THE LEPROSY PROBLEM IN SOUTH AFRICA

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"It can be justifiably stated that a country's standard of civilisation may be measured also by the extent and efficiency of its rehabilitation services." The words are those of the then Minister of Labour, the Honourable Senator Mr. J. deKlerk, and they are quoted from "Rehabilitation", June,1961.

The problem in the Republic is a formidable one and one which under existing conditions, may well be regarded as insoluble.

There are about 1,000* known sufferers from active leprosy in our country—this figure includes all races. The number of undiagnosed cases is undetermined and fluctuating, and the problem which these cases create is materially expanded by the illegal influx of foreign natives across neighbouring borders.

Fresh cases of leprosy, that is to say, cases which have escaped earlier detection, are being admitted to Westfort Institution in Pretoria at the rate of 1·0 patients daily. Discharges from the Institution occur at the rate of 1·1 patients daily; it may thus be seen that the in-patient population at Westfort is being reduced at the rate of 36·5 patients per annum.

Quite recently, the total number of inmates was reduced to 780 as a result of the repatriation of a number of natives to their respective home territories outside the Republic.

These figures serve to illustrate the fact that the problem is very real, and that any complacency with regard to the matter is both misplaced and unjustified. The popular belief that leprosy may be cured by the administration of the Sulfone preparations, and that as a direct consequence, the problem has been solved, is an unfortunate and indeed a dangerous misconception. The average period of hospitalisation in one type of the disease is no less than five years, while in the other it may be as short as five months.

Deformities and disabilities noted on admission of the patient to hospital, are frequently of an irreversible nature, the eradication of Hansen's bacillus notwithstanding.

THE DISABLING LESIONS OF LEPROSY are as follows:

1. **Impairment of sensation in the skin of the hands and the feet.** This is the predominant lesion, and nerve involvement occurs in mixed nerve trunks at definite sites of predilection, thus[1]:
   (*a*) The ulnar nerve, near the elbow,
   (*b*) The median nerve, near the wrist,
   (*c*) The lateral popiteal nerve, near the knee,
   (*d*) The posterior tibial nerve, near the ankle,
   (*e*) Branhces of the facial nerve, especially at the zygoma,
   (*f*) The radial nerve, near the elbow.

In addition, nerve involvement occurs in skin patches anywhere on the body.

Nerve trunks are involved by direct invasion with Hansen's bacillus on the one hand and by the ischaemia associated with oedema and pressure beneath fibrous bands and tunnels, on the other. Later, and in cases of severe deformities, the nerve fibres are destroyed in considerable measure, and the possibility of an antigen-antibody reaction has been suggested.

Clinical research is required in regard to the reversibility or otherwise of the neurological lesion. Our experience has been that whereas recovery is not uncommon in the case of the lateral popliteal nerve lesions, recovery in ulnar and median nerve paralysis is rare.

The diminution of oedema of the nerve trunk, brought about by the use of suitable splints, the administration of oral corticosteroids and intensive application of physiotherapeutic measures, is thought to be responsible for most of the recovery which has been noted, but a true estimate of the recovery of the lesion is impossible on clinical examination only, and it is known that 25 per cent of the fibres of a nerve trunk may be destroyed or rendered afunctional, without coincident clinical evidence of neurological involvement.

2. **Motor paralysis involving the intrinsic muscles of the hands,** and resulting in claw hand deformity together with loss of abduction and opposition of the thumb. The median and the ulnar nerves are involved singly in about equal proportion, and together in a smaller number of cases. Much less frequently, yet not uncommonly in our experience, the radial nerve is paralysed, giving rise to wrist drop (Figs. 1 and 2).

Fig. 1—Combined ulnar and median nerve paralysis, showing the typical "Simian hand" but without hyperextension at the metacarpo-phalangeal joints.

Fig. 2—Ulnar nerve paralysis, showing typical hyperextension deformities at the metacarpo-phalangeal joints and flexion deformities at the proximal inter phalangeal joints.

*This figure is supplied by the Department of Health and is official.

3. **Direct damage to the soft tissues of the hand** by infiltration of the tissues during phases of reaction[1]. This is a common and reversible lesion, it involves particularly the subcutaneous tissues of both the palmar and dorsal aspects of the hand, and the tendon sheaths within the carpal tunnel or at the dorso-lateral aspect of the lower end of the radius (the long tendons of the thumb). This is an important and less well-known feature of leprosy, and it frequently results in the development of contractures. Because it appears to be a lesion of lesser significance than sensory and motor paralysis, it tends to receive less serious attention; because it is associated with oedema, it is responsible for the insidious onset of contractures in subcutaneous tissues, in tendon sheaths and in joint capsules (Fig. 3).

