

Research Article

Study of the pathogenesis and diagnosis of ulcer of lower extremity under various conditions

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ABSTRACT

Background: As lower extremities are exposed to injury and having a circulation strained by upright posture of human being should be the site of ulcer. This has reason for researchers and surgeon who have been concerned with the reasons for their common occurrence and difficulty in their cure. Researcher interested to study the pathogenesis of ulcer of lower extremity under various conditions.

Methods: In the present study, 70 patients of lower extremity ulcer with various types were admitted in surgical wards of Mallareddy Institute of Medical Sciences, Hyderabad. The cases were examined in detail and investigated thoroughly. In clinically doubtful cases, the diagnosis was made only after histopathological examination.

Results: Most common type of ulcer was found in the present was Venous 13 (18.57%) cases, contributed by male (12) and female (1) followed by Traumatic 12 (17.14%) and Diabetic 11 (15.74%). Most of cases belong to the age group 41-60 years (47.14) and male (28 cases). High saphenous vein ligation with stripping of veins (23.07%) and conservative (23.07%) treatment were common surgical procedures used for the treatment of venous ulcer.

Conclusions: In the present, venous ulcers are the most common of all leg ulcers with high morbidity. The surgical procedures are directed at prevention of venous reflux at various levels.

Keywords: Lower extremity, Ulcer, Venous

INTRODUCTION

Lower extremity ulcer is most common in our population due to their chronicity. This problem affects adults, who are in their prime working age, not only from lower and middle strata but also from upper class. At many places, lower extremity ulcer is considered unimportant of all the disease and its management is usually done by the most junior in the unit.

Venous ulcers, or stasis ulcers, account for 80 percent of lower extremity ulcerations.¹ Less common etiologies for lower extremity ulcerations include arterial insufficiency; prolonged pressure; diabetic neuropathy; and systemic illness such as rheumatoid arthritis, vasculitis, osteomyelitis, and skin malignancy.²

Ulcers of skin can result in complete loss of the epidermis and often portions of the dermis and even subcutaneous fat.³

As lower extremities are exposed to injury and having a circulation strained by upright posture of human being should be the site of ulcer. This has reason for researchers and surgeon who have been concerned with the reasons for their common occurrence and difficulty in their cure.

If these ulcers are to heal quickly the underlying cause is to be removed which necessitates the correct diagnosis bases on detailed history, clinical examination and investigation and proper treatment and follow up. With right approach, the vast majority heal with simple ambulatory outpatient therapy the essential requirement for treating lower extremity ulcer include a thorough

understanding of lower extremity anatomy vascular hemodynamic.

In the course of a lifetime, almost 10% of the population will develop a chronic wound, with a wound-related mortality rate of 2.5%.⁴ Of these, underlying venous pathology is the most common aetiology of lower extremity ulceration.⁵ Venous ulcers are often recurrent, and open ulcers can persist from weeks to many years.⁶⁻⁹

The present study is based on the patient of lower extremity ulcer of different etiology, which was treated in Mallareddy institute of medical sciences for one year. The treatment advocated was mainly minor surgical procedure, chemotherapy posture, elastic compressor bandaging and surgery. In this study, which follows an attempt is made to evaluate the results obtained by these procedures.

Objectives

1. To study the pathogenesis of ulcer of lower extremity under various conditions.
2. To establish diagnosis of lower extremity ulcer based on their natural history, details clinical examination, laboratory investigations and histopathological and radiological examination.

METHODS

In the present study, 70 patients of lower extremity ulcer with various types were admitted in surgical wards of Mallareddy Institute of Medical Sciences, Hyderabad. The cases were examined in detail and investigated thoroughly. In clinically doubtful cases, the diagnosis was made only after histopathological examination.

RESULTS

Most common type of ulcer was found in the present was Venous 13 (18.57%) cases, contributed by male (12) and female (1) followed by Traumatic 12 (17.14%) and Diabetic 11 (15.74%) (Table 1). Most of cases belong to the age group 41-60 years (47.14) and male (28 cases) (Table 2). High saphenous vein ligation with stripping of veins (23.07%) and conservative (23.07%) treatment were common surgical procedures used for the treatment of venous ulcer (Table 3).

