

Prevention and Non Surgical Treatment of Common Impairments: An Overview

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INTRODUCTION

In this chapter the common primary and secondary impairments as they often occur in patients with peripheral nerve injuries and neuropathies are discussed. These impairments are also discussed from a different perspective in some other chapters: anatomy and assessment of the hand (Chapter 5), pre- and postoperative therapy in connection with tendon transfers (Chapter 21) and ulcer care and prevention (Chapters 13,15). Nerve function assessment is discussed in Chapter 2.

Primary impairments are seen as the direct result of nerve function impairment (Fig. 4-1). The common primary impairments are: muscle imbalance, loss of (protective/functional) sensation and loss of autonomic function (sweating). Secondary impairments may 'follow' primary impairments. The secondary impairments can be prevented by different interven-

tions including modification of life style. The important interventions will be discussed in the following sections: prevention of nerve function impairment (NFI), protection, exercises and splinting, and ulcer care and prevention.

PREVENTION OF NERVE FUNCTION IMPAIRMENT

Most impairments in leprosy can be attributed to nerve function impairment (NFI). Early diagnosis and regular and adequate treatment will in most cases prevent permanent NFI. Nerve function assessment (NFA) at time of diagnosis is mandatory to evaluate and monitor nerve function for as long as patients are under treatment/surveillance. NFA is not only important to know if nerve function is changing in (progressive) neuropathies but also when considering tendon transfer surgery. Which muscles are active and do they have adequate strength?

There are two widely accepted ways to assess and monitor nerve function: manual muscle testing and sensory testing.

In manual muscle testing the muscles are usually graded on the MRC 0-5 scale. With respect to the neuropathic limb a few studies have reported on reliability and method of assessment. Grip- and pinch strength assessments could also be included when evaluating motor impairment in the upper extremity.⁵⁻⁸

The instruments of choice in evaluating sensibility are Semmes-Weinstein monofilaments. These are graded nylon filaments that, when applied to the skin, give a reproducible force.

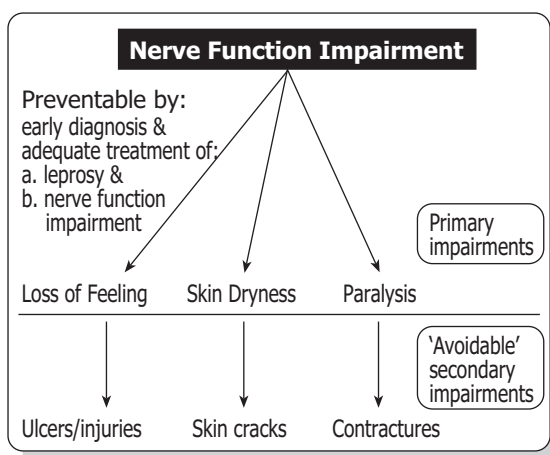


FIGURE 4-1 Primary and Secondary Impairments

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Several studies have assessed reliability, and levels of normal and protective sensation have been determined for hands and feet in different studies for different populations.^{2,3,9}

In one study in a population of patients with diabetes, the responsibility to evaluate and report on sensory impairment was given to the patients.¹ Subjects were given a monofilament to monitor sensation of their feet. A number of subjects reported with decreased sensory nerve function in the course of the study. Nerve function assessment is more extensively covered in Chapter 2.

PROTECTION

Patients with loss of protective sensation of hands and/or feet are in danger of sustaining injuries that they are sometimes unaware of. Pain (discomfort), as a warning sign for pending tissue break down is often lacking. Loss of protective sensation is not a cause but a risk factor in the a-sensate hand or foot for injuries (ulcers). Patients need to know that the skin and underlying tissue are healthy and that when proper care is taken and attention is given to early signs of skin break down, the a-sensate hand and foot can serve a lifetime.

Tool adaptations can be helpful in preventing burns while cooking. Similarly, tool adaptations (including padding of handles) can prevent injuries and friction blisters when working on the land (Chapter 23). In addition, it is important that people with a-sensate hands know that they need to regularly change the way a tool is held and rest the hands. It is good practice to inspect the hands and feet, especially after a day's work out in the field, and if there is any sign of skin break down, to treat the hand as if it could still feel pain.

Plantar ulceration is a common occurrence in patients with insensitive feet. Patients with loss of protective sensation should wear appropriate footwear at all times. The footwear should ideally have a hard sole, which can pro-

tect against penetrating injuries (e.g. thorns and nails). A soft insole will be useful for cushioning the sole of the foot and may help in redistribution of body weight. Outer sole (rocker sole) and in-shoe modifications (orthoses) can further help to redistribute pressures in the foot with severe secondary impairments (Chapter 17).

Many patients with a neuropathy may also have dry skin that easily cracks. It is good practice that these patients at least once a day soak and oil their skin (See appendix on skin care and self-care). Passive finger straightening exercises can be done as oil is rubbed into the skin.

