

FURTHER EDUCATION

Management of plantar ulcers in leprosy

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Introduction

The aim of this article is to promote and encourage ulcer care at the lowest possible level, as near to the patient's home as possible, and to stimulate paramedical workers and physicians in peripheral units to take responsibility for such treatment.

Traditionally surgeons, often working full time in leprosy institutions, in vertical leprosy programmes have given ulcer care. As integration proceeds, focusing on multi-drug therapy, the priority for care after cure in programmes gets a lower profile. There is then an increasing need for empowering patients with the responsibility for their own ulcer prevention, and empowering peripheral health units for basic surgical treatment of ulcers.

The focus of this article is on basic care of foot ulcers in leprosy. The principles and methods presented aim at solving the problems of ulcer formation by the simplest possible procedures, which can be easily taught to medical staff at different levels. The details of surgery are presented in a subsequent article.

Danger of plantar ulceration and its prevention

Peripheral nerve damage results in loss of sensory and motor function of the affected nerve, the posterior tibial and lateral popliteal nerves in the case of the foot. Loss of sensation, and the resulting loss of protective sensation such as touch, pain pressure and temperature discrimination results in increased vulnerability of the affected hands and feet to injury and normal daily activities become hazardous. Loss of sweating, due to disturbed autonomic function, decreases the protective quality of the skin. Paralysis of intrinsic and extrinsic muscles of the hands and feet alters the distribution of the stress on the palm of the hand and the sole of the foot during activity (prehension and weight bearing). All this leads to deterioration of soft and bony tissues. The various sequelae are (1) soft tissues: reduced visco-elasticity, atrophy, ulceration, tenosynovitis, (2) bones: decalcification, absorption, osteitis and (3) joints: subluxation, dislocation, osteoarthritis, and tarsal disintegration. Finally, deformities develop, first mobile and later fixed.

Nerve damage and plantar ulcers

Loss of motor function leads to:

paralysis of muscles → imbalance of muscular forces → deformity and disability
deformity → increased weight bearing on some areas.

Loss of sensory function results in:

Loss of touch, pain, temperature sense → loss of protective sense →
→ increased chances of injury, burn, continued pressure → ulceration.

Loss of autonomic function leads to:

Loss of sweating → diminished resistance to injury and infection.

Early detection and treatment can prevent nerve involvement.

Plantar ulceration and its after effects can be prevented by:

- Change of lifestyle: by health education, and self-care training.
- Daily skin treatment: by soaking in water and greasing with oil or ointment.
- Protective devices: these include footwear together with thorn and nailproof outer sole that protects from external injury, orthotic devices like arch support, weight relieving metatarsal pads, and others that protect from internal pressure, that distribute weight bearing over the whole sole, and protect vulnerable areas of the foot from stresses.
- Preventive and rehabilitation – surgery: in many leprosy programmes surgery is not available for patients. Existing leprosy institutions are few, and far away; many patients in need of surgery cannot travel a long distance for treatment. Moreover, many programmes do not have access to surgically trained staff.

Surgery in ulcer management involves more than performing debridement, sequestrectomy and amputations. *Every intervention should aim at preventing further destruction, and upgrading of the affected limb.*

Ulcer formation

Understanding the reasons and mechanisms for tissue destruction and ulceration is essential for understanding the methods of management. Examining a foot will reveal a story to the attentive observer. This story may deviate from the story the patient is telling, which is of interest since it is crucial that the patient understands how ulcers happen to avoid their recurrence. An enlightened patient is the best contributor to successful ulcer prevention.

Ulcers:

are the result of:

Deformity and/or loss of protective sensation

are caused by:

Repetitive moderate stress

Direct trauma

Pressure causing ischaemia

Burn injury

Walking on infected feet

Where are the plantar ulcers?

