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Salvaging the Nerve-Damaged Limb

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Neuropathy includes all forms of pathological damage to a nerve. This extends from complete destruction and/or loss of function of one or all modalities of the affected nerve or nerves, to minor degrees of misfunction of one nerve.

As a result there will be some abnormality of motor, sensory or autonomic function. The condition may be present from birth (eg birth defects or familial neuropathies such as CMT), the result of an acute process (as in trauma, poliomyelitis, GBS,) or a slowly progressive disease (eg diabetes).

The symptoms of involvement of each type of nerve are different. Symptoms may fluctuate, especially the sensory ones, which may change as the years go by but may never really disappear.

Sensory

The mildest manifestation of sensory neuropathy is "paraesthesia". The patient has abnormal sensations, which may come and go, or remain all the time. These include "pins and needles", "numbness", "itching", "ants crawling under the skin" "walking on eggshells", and are often described as painful because the patient does not know what else to call them. A very common presentation is an UNEXPLAINED PAINLESS WOUND, often a neglected cut, blister, or a burn. Because of NO PAIN the patient goes on using the affected limb and the use prevents healing. People say "It will not heal". Medical Practitioners often say "I cannot cure you". The truth is the body's attempts at healing are destroyed by painless use. With adequate rest and protection most painless ulcers will heal. The basic nerve deficit may not be curable but the patient can be helped to live an ulcer free life without increasing disability.

Motor

Acute paralysis may occur in polio, in some neuromyopathies and GBS. A slowly progressive muscle weakness may occur in leprosy patients and familial motor neuropathy. Paralysis may affect one or two muscles or large groups. It may be peripheral (eg leprosy) or central (eg polio) in origin. It may be transitory or permanent. With the use of physiotherapy and surgery, it should be possible to prevent fixed contractures and deformities, and so keep the limb or limbs useful. In patients in whom fixed deformities have been allowed to occur, it may be very difficult to correct.

When motor nerve involvement occurs there is an inability of the muscle to contract. The muscle is not dead but it no longer functions. Other muscles may overact because there is no opposing force to prevent them, and this may produce a deformity. Affected limbs may show a definite loss of some or

all movements.

Autonomic

The Autonomic nerves are responsible for the secretion of sweat and sebum (the oily secretion of human skin), and dysfunction may lead to DRY SKIN that cracks easily. The affected patients may show abnormal thermal response, hypopigmentation or capillary lability. This skin needs water! Oil alone will not hydrate it, but if oil is rubbed on after soaking in water for 10-15 minutes, or even just after the bath, the skin becomes more resilient and "comfortable" and less trauma prone.

MANAGEMENT

Motor deficiencies may be correctable by surgery. If only some muscles are paralysed it may be possible to do tendon transfers to reactivate the paralysed limb or make a weak limb function better. It is essential that physiotherapy be undertaken before and then after the surgery. In patients with complete paralysis of a limb, it may be possible to arthrodesis (fuse) some bones to give a better position, or to fix some tendons to provide a static support that allows passive movement to improve function (a tendonesis). This type of surgery requires patient motivation and cooperation but can liberate suitable patients from a life time of orthotics or prosthetics or from walking with a limp.

GENERAL CARE

The patient needs to understand his problem. What is nerve damage? How it affects him and how it may progress. He needs to know the basic points of self care and apply the applicable points himself daily. The use of a podiatrist will help some patients but daily care is best to prevent build up of callus. This can only be done by the patient himself.

Good health education means:

- Tell him why he has the problem.
- Show him how to look after himself.
- Get him started, doing it himself.
- Encourage him to keep going.
- Compliment him and/or correct him.
- Get him to teach another! A convinced patient is the best teacher.

DAILY SELF CARE

1. INSPECT

In the presence of any sensory abnormality, the patient should inspect affected areas EVERY DAY, checking for rubs, cuts, blisters, redness, heat and swelling. He should think WHY? He should then determine how to prevent a recurrence.