Patients in different grades depending upon presence of vascular disease, neuropathy or both with diabetes were found more in Diabetes (36.36%) and Diabetes with Neuropathy and Vascular disease (36.36%) (Table 4). Staphylococcus (8 cases) and Proteus (4 cases) are found more common organism in infected ulcer (Table 5). Motorcycle (7 cases) and fall (3 cases) are more common factors causing traumatic ulcers (Table 6). Skin grafting and conservative treatment were most common treatment for traumatic leg ulcer (Table 7).

Table 1: Different types of ulcers.

| Type of ulcers | Male | Female | Total(%) |
|------------------------------------|------|--------|---------------|
| Venous | 12 | 01 | 13 (18.57) |
| Diabetic | 08 | 03 | 11 (15.74) |
| Traumatic | 09 | 03 | 12 (17.14) |
| Trophic | 04 | 01 | 05 (07.14) |
| Arterial | 07 | 01 | 08 (11.42) |
| Ulcer with underlying bone disease | | | |
| a. Chronic osteomyelitis | 02 | 01 | 03 (04.28) |
| b. Compound # tibia/fibula | 05 | 00 | 05 (07.14) |
| Leg ulcer AV fistula | | | 02 (02.85) |
| a. Pressure sore | 02 | 00 | 02 |
| b. Infective | 08 | 03 | 11 (15.74) |
| Total | 57 | 13 | 70 (100) |

Table 2: Age & sex distribution.

| Age group (years) | Male | Female | Total (%) |
|-------------------|------|--------|------------|
| Below | 24 | 07 | 31 (44.28) |
| 41 - 60 | 28 | 05 | 33 (47.14) |
| Above 62 | 05 | 01 | 06 (08.57) |
| Total | 57 | 13 | 70 (100) |

Table 3: Various types of surgical procedure used for the treatment of venous ulcer.

| Types of procedure | Male | Female | Total |
|---|------|--------|-------|
| Excision of ulcer with skin grafting | 02 | 00 | 02 |
| High saphenous vein ligation with stripping of veins (Trendelenburg) | 03 | 00 | 03 |
| High saphenous vein ligation with subjected ligation of perforation | 00 | 00 | 00 |
| Subjected ligation of perforator | 02 | 00 | 02 |
| Subjected ligation of (previously treated varicose vein) perforating vein | 02 | 00 | 02 |
| Sclerotherapy | 01 | 00 | 01 |
| Conservative | 02 | 01 | 03 |
| Total | 12 | 01 | 13 |

Table 4: Number of patients in different grades depending upon presence of vascular disease, neuropathy or both with diabetes.

| Treatment | No. of patients (%) |
|--|---------------------|
| I. Diabetes | 04 (36.36) |
| II. Diabetes + Neuropathy | 03 (27.27) |
| III. Diabetes + Vascular disease | 00 (00.00) |
| IV. Diabetes + Neuropathy + Vascular disease | 04 (36.36) |

Table 5: Various organisms cultured in infected ulcer.

| Organisms | No. of patients |
|----------------|-----------------|
| E.Coli | 03 |
| Staphylococcus | 08 |
| Pseudo | 03 |
| Proteus | 04 |
| Streptococci | 03 |
| Mixed | 02 |
| Klebsiella | 03 |

Table 6: Various factors causing traumatic ulcers.

| Nature of surgery | No. of patients |
|-------------------|-----------------|
| Bicycle | 01 |
| Fall | 03 |
| Motorcycle | 07 |
| Four wheeler | 01 |

Table 7: Treatment of traumatic leg ulcer.

| Type of treatment | No. of patients |
|-------------------|------------------|
| Conservation | 03 |
| Skin grafting | 07 |
| Others | 02 (debridement) |

DISCUSSION

In the present study, 70 cases of lower extremity ulcer have been studied with respect to their etiology clinical features and management.

Two types of classification ulcer are possible

Clinically ulcer

- Spreading – when surrounding of an ulcer is inflamed and floor covered with slough without evidence of granulation tissue. It is painful ulcer the edge is inflamed, oedematous and ragged. The draining lymph nodes are enlarged tender.
- Healing – The floor is covered with pinkish or red healthy granulation the edge is reddish with granulation while the margin is bluish with growing epithelium, discharge and slight.

