

RECONSTRUCTIVE SURGERY OF LIMBS IN LEPROSY – PRESENT STATUS

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Due to a better understanding of the mechanisms of nerve damage, a concept of "Preventive Nerve Surgery" has come up during the last few years. The genesis of plantar ulcers are better understood now. The recent developments in the treatment of paralytic deformities of hand and foot have been outlined.

During the last decade leprosy surgery has witnessed an approach based on much desired sound anatomic and physiologic principles. The older concepts have been re-examined in the light of new scientific knowledge and answers have been found for the various questions which were eluding the leprosy workers since long.

Peripheral Nerve Surgery

Sunderland's³⁴ classic work on anatomy of nerves trunks contributed to the indepth understanding of spread of infection and involvement of nerve trunks by disease process. Carayon⁶, who saw his first case of neuritis in early fifties, investigated the problem of nerve damage in leprosy using contrast radiography and conclusively demonstrated the role of external factors in progression of nerve trunk damage and surgical removal of these factors in preventing, reversing or arresting further neurological deficit in these cases.

Nerve compression studies in experimental situations and its effect on neural blood circulation and nerve conduction velocities have been well documented.

Nerve damage can occur even before there is significant clinical nerve thickening. Nerve conduction studies can indicate the nerve damage and also help to locate the site of damage but nerve damage to certain extent has to occur before it can clinically or electrophysiologically manifest. Nerve compression is known to exist even without any conduction velocity changes as documented in some cases of carpal tunnel syndrome.

Even though nerve surgery in leprosy was

being done since nineteen thirties, the operations were restricted to cases of established paralysis and aimed to relieve intractable nerve pain. Since the anatomy of nerve trunk was not well understood at that time the procedures then practiced were such that would damage the blood supply of nerves – desheathing procedures and/or damage the continuity of nerve fibres-deep multiple longitudinal incisions in the nerves. Carayon⁷ performed internal neurolysis respecting the nerve anatomy and thus fascicular neurolysis came into existence where diseased nerve bundles in the nerve trunk were dissected under magnification and could be excised.

Various workers reported their results on nerve decompression in eighties and listed different indications for nerve decompression (1, 5, 9, 12, 19, 24, 25, 35). A review of the results suggests that earlier the operation, better and quicker is the sensory- motor recovery; less damaged nerves having better chances of recovery. Surgical intervention is urgently required for cases having acute nerve compression and sudden paralysis. Chances of recovery are better in these situations. The routine specific anti-leprosy and anti-inflammatory drugs together with rest to the nerve by appropriate splinting, if fails to improve the sensory motor functions, more decompression is indicated. In cases of posterior tibial nerve, recovery with medicines alone is rare, hence early surgery is advocated.

The procedures of epineurotomy and fascicular neurolysis are performed exercising maximum care, preferably using magnification, so

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as to ensure that no damage is done to the nerve fibres and vasculature during surgery. In case an epicondylectomy is done, an elbow splint and sling has to be used at least for three weeks.

Steroids have been found to improve the results of nerve decompression procedures. Clofazimine— an antileprosy drug which has an anti-inflammatory effect also, has been used in lepromatous cases alongwith steroids to bring down the inflammatory process. Obviously an appropriate combination of the medical and surgical measures in treatment of early nerve damage is ideal.

Neuropathic Plantar Ulceration

Plantar ulcers, a cause of social rejection and physical suffering to the patients, are more commonly seen in forefoot²⁷.

Studies on rat foot using mechanical automated hammers supplemented with thermographic and histological examination of the experimental feet has revealed several interesting facts about genesis of plantar ulcers. The role of sustained minor trauma in the genesis of plantar ulcers has been substantiated. Repeated moderate pressure has been shown to induce thickening of stratum corneum of the skin of sole. This repeated pressures also set up a low grade inflammation as actual necrosis occurs followed by autolysis and blister formation. Blister ultimately gives way resulting in an ulcer.

Similar situations exist in patients who have anaesthesia of the skin of sole. They can stand on the same foot for long periods of time and can walk longer distance without getting pain. This repeated trauma damages deeper tissues resulting in necrosis and ulceration. The forefoot has to bear maximum stress during walking and hence more frequently gets ulcers. In addition to local trauma it produces, walking on open ulcers squeezes bacteria into healthy tissues around and spread the infection. Since pain sensation is absent all protective reflexes are lost and the damaged foot is continuously and excessively used.

Paedobarographic measurements on normal individuals, while walking fast and running, has shown concentration of pressures over one or two areas of the sole of their foot. In response to the feeling of discomfort they soon change their gait so that the area is relieved of the stress and other

parts of the foot are allowed to take the stress in turn. These types of change do not occur in leprosy patients because they do not feel pain.

The stress is accentuated by paralysis of intrinsic muscles of foot. Intrinsic muscles in foot pull the metatarsal heads up off the ground, during push off phase thereby easing local pressures. This capability is lost when these muscles are paralysed.