He should FEEL the skin, checking for any heat and/or swelling. HOT SPOTS are warning signals that something is wrong. When they persist overnight, BEWARE. In the absence of pain, heat and swelling may be the warning signs of internal pathology. An infected area, a sprain or a fracture may cause no pain, when sensory nerves are damaged, but can be suspected by the presence of heat and/or swelling that lasts for more than 2 hours of rest after the activity in which it occurred and especially if it persists overnight.

Palpation of the sole, exerting pressure on weight bearing areas may also, in some patients, reveal problem spots. If the patient's hands suffer from reduced heat perception he needs to know it and

understand and learn to use a sensitive part of his arm or body to check, or else get someone else to do it. The ability to detect abnormal degrees of heat after activity can save feet from painless destruction.

The patient needs to know what to do when he finds heat and/or swelling in a neuropathic limb.

2. SOAK

Autonomic damage can result in abnormal function of sebaceous glands and absence of sweating. This means dry skin. Sun damaged skin and scarred skin may also be excessively dry. Dry skin is less resilient and more prone to burns and trauma than is moist skin. Dry skin rapidly absorbs water during soaking. Plain water is all that is needed. Usually, there is no need to include medication in the water, though many people add aqueous cream. Medication such as potassium permanganate for treatment of fungal infections, can be added if desired. It is safest to advise the water at room temperature. Hot water may burn the limb with heat impairment. Ten to twenty minutes soaking will soften all the callus making it appear white and spongy and will adequately hydrate dry skin and subcutaneous tissues.

3. SCRAPE.

After soaking, the callus is white and soft and can easily be removed by scraping. It is important that all rough areas of callus be smoothed off. Do not aim to take all callus as it does protect, especially on the sole. But THICK or ROUGH PATCHES need to be smoothed down. Hard ridges also need to be rubbed off as they may crack, eg around the heel edge and under the ball of the foot. These cracks, initially superficial, may gradually deepen until they may reach bone. Hence they may precede deep cracks and ulcers and infections. The roughness and irregularities in the callus need to be looked for when the skin is dry, as they soften during soaking and so are less easily felt.

The most efficient tool for scraping is a sharp knife (eg surgical scalpel size 10 is best) but it must be used to scrape or shave off the callus, not to cut it off. Callus can be removed less rapidly by use of pumice stone, (or other stone or broken brick) nylon or metal scrapers. A green nylon pot scraper is effective if used regularly when dry on skin that is well soaked after a bath or shower. It prevents build up of callus when used each day, but it is slow when used on neglected areas. Ideally the patient should learn to do his own scraping EVERY DAY and not depend on a monthly trip to the podiatrist.

4. OIL

While the skin is still wet (do not wipe dry), apply oil. Any oil will do. It is to keep the moisture in the skin and prevent evaporation. Many oils are not absorbed directly into the skin. Even Vaseline will reduce evaporation, but is not absorbed. Vegetable oil is absorbed better than mineral oil and animal oil better than vegetable. Hence lanolin or fish liver oil is probably most effective in nourishing the skin and replacing the deficiency in sebum production, but the main purpose of the oil is to keep the water in. Good hydration keeps the skin more resilient and less easily burnt and traumatized.

5 EXERCISE

Maintain mobility of joints. If there is any muscle weakness it is important to prevent contractures developing. If fingers or toes are already becoming contracted in a flexed position it is important that these contractures be overcome. The presence of contractures increases abnormal pressure on the stretched aspect of the joint. Clawed toes that are fixed in extension at the MTP joint, increase the tendency to ulceration on the ball of the foot. Where permanent muscle paresis or paralysis has occurred its correction by surgery should be considered to minimize further damage. The presence of

a motor dysfunction can result in abnormal pressures falling on part of the foot during walking. When sensory neuropathy is associated with motor neuropathy this may predispose to ulceration as in leprosy where an ulcer over 5th metatarsal head commonly follows a foot drop.

6. PROTECT

The patient needs to take the responsibility of preventing trauma. He needs to use protective appliances.

FOOTWEAR If there is any diminution of sensory perception in the feet the patient should never walk without shoes!