- Callous – Pale granulation tissue on the floor, considerable induration at the base, edge and surrounding skin ulcer shows no tendency towards healing.

Pathologically ulcer

a. Nonspecific ulcer

- Venous ulcer
- Diabetic ulcer
- Traumatic ulcer
- Arterial ulcer
- Neurogenic ulcer (trophic ulcer)
- Infective ulcer
- Tropical ulcer
- Cryopathic
- Mastorell's ulcer (Hypertensive ulcer)
- Beinin's ulcer (erythrocyanoid ulcer)
- Miscellaneous

b. Specific ulcer – seen in tuberculosis, syphilis

- Malignant ulcer e.g. epithelcoma, rodent ulcer and malignant melanoma.

They are discussed in relation with clinical features, pathogenesis and the management as follow -

- Venous ulcer – The term venous ulcer describes the pigmented, indurated skin in a peri walled with skin changes lipodermatosclerosis.

The importance of gravity in the cause of this condition was stress by Brodic, Hiton and Recently by Angle & Bergan. Gay was the first shown that, such ulcers are due to obstruction of trunk veins (deep and superficial) and that varicose vein play no part.

Venous ulcers are often recurrent, and open ulcers can persist from weeks to many years. Severe complications include cellulitis, osteomyelitis, and malignant change.¹⁰

Chronic ulceration of lower extremity following deep vein thrombosis is a condition that undoubtedly has plagued the human race since man assumed the erect position. Venous ulceration occurs in the gaiter area in 95% of cases especially around the malleolar (the rounded protuberances on the ankle) region.¹¹

Aetiology & pathogenesis of venous ulcers

On the basis of study conducted¹², a conception of pathogenesis is suggested the main links of which are more circulatory disorder in the system of perforating veins of a closed structure and deficient resolution of fibrin due to diminished local fiberolytic activity of the plasma insufficient splitting leads to the formation of paravasal collagen leys prevently normal exchange between the capillaries. Impaired nutrition facelates

spasm of arteries and to activation of collangiolytic peptidases and DAB occurs in ischemia tissue which leads to destruction of the skin and formation of ulcer.¹³

Clinical features of venous ulcer

The usual site of chronic venous ulcer is just above the medial malleolus. If short saphenous system is affected then ulcer is situated on the lateral side usually they are single but multiple ulcer may occur. Varicose ulcer is shallow and never penetrate deep fascia. It has punched out edges which are often characterized by a thin blue line of growing epithelium floor is opened by pink/pale granulation time rarely slough. Often one or more large feeding veins can be seen towards the edge of the ulcer. The surrounding skin is indurated, oedematous and pigmented. Varicose ulcer is painless. It becomes painful due to saphenous neuritis (when nerve is caught into inflammatory process and scarring).

Treatment of venous ulcer

Aim of the management of post-thrombotic limb or venous hypertension at ankle with varicose vein and by controlling this abnormal venous hyperplasia.

1. Posture
2. Elastic compression bandage
3. Surgery

Local application to ulcers

We used Eusol when slough was present, after that we applied MgSO₄ till oedema subsided and then dressing with paraffin guaze till ulcer healed.

Placental extract (placentrex), collagenase (salutyl), hyaluroinic acid (Bronit).

Skin grafting in venous ulcer

Acc Cockett ulcer with 4-5 years duration to be treated surgically by grafting. After 45 years the whole area and subcutaneous tissue including deep fascia must be excised weddy and then grafted.

Now microvascular free skin flap transfer offer the prospect of bringing healthy tissue into the areas of severely damaged.

Post-operative rest, elevation of legs for atleast 3 weeks is indicated to avoid under graft and graft necrosis.

Results of early surgery are better in cases of uncomplicated varicose vein with perforation incompetence.

There are three possible factors in the post-thrombotic syndrome:

1. Valve incompetence in the ankle perforating veins (amenable to osurgery).
2. Valve loss in main deep vein (results of surgery may not be satisfactory).
3. Post-thrombotic obstruction particularly large vein (not satisfactory).

For uncomplicated varicose veins without perforator incompetence, high saphenous ligation with or without stripping veins is the best possible treatment. If associated perforator are incompetent than subfascial or extrafascial ligations should be done along with stripping.