Fig. 3—Induration and oedema of the left hand, typical of the soft tissue infiltration which occurs in the reactive phases of leprosy. This is a reversible lesion.

4. **Motor paralysis involving the intrinsic muscles of the feet,** and resulting in the development of claw toes, hallux valgus, bunion formation and callosities (Fig. 4).

Claw toe and hallux valgus deformity in leprosy develop in much the same manner as similar lesions in non-leprous patients, especially women. In the leper, paralysis of the intrinsic muscles of the feet occurs as a result of motor nerve lesions, while in the non-leprous patient, pseudo-paralysis of the intrinsics occurs as a result of ischaemia from constrictive footwear. The end results are the same, excepting only that the feet of leprous patients suffer the additional disadvantage of impairment of sensation, leading to the formation of vesicles, pressure sores and trophic ulcers.

Drop foot deformity from involvement of the lateral popliteal nerve is a frequent feature of leprous feet, and adds immeasurably to the patients discomfort because of the splinting which it necessitates.

5. **Secondary deformities of hands and feet,** the result of delay and neglect in the application of treatment, are at least as important as the primary lesions, and in many cases of neglect constitute the determining factor in the management of the case.

Deformities include contractures of the skin on the flexor aspect of the paralysed thumb and fingers, contractures of the web of the thumb resulting in inability to abduct and to oppose, and "damage to and absorption of fingers due to wounds, to sepsis, to inability to grasp evenly with the entire surface of the hand and to the use of excessive and unrealised force by anaesthetic fingers. Acute flexion of the fingers also exposes the knuckles to injury which may lead to sepsis at the inter-phalangeal joints[1]". With regard to these secondary deformities, emphasis must be laid upon the value of the education of the Bantu patient, who persistently exposes him or herself to the dangers of the open fire while cooking, while seeking warmth and while washing and ironing personal effects.

6. **Absorption of digits and extremities.** Bone changes in leprosy are of three main types, thus:
   (*a*) Involvement of the bone in secondary infection with trophic ulceration;
   (*b*) Involvement of the bone in disuse atrophy (osteoporosis), and in the osteoporosis which occurs in the presence of septic lesions; and
   (*c*) Involvement of the bone in the granulomatous lesion of leprosy. While this is not a common feature, it involves particularly the phalanges of the fingers and it results in multiple areas of bone destruction; these lesions may heal with cortical sclerosis and thickening after one year of sulfone therapy.

7. **Last, but not least, visual impairment.** The individual who possesses normal tactile sensibility is able to conquer the handicap of blindness in considerable measure. When sensations are lost or impaired in the extremities, the addition of visual impairment gives rise to disability which is well-nigh insuperable; the victim is condemned to a state of near-helplessness.

Fig. 4—The deformity which occurs in the feet as a result of the paralysis of the foot intrinsic muscles. Vesiculation and ulceration are common concomitant lesions.

THE ROLE OF PHYSIOTHERAPY IN LEPROSY:

The potential which physiotherapeutic measures carry for the relief of the lot of the leper is considerable. In both the prophylactic and therapeutic fields, much can be accomplished, and the former are particularly rewarding **because the majority of the disabling deformities of leprosy are readily preventable lesions.**

The irreverisible nature of the sensory changes in the hands and feet has already been emphasised; these changes must therefore be accepted as inevitable. The dire consequences of sensory impairment may however be prevented, and preventative therapy is the most valuable and the most rewarding contribution which the physiotherapist can make towards the solution of the problem.

The scientific meeting on rehabilitation in leprosy, held under the auspices of the World Health Organisation in Vellore, Madras, in November, 1960 "was unanimous in the opinion that it has now been established that standard methods of physiotherapy and reconstructive surgery are applicable to leprosy patients, and that the results of such treatment are at least as good as those following similar treatment for other paralysing diseases[1]".

Physiotherapy measures include the following:

1. *The education of the victim of leprosy in respect of his own condition.* It would be difficult to overemphasise the importance of this function of the physiotherapist, whose diligent and patient application of first principles must convince even the most obtuse of their value.

   Presure sores and trophic ulcers commence on the hands and feet in the form of minor abrasions, cuts, scratches and vesicles, all of which are avoidable. Those who dedicate themselves to the alleviation of suffering in the leper, must needs inculcate in the minds of the victims the principles and methods of skin hygiene, and the value of those simple measures which are directed at the elimination of trauma to and breaches of insensible cutaneous surfaces. The use of clean hose and protective footwear is of equal importance.

2. *The timely recognition of incipient skin lesions.* Minor injuries of anaesthetic hands and feet are overlooked by the patient. Their recognition and timeous treatment by means of rest, dressings, protective splints and physiotherapeutic measures are essential if sepsis, scarring, contractures and even sequestration are to be prevented. The usual sites of injury are the hands, and the feet at those surface areas which bear maximum pressure while walking. Ill-fitting footwear constitutes yet a further traumatic factor.