Shoes should

1. Be well fitted (so not too tight).
2. Be laced up (or at least firmly attached.)
3. Have soft non rubbing upper.
4. Have good resilient sole thorn impenetrable. In Australia, Poron or PPT in 3mm and 10mm thickness is widely used.

Do not aim to create an arch in a flattened foot by providing a hard arch support. This may produce more problems. In Motor neuropathy the arch is often flat but that does not matter if the patient's weight falls evenly on the whole sole. With neuropathy it is better to provide a resilient protective sole than a hard supportive one. The use of more resilient insole material as an inner sole will cut the incidence of ulcers due to repetitive moderate pressure by at least 50%.

Hands require the provision of GLOVES, handles for hot things, cigarette holders and perhaps protective handles for work tools.

The patient must learn to think. Will it CUT? Will it BURN? Will it BRUISE? Will it BLISTER? If the answer is negative he can go ahead. If it is positive he should decide on some protection.

7. TREATMENT OF ULCERS

Even with good care it is not uncommon for a patient with a sensory neuropathy to develop at least one ulcer.

Developing an ulcer is not a CRIME. Accidents happen to the best of us. The CRIME is NEGLECT. If the ulcer is cleaned, covered and rested it will heal as quickly as a similar ulcer on a normal limb, but because of NO PAIN the patient continues to walk or work. The continued use and pressure destroys the body's attempts at healing. In due course the idea that it will not heal is accepted by everyone. It is not that it WILL NOT heal, but it is not given a chance to heal. Every attempt to heal is frustrated by further trauma falling on the healing tissues. Never underestimate the severity of an ulcer on a weight bearing or pressure area. The rule should be NO WALKING ON AN ULCER.

Most primary ulcers are the result of direct trauma. The first ulcer may follow an obvious accident a step on a stone or a puncture by a nail, but because of NO PAIN the lesion is neglected and the ulcer becomes chronic. A person with normal sensation would alter their gait to prevent pain when walking on the ulcer, but the patient with sensory neuropathy will continue to walk as if nothing was wrong. The more chronic the ulcer, or the slower it heals, the more scar tissue will be left when it does heal. Scar tissue is more prone to ulceration than normal skin.

Hence it can be said that:

Sensory deficient skin is ulcer prone.**Scarred skin is ulcer liable.****One ulcer leads to another unless actively prevented.**

Any ulcer on the weightbearing surface of a foot should be completely rested until it is healed. This is achieved by:

1. Total bed rest NOT ONE STEP to bathroom in wheel chair if needed.
2. Splint and crutches to rest and protect the damaged limb. The patient can get around on crutches, but there is no weight on the wound and he is not traumatizing it by rubbing on the bed or bumping it.
3. The use of a contact walking plaster cast. If correctly applied there should be no friction inside the cast. Also the body weight is spread over the foot so there are few (if any) peak pressures. There is no direct weight on the ulcer so it can heal even though it is being walked upon.
4. A split or bivalved total contact cast which gives the support mentioned in (3) but can be removed for wound dressing. Only useful with a cooperative patient who will leave the splints on the leg and not remove them at home.

The average uncomplicated ulcer takes 6 weeks to heal in a contact cast. An infected, very large, or complicated ulcer will require longer. If the patient is allowed to walk as soon as the ulcer is healed it may well recur. A safe rule is no weightbearing on an ulcer until the wound is fully healed and all scabs off for a minimum of 2 weeks. There are no short cuts.

FOR ULCERS REST IS BEST**SPLINT AND CRUTCHES****or WALKING PLASTER CAST.**

Many recommendations have been made regarding applications to put on ulcers. There is no real evidence that any one application will hurry healing if the wound is clean and rested. Many patients are given antibiotics and not made to rest. Healing is not improved. Many patients have healed rapidly with dry dressings and complete rest. Never forget that it is the absence of pain that allows the patient to continue to abuse the traumatized tissue. Ensure REST; then healing will occur unless there is so much scar tissue that the skin vitality is compromised.

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