then surgery was done.

III. SURGICAL PROCEDURE:

1) For the Subungual ulcers:
Procedure was done as outpatient daycare procedure.

Procedure: Under local anesthesia, A vertical incision was made in the plantar region of

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the toes at the level of proximal phalanx region. The flexor tendon was identified and it was cut. Skin sutured after hemostasis. The subungual callosity was debrided. Dressing was done.

2) For the Interphalangeal joint ulcers:

Under spinal anesthesia, Keller's excision arthroplasty was done. The proximal third of the base of proximal phalanx of the great toe along with the insertion of the intrinsic tendons is excised through dorsal approach. The ulcer was debrided. Post-operatively patient was kept in POP backslap and non-weight bearing mobilization for the period of one month. Patient was followed up every week with dressing and medications.

PRE-OPERATIVE

POST-OPERATIVE

3) Ulcer in the metatarsal region:

Under spinal anesthesia the ulcer was debrided. Through dorsal approach the metatarsal head was removed. The associated equinus deformity was corrected by gastrocnemius slide or lengthening done by two oblique incision in the Tendo Achilles. For the ulcer on the medial side 1st metatarsal head region with eversion of foot the tight Peroneus Longus was released and transferred to Peroneus Brevis. For the ulcer in the lateral boarder of foot on the 5th MTB head with lateral rotation and inversion of foot the Tibialis tendon transfer was done. Patient was kept in non-weight bearing mobilization and regular dressing for one month.

On followup after one month all the wound healed well and there was no complication of wound healing in the dorsum of foot and in the original plantar ulcer region. There was complete healing of ulcer.

PRE-OPERATIVE POST-OPERATIVE

IV. DISCUSSION

Classification:

There are around five different classification for diabetic foot ulcer. Out of them Wagner system of classification are relatively simple to assess and better predictor of amputation

Wagner classification assesses ulcer depth, osteomyelitis, gangrene

Grade 0-Pre or post ulcerative lesion

1-Partial / full thick ulcer

2-Ulcer probing to tendon or joint capsule

3-Ulcer deep with osteitis.

4-Partial foot gangrene.

5-Whole foot gangrene.

Pathology

Diabetic foot ulcers are caused by three dominant factors. These are diabetic neuropathy, ischemia and limited joint mobility. Neuropathy affects motor, sensory and autonomic nerves. Motor loss causes intrinsic muscle atrophy, deformities, soft tissue atrophy and disorientation of joints in the foot and toes. These leads to abnormal strain on the foot, loss of sensory stimulation results in loss soft protective sensation and tissue damage which patient ignores as there is no pain sensation. Autonomic nerve dysfunction causes blood flow imbalance and delay of wound healing.

Limited joint mobility causes stiffness of joint of foot and abnormal high plantar pressure. These cause damage to the already decreased sensation of neuropathy foot, which leads to severe plantar ulcers. Then form of abnormal force on the plantar region causes skin callosities, which later breaks and expose underlying tissue and becomes chronic ulcers. Then ulcers gradually expose tendon, joint, bones and causes ascending infection abscess, osteomyelitis.

Decreased vascularity in the limb can be diagnosed with palpable pulsation in the foot, Arterial Doppler test and Ankle Brachial Pressure Index. Macrovascular disease involving both lower limbs are very common in diabetic individuals. These affects the healing of ulcers. Macrovascular occlusive diseases can be managed by angioplasty, bypass graft according to the site of obstruction either suprapopliteal or infrapopliteal.

Management of forefoot ulcers:

All the patients were advised initially conventional offloading with customized special front offloading footwear, total contact cast and braces, but none of the patients were using them regularly and used it only for short time. So all these patients were advised surgical offloading. Surgical offloading is the gold standard for the diabetic foot ulcer treatment. This surgery restore the mobility of stiff joints, restores correct posture and distributes equal pressure in the foot.

The ulcers in the subungual region of the toes were associated with hammer toe or mallet toe deformity in our cases. So this associated with dynamic flexion deformity of the IP joint and flexor Hallucis Longus and flexor Digitorum Longuscontracture. These ulcers were treated by doing flexor tenotomy of FHL, FDL tendon at the base of the plantar surface of the toes.

Ulcers in the IP join region in the great toe was due to the stiffness of the 1st MTP joint. This may be structural hallux limits or functional hallux limits where in both there is difficulty in extension of the 1st metatarsal joint. This was tested clinically by Hubscher'smaneuver. There is also defective inelastic plantar common intrinsic tendon which are passing from intrinsic muscle to the base of proximal phalanx of great toe. The plantar fascia also passes around the metatarsal head and get inserted into the base of proximal phalanx. These arrangements helps duringweight bearing by causing flexion of first ray during dorsiflexion of great toe. In diabetic foot ulcer this anatomical attachments causes flexion of the proximal phalanx of the great toe with dorsiflexion of the first toe during walking which results in increase in the pressure at the level of interphalangeal joint causing ulcer.

For these ulcers Keller excision arthroplasty in the best choice. Hence the proximal third to the base of proximal phalanx of great toe along with insertion of intrinsic tendon is excised, through dorsal approach. The ulcer heals spontaneously very well.

Ulcers in the forefoot under the head of metatarsals are associated with fixed metatarsals pronated or supinated foot and ankle in equinus deformity due to contracture of Tendo Achilles. So the ulcers are treated with removal of heads of metatarsal in small toes and reconstruction of the foot pronation, supination deformity with concerned tendons adjustments either by lengthening or plication. The great toe ulcer at metatarsophalangeal joint level are managed without removal of head and preserving the medial arch of the foot by transferring the extensor Hallucis Tendon and fusion of IP joint of great toe. All these ulcers in MTB head are managed with Gastrocnemius slide or TA lengthening.

V. CONCLUSION:

Surgical offloading is the best method to manage forefoot diabetic foot ulcers. All the diabetic patients when they notice callus formation in the foot in the early stage must be referred to diabetic foot surgical specialist. This will prevent patient's development of major chronic non-healing ulcers in the foot and further deterioration to amputation of toes or foot. Management of ulcer by correcting the exact cause will results in good healing and also it prevents recurrence of ulcer.

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