When the skin is cracked, saline footbaths are valuable, followed by the application of zinc and castor oil ointment. Badly cracked feet respond rapidly to this treatment and the skin soon becomes tough, smooth and healthy.

Wax baths are of more value in the case of the hands, and zinc and castor oil ointment is used only in intractable lesions.

Wax baths should be used with caution because burns occur with extarordinary facility. There is loss of perception in these cases and it is known that heat as a physical factor is dissipated less rapidly than under normal conditions from its area of application, owing to the fact that in leprosy there is delayed vasodilatation. Paraffin wax used in wax baths for lepers should have a melting point not exceeding 112° to 115° F.

Exercise

Exercises are given:

(*a*) to reduce existing contractures (Fig. 5),

(*b*) to prevent the development of contractures,

(*c*) to strengthen muscles.

Fig. 5—Structural contractures have occurred at thumb and finger joints of this hand. Prevention would have been easy. Cure is difficult, even impossible.

A warning is issued in regard to these exercises, namely, that spontaneous fractures due to neurotrophic bone absorption, to cyst formation and to secondary infection are not uncommon. This factor should be borne in mind, especially when attempting to reduce contractures. A careful watch should be kept also on the feet, for fractures are common as a result of normal weight-bearing and such fractures pass unnoticed because of absence of pain sensation.

A common deformity in the hands of these cases consists of hyperflexion of the interphalangeal and hyperextension of the metacarpo-phalangeal joints of the fingers. The diligent co-operation of the patient is essential in the prevention and the treatment of these deformities.

Massage and Splinting

The neglected hand commonly presents with shortened contracted fingers, dry, calloused skin and deep cracks in the palmar flexures.

Wounds of the hand are dressed, while the fingers are lightly bandaged over a round object, about the size of a tennis ball. Massages with zinc and castor oil, splinting and exercises are commenced as soon as possible.

The most satisfactory method of splinting the fingers is as follows: A strip of orthopaedic felt is laid along the dorsum of the finger, and a light plaster-of-paris cylinder is applied over it. The finger is then gently held in the extended position until the plaster sets. Plaster cylinders

must be removed and re-applied after exercise every two to three days.

An alternative method[2] is to make a splint of $\frac{1}{8}$ in. perspex, which is applied to the palmar surface of the finger and kept in position by means of elastoplast strapping. Several sets of splints are needed to gain progressively greater degrees of extension.

Perspex is easily softened by heating, after which it can be moulded to a plaster cast of the finger requiring straightening. Rough edges of perspex are removed with an emery wheel.

The most important exercise employed in the correction of finger deformities consists of the following:

With the wrist in extension, the metacarpo-phalangeal joints are held in 90° flexion. The inter-phalangeal joints are then actively extended. It is most important to achieve the fullest possible measure of correction of deformity before surgery for the reconstruction/replacement of lumbricals may be contemplated. Transposed muscles and tendons are unable to effect post-operative correction of finger deformity. In this respect, the value of adequate and accurate note-taking in chronological sequence, cannot be exaggerated.

Splints are not normally used for the wrists, because of the danger of pressure sores in the absence of pain sensation. When used for conditions such as wrist drop and claw hands, they require meticulous supervision. Drop foot requires some type of foot support, and four types are used at Westfort:

1. Double below-knee irons.
2. Inside iron and outside T-strap.
   These two types are of particular value, to male patients who are apt to break splints of lighter construction.
3. Swedish style O'Gorman splint, of use in women only.
4. An improvised spring or elastic support attached to the wooden sole of a sandal at its outer edge, and to a leather band at below knee level.

Splinting and infra-red radiation in selected cases

Reaction in leprosy is thought to be an allergic phenomenon which displays varying manifestations in the different forms of leprosy. In all types, oedema of extremities and neuritis of superficial nerves are usually encountered. The constitutional features of reaction in leprosy include pyrexia and malaise, and these together with pain in the affected extremity may well combine to render the patient unwilling and unco-operative.

Reaction is of particular interest to physiotherapists when manifest in any one of the following forms:

1. A violent reaction in the peripheral nerve trunks, associated with the development of severe paralysis within a matter of days or even of hours. In these cases physiotherapy is essential for the prevention of rapid-onset deformities.
2. Erythema Nodosum Leprosum, a reaction seen only in lepromatous leprosy. Small erythematous nodules ranging in diameter from 2 mm.-20 mm. appear in the dermis, chiefly on the face and extremities. They are painful on pressure, and when accompanied by peripheral neuritis, may give rise to severe pains which in turn favours the development of contractures and deformities.
3. Persistent oedema of the hands and feet, giving rise to venous stasis and the eventual development of deformity.