EXERCISES

There are basically two objectives for exercises of the hand or foot with weak or paralyzed muscles:

- a) Strengthening;
- b) Prevention/correction of contractures.

a) Strengthening exercises

In the authors' opinion no specific exercises are needed to strengthen weak muscles. Patients should be encouraged to use their hands as much as possible in meaningful activities. This will help to maintain available muscle strength or it may slow down the increase in muscle weakness in certain neuropathies.

b) Exercises to prevent or overcome contractures

Many patients with paralysis of the muscles of the hand develop, or present with, a 'claw' position of the fingers. The 'clawing' may be severe when there is paralysis of the intrinsic muscles only, less severe when there is also weakness of the extrinsic muscles. A few basic exercises will help to prevent joint stiffness (contractures) or they may help in overcoming joint stiffness. Joint stiffness may especially occur in the middle joints of the fingers (PIP joints) and the thumb. Exercises will always be

helpful to prevent the stiffness from becoming worse. If the stiffness in the middle joints of the fingers is less than 30-40 degrees there is a good possibility that the angles may improve.

The mobile and the stiff 'claw-hand'

When you are able to straighten the joints 'passively' the fingers are considered mobile. There are different exercises for the stiff and the mobile hand (Fig. 4-2a,b).

A **A Mobile** **Twice daily-20** **May take**
 'claw hand' **repetitions** **5 minutes only**

A1 Fingers

Press with the other hand (forearm) the palm/knuckle joints firmly down on your thigh. Straighten fingers, actively, as much as you can. Hold straight for few seconds and relax. Repeat.

A2 Thumb

(Only when there is tendency for the thumb joint to bend)! Support with other hand middle joint (MCP) of the thumb. Straighten end joint (IP), hold for few seconds; relax and straighten again. Repeat.

B **Stiff** **Twice daily-20** **May take**
 claw-hand **repetitions** **10-15 minutes**

B1 Fingers

With the hand supported on the thigh (palm up) passively straighten the finger joints with the other hand (forearm).

B2 Thumb

Straighten the thumb joint between the thumb and the index finger of other hand.

C Thumb Web

In patients with combined ulnar-median palsy a thumb web contracture may develop, or may be present. Two exercises help to prevent a contracture, overcome a mild contracture or prevent worsening:

C1 'Rub' thumb web space with the ulnar border of the other hand pushing against the first metacarpal bone.

C2 'Interlock' the thumbs and press with the thumb against the metacarpal of the thumb.

Aim of exercises:

- 1 Mobile 'claw hand': to prevent joint stiffness.
- 2 Stiff 'claw-hand': to overcome / decrease joint stiffness or prevent worsening.

Patients with a mobile 'claw-hand' only need to do the exercises listed under A. Patients who have stiffness of the finger joints should always start with the B exercises and finish with the A exercises.

Surface

The patient is instructed to do the exercises on his/her upper thigh. This provides for a soft surface and the back of the knuckle joints is protected. Because the patient may have been soaking and oiling his hands before doing his exercises, it is advisable that the patient puts a piece of old cloth on his thigh to protect his clothes.

NOTE

- Care should be taken not to 'break' or further damage the skin when there are skin cracks.

SPLINTING

Generally speaking, splints may serve two purposes:

- a) facilitation of use (functionality) of the hand or foot and
- b) prevention or correction of secondary impairments.

a) Facilitation of use

Wrist extension is essential for most activities of daily living (ADL) involving the hands. In patients with wrist drop, wrist extension can be achieved with a so-called cock-up splint. This splint can be attached to the hand either on the volar or dorsal side. The fingers and thumb should be free to move in extension/flexion

Figure 4-2a,b Exercises for the paralysed hand.

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and opposition. There is usually no need to maintain the fingers in extension by a modification of the splint.

In patients with median nerve palsy, dynamic thumb opposition can be achieved by a rubber band that is directed to the thumb from the ulnar side of a wristlet.

A footdrop can be corrected by a back splint that is worn in the shoe or by a footdrop spring device. This orthosis is on the anterior side of the lower leg and originates from above or below the knee. It is usually made of leather (straps) in which a spring can be incorporated.

A splint is rarely needed for a patient with 'claw' fingers. Only if a splint would enhance the function of the hand would a splint be justified.

b) Prevention or correction of secondary impairments: contractures

The most likely joints to contract in the hand are the PIP joints. Basic exercises (see above) will prevent and may overcome mild contractures. With more severe contractures serial finger casting with Plaster of Paris has been shown to be most effective in releasing contracted PIP joints.

Finger flexor tightness may develop secondary to longstanding claw position of the fingers. Serial casting with wrist and fingers in extension will be effective in overcoming tightness of the extrinsic finger flexors.