Foot :3/4

Hindfoot:1/4

Fifth metatarsal base: 1/8

Heel 1/8

Ulcers on the heel and under the fifth metatarsal base are high-risk ulcers

PRINCIPAL CAUSES OF ULCERS

Repetitive moderate stress

Normal sensation prevents overuse of the foot. In the absence of sensation, the foot is overused; the patient accumulates tissue damage which goes *unnoticed* until a breakdown occurs. Too much walking gives rise to a 'hot spot' and swelling at the site of maximum stress. This injury is *still reversible if the foot is rested at this stage*. Further walking causes tissue death and a deep infected ulcer. The patient says that 'an ulcer suddenly occurred', without any injury. He tells the truth, for this is a 'within-out ulcer'.

Direct trauma

Examples are: thorn-pricks; thorns penetrate the sole of the shoe. Stones in the shoe are not felt and cause injury. Stones, nails and similar objects hitting during walking or working is another cause.

Pressure causing ischaemia

Pressure lasting an appreciable time causes local ischaemia. Ulcers of this kind are situated at harder areas at the side of the foot, or the dorsum, or the knuckles of the toes. An example is a shoe bite and injury because of a new shoe worn for too long.

Burn

Temperature and exposure time is the important causative factors. Long exposure time can cause burns on unprotected skin, e.g. resting close to the fire at night, resting the foot on a gearbox, standing in the hot sun on a metallic surface like a drainage cover.

Walking on an infected foot

Walking on a foot with an infected ulcer can change a simple, manageable situation into a serious problem. Only when the tissue damage has reached the deep tissues and the patient gets serious pain from the deep sensation may he/she seek help.

When a summary of these findings is made, the probable cause and ways to prevent recurrence will be defined.

LOCATION OF ULCER

Forefoot (3/4)

Tip of the toes: usually from claw toes, resulting in digging of the toe-tips into the ground.

Dorsum of the proximal interphalangeal joint: usually from a too tight shoe or a sandal straps.

Under a metatarsal head/the metatarso-phalangeal joint: mostly from repetitive moderate stress and a prominent metatarsal head from claw toe (intrinsic paralysis) deformity, collapse of the metatarsal arch and atrophy of the sole, often with callus formation of the skin.

In the instep

If not from a direct trauma, very often by a perforation from a tendovaginitis.

Hindfoot (1/4)

Fifth metatarsal base (1/8): usually in cases with insufficiency of the muscles innervated by the common peroneal nerve (foot drop or inversion). A 'high risk' ulcer, since infections in the fifth tarso-metatarsal joint easily spreads to the tarsal bones and joints, contributing to the deterioration of the tarsal bones (TD), with collapse of the longitudinal arch and instability of the foot resulting in a shift of the weight bearing to the central foot.

Heel (1/8): a heel ulcer easily causes destruction of the important heel pad, leaving a bad scar. The heel is difficult to resurface. It is almost impossible to compensate an insufficient heel with an orthopaedic device.

Examination of the foot

The examination of the foot will identify the cause, position, and type of an ulcer.

Observations: answers to the following questions will provide the answer how to manage ulcers.

Does the patient understand how ulcers are formed?

Does the lifestyle of the patient carry risk factors?

Is the profession a risk factor?

When did it start?

How did it start?

Any special event?

Has the patient's situation changed?

Any special reason for walking more than usual?

Is the patient wearing proper protective footwear acceptable to him/her?

Is there a total or partial loss of sensation?

Is there any clawing of the toes or foot drop?

Is there any stiffness in the joints?

Is there any inversion or eversion?

Has the metatarsal arch collapsed?

Has the longitudinal arch collapsed?

Is there hypermobility between the forefoot and the hindfoot (signs of tarsal disintegration)?

What is the likely cause of the ulcer?

TYPE OF ULCER

A simple classification is necessary, since the ulcers are usually examined by the field staff, who have to make the decision whether the patient can be treated in a peripheral setting, or must be sent to a centre for surgical treatment. Ulcers can be classified into two groups, *superficial* and *deep*.