Various Operations (Dodd H & Cockett FB)

1. Trendelenburg operation (1881) – Trendelenburg (1891) advised ligating the long saphenous above the large varies in the thigh at junction of middle and lower-third of thigh or a little lower.
2. Thomas modification of Trendelenburg operation – Ligation of long saphenous vein at its highest is possible.
3. Sapheno-femoral flush ligation – Ligation of long saphenous vein where it enters femoral vein a flush ligation proximal to any, tributeries is essential otherwise recurrence is inevitable.
4. Subfascial ligation of Dodd & Cockett for incompetent perforating vein.
5. Linton (radial approach) – In this technique, the superficial varicosities were ligated and stripped with subfascial ligation of perforating veins.

Venous ulceration is a chronic disease, which is characterized by periods of exacerbation and remission. Venous ulcers often take a long time to heal, which results in physical and psychological discomfort and negatively affects a patient's functional status.¹³

Arterial ulcer

It is mostly to atherosclerosis of thromboangitis obliterans (Buerger's disease) can be 'pure' when ulcer is only due to obliterate arterial disease or combined when it is associated with varicose veins or post-thrombotic disease. Arterial leg ulcers occur as a result of reduced arterial blood flow and subsequent tissue perfusion.¹⁴

Classification clinically can be (1) acute (necrotic) and (2) chronic.

The commonest cause in younger age group is thromboangitis obiterans (TAO) while in old age athrosclerosis is the causative factor. Common sites are toes, heel and anterior surface of tibia (skin); associated signs of ischaemia i.e. rest pain, intermittent claudication,

undue coldness, pale dry skin. Absent arterial pulsation are present.

Pathology

Acute thrombosis of affected smaller arteries leads to sudden appearance of bluish red undurated plaque with fluid filled bleb over it. This plaque becomes black and later sloughs to form ulcer.

Clinical features

Sites – toes, heel, anterior surface of tibia may be single/multiple. Edges – undermined (punched out); Base – subcutaneous tissue, tendon or periosteum; and Floor – few granulation tissue with unhealthy slough.

Chronic arterial (indolent) – It has insidious / onset and arises after infection on trivial trauma to toes or foot ulcers are small indolent and very painful. They may be present years together before the treatment is undertaken. Other signs of arterial diseases are present.

Treatment – Aim to improve collateral circulation and promote healing of ulcer.

1. Underlying cause of arterial ulcer must be find out TAO – smoking is prohibited.
2. Control infection with antibiotic after culture sensitivity recently it has been proved that, regional administration of antibiotic affords greater concentration than systemic administration for the treatment of ischaemic leg ulcer. (Accvedo A, 1990)
3. Bed rest.
4. Local care of ulcer – with EuSOL / NS followed by stretch dry dressing, local debridement of slough and excision of overhanging edges, if required.
5. Vacuum compression therapy - increase capillary filling
6. Skin grafting after healthy granular tissue
7. Lumbar sympathectomy to improve circulation – it should be done when the infection is controlled and ulcer is clean. It open collateral pathways, improve vascularity of the skin and leads to early and rapid healing of the ulcer. It also modifies level of amputation.
8. Amputation – if no response to conservative treatment and severe rest pain.
9. Arterial reconstruction surgery

In combined ulcers, if varicose veins are present and they are compromising the circulation in the limb, high saphenous ligation with modified stripping of veins (only in or above the upper quadrant of leg) is performed. After this, ulcer is healed is a case of pure pure arterial disease.

New omental transfer –reported encouraging results in the end stage vascular disease in TAO.

Traumatic ulcer can be either:

1. Mechanical i.e. Road Traffic Accident (RTA)
2. Physical i.e. electrical / 1x' ray burn
3. Chemical i.e. from applications caustics

Here in our study, we have included ulcer resulting from road traffic accidents and electrical (exact wound) The most commonest cause of RTA –automobile accidents.

In many countries motor vehicle accidents sank first among all fatal accidents.

In developing countries, a large preperation of vehicles involved in addidents are two wheelers, compared to cars. They are unstable and provide little protection for these riders in accident. In these countries, pedestrians are more frequently involved in RTA than others, whereas in developed countries four-wheelers are more frequently involved in the accidents.