A thumb web contracture may develop in the presence of paralysed intrinsic muscles that oppose the thumb. Serial casting of the thumb in maximum opposition and abduction will be beneficial in releasing the contracted tissues. It is mandatory that before the application of a new cast the patients do the necessary exercises (Fig. 4-2).

Generally speaking, no specific exercises are needed for the paralysed foot. The likelihood of a severe Achilles tendon contracture develop-

ing in ambulant patients is rare. Moreover, in cultures in which squatting is a common 'exercise' in 'toilet visits' or where people just commonly sit down (squat) to rest or 'chat', the Achilles tendon will maintain adequate length for walking. However when footdrop corrective surgery is carried out the Achilles tendon usually needs to be surgically lengthened to allow the tendon transfer to function adequately.

ULCER CARE

One of the main concerns in the management of the a-sensate hand or foot is the (re) occurrence of ulcers and injuries. Patients with loss of protective sensation need to know how to care for their insensitive limbs and how to prevent/ minimise the risk of an ulcer (see above).

Once an ulcer or injury is present they should treat it as if they can feel the pain.

The sensitive hand or foot would not be used or activities would be done in a different way not to feel pain until such time when there is no more pain. By that time the tissues are healed. Pain is a natural way (gift) of 'splinting' a painful limb.⁴

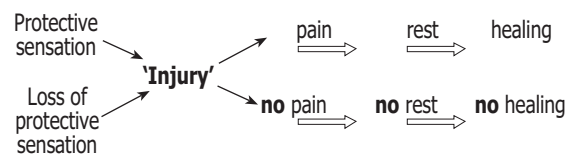


FIGURE 4-3 Rest is the treatment for an ulcer/injury.

Rest can be accomplished in a variety of ways. As most of the ulcers will occur on insensate feet we will give some methods to rest the ulcerated foot. Taking pressure off the ulcer is usually achieved by crutches or bed rest. Minimising pressure can be achieved by POP walking casts and modifications to the footwear.

The best option is decided between health worker and patient but will often depend on what is available and practical.

a) Bed-rest: Not always practiced and practical. Patients want to go outside and sit in the sun, go to the bathroom, or play games in a recreation room.

b) Pair of crutches: These can be given to most patients for walking.

c) Trolley: This is a small stool with wheels. This is especially suitable for patients that can not use their hands. They can 'propel' themselves with the non-ulcerated foot or with the heel(s) of affected feet as most ulcers occur on the forefoot.

d) Wheelchairs: Should not be used for patients with plantar ulcers! When a patient can not 'handle' crutches, can not bear weight on both feet, and a trolley is not an option, only then should a wheelchair be given.

e) Heel-walking: If an ulcer is located on the forefoot, especially with only one foot affected, patients can be taught to walk on their heel. (Not for patients with footdrop!)

Providing splints for patients with plantar ulcers to rest their feet may create a sense of dependency on splints. "Splints are needed to heal an ulcer" (not true).

Partial weight bearing takes place in a **Total Contact Cast**.

Total Contact Casting is very effective in the healing of plantar ulceration. (See appendix A)

There is evidence that 'some' weight bearing on a granulating ulcer enhances ulcer healing more than non-weight-bearing.

Generally, no medication either by mouth, injection or on the ulcer is needed to heal an

ulcer. Soak and wash an ulcer and keep it clean. A dressing will prevent dirt from entering into an ulcer.

ELECTROTHERAPY AND OTHER PHYSICAL THERAPY MODALITIES

Electro-stimulation is often used in peripheral nerve injuries. There is no evidence that electrotherapy will help in the recovery of peripheral nerve function or muscle strength. It may aid in slowing down the rate of atrophy but electrostimulation sessions will have to be frequent (a few times daily every day of the week). As soon as there is evidence of returning muscle function purposeful activities/exercises should be instructed to the patient.

ULTRASOUND/TENS

Ultrasound and TENS (Transcutaneous Electrical Nerve Stimulation) could be beneficial in the treatment of painful nerves as sometimes seen in leprosy. The relief of pain by these modalities, however, has not been shown in controlled clinical studies.

WAX BATH

Wax bath is often given for patients with insensitive hands and/or contractures, sometimes postoperatively following tendon transfer surgery. If the purpose of wax bath is to make the skin 'supple' then this objective could also be achieved by soaking in water. The 'superiority' of a wax bath over water soaking in achieving this objective has not been shown. A wax bath may create a sense of dependency in patients who would not soak their dry hands and feet when discharged from a hospital/clinic where a wax bath was used.

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CONCLUSION

Early diagnosis of leprosy can prevent nerve function impairment in many patients. Early diagnosis of nerve function impairment can also prevent permanent nerve function impairment in many persons through appropriate medical and educational intervention. If nerve function is lost, secondary impairments due to sensory, autonomic and motor impairment can be prevented or corrected by strategies of self-care, education to prevent (re) ulceration and surgery.

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