The denervated foot is somewhat ischemic also because of strangulation of posterior tibial artery due to inflammatory fibrosis the nerve and artery sharing the same neurovascular sheath. Dryness of the skin of sole, due to autonomic nerve damage, leads to fissures and such foot easily succumbs to ulcerating process.

The sites of compression in the course of posterior tibial nerve are in the tarsal tunnel and calcanean tunnels. Posterior tibial neurovascular decompression, if done early, can help to save these feet to some extent. It improves circulation because of simultaneous arteriolytic and sympathectomy of posterior tibial artery.

Paedobarographic studies have shown that walking on hard cemented floor generates pressure under bony prominences of sole whereas walking with a microcellular rubber footwear tends to diffuse down this pressure. Moulded insoles further reduce these "pressure points" by equally distributing pressures as they bring large area of sole in contact with ground. However, it should be borne in mind that some low grade pressure still exists with these modified footwears. Therefore, an extremely long walk or a succession of walks is likely to produce enough inflammation and damage. Surest sign of an impending danger is an area of local warmth in the skin of sole.

The patient has to learn to walk gently and take shorter steps, need not run or jump. Rockers have been used in shoes to alter the forces of push-off phase with successful results. Metatarsal head excision and procedures to take off weight from metatarsal heads have come up in recent years with variable results.³⁰ These should be reserved for selected group where preoperative standing and walking foot print studies have shown areas of high pressure under metatarsal heads. The excision should be conservative and foot should not be unduly shortened. Ideal test to

make such a decision is record local hot spots after some test walking. A positive record will indicate surgery.²⁶

Role of zinc in wound healing has been documented in studies on skin burns and finger injuries.¹⁰ It has been shown that the resulting scars are soft and supple. Zinc oxide ointments in vaseline base are widely used now. Recent innovation is a water proof zinc oxide adhesive tape which can be used for dressing the ulcers and wounds on extremities. Frequent change of dressings is not required if these tapes are applied on to the wound surface to cover them. In practice, these tapes are useful only for minor injuries and small ulcers.

Two tailed tibialis posterior muscle transfer using circumtibial route is being performed for correction of drop foot.²⁸ The toe extensors however, should be strong enough to bear the pull of transfer. The procedure gives a more balanced correction. However, a recent report about long term follow-up study of corrected drop foot, by two procedures has mentioned that one tail procedure also gives more or less similar results.¹¹

Hand Deformities

Claw finger deformity can be corrected by number of available procedures, latest being pulley insertions and intrinsic reactivation procedures¹⁶. In the pulley insertion procedure, A1-A2 pulley is used as an anchor over which the transferred motor slip exerts its force thereby flexing the proximal phalanx.¹³ In original Zancoll's "Lasso" technique A1 pulley is used as anchor.²⁶

Use of A1-A2 pulley gives very good results in cases without long flexor contractures whereas original "Lasso" is being performed as salvage procedure for cases with proximal interphalangeal joint contractures.¹⁵ Various modifications of "Lasso" procedure have been reported.² Intrinsic reactivation procedure is recommended to be used for cases who have reversal of distal transverse metacarpal arch. Here the transferred motor is elongated to give five slips which are looped round the tendon of interossei for each finger.²¹

Extensor diversion procedure is a passive

correction procedure. The hyperextension of MP joint is prevented by a slip of tendon attached to lateral band and the long extensor. It is claimed that no re-education is required and post operative appearance is good. This procedure does not correct the sequence of flexion of fingers which is so important for the grip. Tip still flexes first and rolls inwards into palm. Dermadesis and pulley advancement procedure³³ has also been tried for restoration of function and correction of deformity in ulnar claw hand.

Correction of paralysed thumb deserves special mention because it is still a difficult problem in leprosy surgery. Isolated median nerve paralysis in leprosy is rare. Most of the cases have combined low ulnar-median defect or high ulnar low median type. Classical Brand's sublimis 'Y' transfer is not very successful and at times when the joints are supple a swan-neck deformity results where MCP joint hyper-extends and IP joint flexes. The pinch becomes weak. Extensor indicis as opponens has been used either singly or in combination with MCP joint stabilisation procedures.^{17, 22} Extensor pollicis brevis has been tried as an abductor together with MCP joint stabilisation with variable success.²³ Flexor retinaculum has been tried as a pulley for abductor-opponens replacement because it is fixed, stiff and centrally located.³¹ Its use as a pulley makes the transfer more physiological if we consider the origin of abductor pollicis brevis.

Transfer of radial half of flexor pollicis longus to extensor pollicis longus around the thumb metacarpal over the dorsum of middle of proximal phalanx is being used to stabilize MCP joint at some centres and has been found to be satisfactory.¹⁴

Sensory re-education technique has been tried in selected group of patients with encouraging results. However, it is time consuming, requires patience and is tiring. Nerve transfers and innervated skin flaps have been attempted to restore sensations in anaesthetic limbs with variable success. It will be premature to comment on those at the moment but this definitely points towards a better future and new hope.

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