Characteristic of traumatic ulcers – may/may not be associated underlying fracture osteomyelitis (unless associated with fracture and osteomyelitis have been studied separately). These ulcers are seen in all age groups and more common in males. The site more common where skin is closely applied to bony prominences e.g. skin, malleoli over which there are no muscles.

Treatment

Rest, immobilisation, debridement, dressing, antibiotic

Skin grafting

Flaps, sural a based ---- cutaneous flaps

Neurotrophic / Neuropathic / Neurogenic / Trophic ulcer

This is also called a perforating ulcer. It is seen in diabetes alcoholic peripheral neuritis, tabes dorsalis, leprosy, paraplegia and syringomyelia. It is usually due to neurogenic causes one to repeated injury with pressure in an anaesthetic area.

Common site are heel, ball of the foot, if the patient is ambulatory and gluteal region and back of heel. If the patient is non-ambulatory (we have not included bed sore in the present study).

Progress is as follows – Lallostrty – suppuration – breakdown forms ulcer, which gradually borrows through muscle tendon and sometimes even up to the bone.

It is usually pain less, currently trophic ulcer are considered to occur both due to anaesthesia and ischemia.

The characteristic feature of this ulcer in its callousness towards healing. Its edge is slightly raised and exudes

crpions and erosanguinous discharge. This ulcer practically retains the same for month and years. In some cases, it destroys the surrounding tissue and this spreads widely, every effort should be made detect the cause behind the ulcer and treat accordingly.

Avoidance of weight bearing special shoes to debridement weight differently are often effective. For neuropathy Vit. B₁₂ injection is tried. Diabetic patients are at higher risk for arterial diseases and neuropathy, therefore, can develop ulcers due to both entities. In addition, hyperglycemia poses the risk of ulcers secondary to neuropathic impairment of sensory, motor, and autonomic function, typically in the hand and foot, or "stocking and glove" distributions.¹⁶ The major underlying causes are noted to be peripheral neuropathy and ischemia from peripheral vascular disease. Other factors in ulceration are trauma, deformity, callus formation, and edema.¹⁷

Pressure sores (ulcers)

Pressure and shear forces over bony prominences have key role in the formation of pressure ulcers. There are due to badly applied plaster of paris bandaged. They occur over the prominent bony points (bed sores excluded from our study).

Pathogenesis

Necrosis spreads outwardly beginning with the subcutaneous fat and eventually affecting the epidermis. Histologic analyses of cause of the ulcer formation in human being several a sequence of capillary and venula dilation accompanied by perivascular infiltrate. Capillary permeability allows intra-muscular cells to until the connective tissue with release of degradation enzymes.

National Pressure Ulcer Advisory Panel has developed staging system as follows:

1. Stage I: Non-blanchable erythema of intact skin the lesion of skin ulceration.
2. Stage II: Partial thickness skin loss involving epidermis/dermis the ulcer is superficial and presents clinically.
3. Stage III: Full thickness skin loss involving damage or necrosis of subcutaneous tissue that may extend down to but not through underlying fascia. The ulcer presents clinically as a deep crater with or without undermining of adjacent tissue.
4. Stage IV: Full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone or supporting structure (tendon joint capsules).

Treatment

1. Plastic removal
2. Debridement + Antibiotic

3. Sterile sodium chloride impregnated dressing over pressure give satisfactory results. Calcium dressing have been used in the treatment of pressure ulcer and also in ulcers of various aetiology. The advantages are good wound exudate absorption, patient's comfort and ease of application.
4. Skin grafting

CONCLUSION

In the present, venous ulcers are the most common of all leg ulcers with high morbidity. It is unfortunate that many a times it is not properly diagnosed and, unnecessarily, expensive treatment is undertaken. Conservative management with leg elevation and compression therapy is effective and is the mainstay of therapy, particularly in the elderly and infirm not suitable for surgery. No particular dressing material has been found to be superior to the others. Ulcers of prolonged duration not responding to conservative measures or patients, who, for life style reasons, are unable to undertake it, will require surgery. The surgical procedures are directed at prevention of venous reflux at various levels.

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