Superficial ulcers involve epidermis, cutis and subcutis.

Deep ulcers involve any deeper tissues, e.g. fascia, bone, joint, tendon sheath, tendon.

PHYSICAL EXAMINATION

Thorough *physical* examination is essential for classification of an ulcer.

Palpation

- *Touching* reveals heat.
- *Pressing* gently reveals tenderness and discharge. A suspect joint may yield a drop of infected synovial fluid when pressed (osteoarthritis). Some drops of synovial fluid appearing on milking the tendon sheaths towards the ulcer indicates a tendovaginitis. Missing a tendovaginitis and not draining it can be disastrous.
- *Crepitations* can be felt when cartilage and bone are engaged.
- *Probing*: unfolding and flaming a paper clip can make a simple probe. Gentle probing gives information about depth and kind of tissue involved. Never use unsterile probes!

Measuring ulcer size

The approximate size of an ulcer can be registered by measuring with a divider and a scale. Monitoring should be carried out regularly during treatment.

Tarsal disintegration

Swelling of the ankle joint is very often a sign of tarsal disintegration (TD), a condition which very early leads to a total destruction of the foot, requiring amputation. TD is common in young people with sensory loss of one foot only. TD is a condition that requires urgent treatment by a specialist (leprosy surgeon or orthopaedic surgeon).

Heat swelling and fluctuation on the anterior or posterior side of the lower leg may be due to deep infection which has migrated upwards from the foot along the long extensor and flexor tendons.

Principles of treatment of plantar ulcers

PREVENTION

Self care training of the patient and family members

- Soaking and oiling
- Trimming

- Inspection for early signs of ulcer formation
- Ways of taking rest
- Basic dressing techniques for home use.

Stimulate formation of self-care groups for

- Sharing experience
- Mutual support.

Develop a footwear programme

- Protective footwear should be *acceptable* and *available*
- The programme should be *sustainable*
- The use of available commercial footwear, which can be modified, should be encouraged.

TREATMENT

- Immobilization
- Treatment of deep infection.

Treatment is surgical. Antibiotics should only be used if the patient's general condition requires it (septicaemia). Liberal, unnecessary use of antibiotics only creates resistance.

- Remove dead tissue by wide exploration and good drainage
- Restore weight bearing surface by careful planning of the intervention.

Almost all ulcers, even deep, will eventually heal by rest. They may reoccur early, though, if the cause of the ulcer has not been removed. Therefore it is necessary to analyse the cause of the ulcer carefully and remove the cause by change in lifestyle, proper footwear and surgery (aiming at upgrading the foot and preventing a new ulcer).

Necessary surgical procedures should be performed as close as possible to the patient's home and with nil, or as short as possible hospitalization.

TREATMENT BY WHOM?

Ulcer treatment should be differentiated into different levels and be performed by:

- *The patient or household member*

Early on, the patient or a member of his household best takes care of minor ulcers, preferably after some self-care training.

Self-care training can be provided by trained leprosy workers. The methods are rest, reduced weight bearing by sitting down, using crutches, cleaning the ulcer with clean water and soap, oiling the skin and covering the ulcer with clean cloth.

- *Local clinic should treat*

Forefoot ulcers, requiring smaller interventions with no or local anaesthesia.

- *Peripheral hospital should treat*

Forefoot and hindfoot ulcers, septic conditions requiring larger interventions in local or spinal anaesthesia, and requiring a short hospitalization.

- *Specialist hospital should treat*

Forefoot and hindfoot ulcers, requiring larger interventions, including partial amputations, corrective osteotomies, and resurfacing of the sole. Gross deformities need surgical correction and a special orthotic device.

Early treatment as near as possible to the patient's home diminishes damage and development of disability, handicap and stigma and should be given high priority in leprosy programmes, vertical or integrated. The resources for such activities are usually already in existence. What are needed are proper planning, structuring and training.