Splinting in the position of function is of paramount importance. During the acute phase sufficient exercise and passive movement to prevent contractures is given.

Infra-red radiation is of considerable value in relieving pain in oedematous hands and feet.

Therapy designed at the strengthening of the muscles

In leprosy, as in other conditions affecting the peripheral nerves such as poliomyelitis, the destruction of nerves is often incomplete with the result that there is paresis rather than paralysis. Efforts at increasing the strength of the remaining muscle fibres constitute standard physio-therapeutic procedure.

Considerable emphasis should be placed on functional exercises and activities, e.g. the use of a draught-board with clothes pegs or hair clips for counters. These are clipped on to metal tags on the board. In the absence of an occupational therapist, this task will fall to the lot of the physiotherapist.

It is impossible to prognosticate during the active phase of nerve involvement, and all nerve lesions must therefore receive intensive treatment. It has been our experience that lateral popliteal nerve lesions have enhanced powers of recovery when compared with lesions of the ulnar and the median nerves.

Electrical stimulation requires an apparatus capable of delivering long impulses (up to 1,000 m.secs.) of variable wave form and with adjustable, long intervals. The current must be depolarised, as high intensities are often essential. The skin is hypersensitive and easily damaged.

Acute neuritis is generally of an intermittent nature, and electrical tests are not always a reliable index of the progress which occurs during treatment. However, when paresis or paralysis is noted, muscle tests should be performed regularly.

Daily attention to the muscles of all cases in a large institution is not possible, and our experience has been that time spent on cases of acute polyneuritis has been more rewarding than on cases of other types of nerve lesion.

Short wave diathermy

Short wave diathermy is most commonly used for neuritis, bursitis of the knee, and tendinitis at the wrist and the ankle. Mild doses and short periods of treatment are considered safest.

Short-wave diathermy is absolutely contra-indicated in all cases of Erythema Nodosum Leprosum, because it produces aggravation of the local lesion. For this reason, lepromatous leprosy should be treated with caution, because E.N.L. might well be present, albeit in unrecognisable form at the time of one's examination; short wave diathermy even in mild dosage, could produce a serious flare-up of this distressing complication.

Ultrasonic therapy

This form of short-wave therapy has not been used at Westfort Institution, but favourable reports have been received from elsewhere.

Robert N. Zimmerman, Chief Physical Therapist at the U.S. Public Health Service Hospital at Carville, Louisiana states[3]:

"In applying ultrasound for neuritis, we consider not only the treatment to the nerve trunk, but also give therapy to the corresponding nerve roots. We have been successful with dosages from ·5 to 1·5 watts/cm² along the nerve distribution for 4-6 minutes, and corresponding nerve roots with dosages and duration identical with nerve distribution technique. I would estimate that more than 80 per cent of our patients treated for this condition have had relief from pain within a period of 3-5 days."

Elsewhere[4] he states that ultrasound is more beneficial than any other modality in alleviating the symptoms of acute neuritis in leprosy, and that the presence of E.N.L. does not constitute a contra-indication to its application.

Summary and Conclusion

Discussion of the nature of the lesions of leprosy has been omitted, in order that their effects may receive the spotlight of our attention.

When viewed in this light, it is clear that leprosy is a disease in which the different stages of the disease, and the

(*Continued on following page 7*

Continued from preceding page 6)

advancement from stage to stage are seen to develop by a slow and by no means inexorable process.

Without the light which such a detailed consideration sheds, we are inclined to assume too readily that structural changes involving the digits in a process of dissolution are primary, when in fact they are usually secondary to a number of readily avoidable factors. *With* the light of such realisation, comes the sure knowledge that the avoidable factors are of a straightforward nature, and that they are eminently amenable to treatment.

The world problem in respect of leprosy involves no fewer than ten million (and no more than 20 million) souls. The problem within the Republic is, numerically speaking, a small one, but one which is in inverse proportion to the potential it bears as a subject for scientific research, and as a field in which both the medico and the physiotherapist may make outstanding contributions.

REFERENCES

1. "Scientific meeting on Rehabilitation in Leprosy," 1961. W.H.O. Technical Report Series, No. 221, Geneva, 1961.
2. BRAND, P. W. (1959), in *Leprosy in Theory and Practice*. Editor, R. G. Cochrane. Published by Wright Bristol.
3. ZIMMERMAN, R. N. (1962). Personal Communication.
4. ZIMMERMAN, R. N. (1961). "Ultrasonics," Seminar on Leprosy, U.S. Public Health Service Hospital, Carville, L.A.

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