Objectives for tertiary care centers

- To provide DPMR services (mainly RCS) with provision of aids andappliances.
- To hold camps and workshops for clearing of backlog of cases in needof RCS and training of surgeons.
- To integrate DPMR/RCS services in to medical colleges, PMR institutes

and District hospitals.

Management of Nerve Impairment

A patient may present with complaints such as loss of sensations or drynessor weakness in the limbs. He may also present with thickening of the nervetrunk without any symptom/sign or acute neuritis i.e. painful, tender andthickened one or more nerves or chronic neuritis where pain and tendernessis less prominent but damage to the nerve gradually increases to completenerve destruction i.e. complete paralysis for more than one year (fibrosednerve, "cord like" on palpation).

Examination of important nerves of the face and the neck

Commonly affected nerves in the face are Trigeminal nerve and Facialnerve. Besides these, thickening of greater auricular nerve, supra-orbital andsupra-trochlear nerve can also be noted.

Trigeminal nerve

Sensory part of the trigeminal nerve supplies the conjunctiva and cornea andpart of the facial skin. Most important effect of involvement of the trigeminalnerve is reduced or loss of sensation of cornea and affects blinking of theeye. Hence, irregular/infrequent/absent blinking indicates involvement oftrigeminal nerve.

Supraorbital and supratrochlear nerves

Supraorbital and supratrochlear nerves are cutaneous branches of thetrigeminal nerve that may become visibly thickened and can be palpated bypassing the finger along the upper border of the orbit.

Facial nerve

Facial nerve is purely a motor nerve and supplies various muscles ofthe face including orbicularis oculi. *There is no sensation loss due to itsinvolvement.* Paralysis of facial nerve in leprosy is of lower motor neurontype affecting the muscles of half of the face on the same side with loss ofcreases and expressions. Face becomes flat and angle of mouth is pulledtowards the normal side. Weakness/paralysis of orbicularis oculi is importantbecause it affects the closure of the eyelid. Inability to close the eye is called'Lagophthalmos' and has grave consequences leading to blindness.The nerve innervates skin of angle of the mandible and parotid area and canbecome visibly enlarged. It is visible on the side of the neck, below the ear,crossing the upper third of the sternomastoid muscle, lying parallel to theexternal jugular vein. To palpate the nerve ask the person to turn head toopposite side so as to tighten the sternomastoid muscle. Nerve is seen crossingthe upper third of the muscle lying parallel to the external jugular vein.

Examination of nerves of the upper limb

While examining the peripheral nerves look for the autonomic function ofthe nerve, dryness, crack, callosities, atrophy of muscles, deformities and anyother secondary impairments like blisters or burns and ulcers.

Ulnar nerve

Ulnar nerve in leprosy is affected at the elbow and can be palpated in theolecranon groove, just above and behind medial epicondyle of the elbow.Its affection causes sensory loss on palmar aspect of little finger and medialhalf of ring finger. The motor loss causes atrophy of hypothenar eminence,weakness in little finger in bringing it out or bent finger which is called
clawing. It can also be tested by asking the person to move the little finger sidewaysor out i.e. away from the other fingers in the same plane as palm and notingthe resistance against your finger.Long duration paralysis causes typical claw hand deformity, characterised byhyperextension at the metacarpophalangeal joint and flexion at the proximalinterphalangeal joint.

Median nerve

Median nerve is affected at wrist as it passes in the carpet tunnel under theflexor retinaculum of the hand and is palpable (with experience) proximal tothe wrist, deep and medial to Palmaris longus tendon, when the wrist jointis semi flexed. Its affection cause **loss of sensations on the p**almar aspect oflateral three and a half fingers i.e. thumb, index, middle finger and lateralhalf of ring finger and corresponding part of the palm. The motor paralysiscause flattening of the thenar eminence and also clawing of index and middlefinger and/or Ape thumb deformity in which thumb lie in the plane of the palmand cannot be abducted. Paralysis of the median nerve is usually associatedwith that of the ulnar nerve resulting in complete claw hand.

Radial nerve Radial nerve has two parts. The main nerve in the arm supplies the musclesat the back of the forearm and superficial cutaneous branch of radial nervesupplies the small part of the skin on the back of the hand. Superficial nerveis commonly affected in leprosy. Main trunk is only occasionally affectedand is palpable in the oblique groove posterior to the insertion of deltoidmuscle in the arm.

Damage to the main nerve trunk causes disability because muscle balance ofall the joints of the hand i.e. wrist, fingers and thumbs, is disturbed. Sensoryloss in the area of supply of radial nerve does not indicate involvementof main nerve trunk. Radial cutaneous nerve branches out early from themain nerve. Hence, thickening of this branch may not be associated withmuscle weakness. Thickened radial cutaneus nerve can be seen or palpatedoccasionally at the lateral part of the wrist / back of the hand.Radial nerve trunk supplies the muscle in the back of the forearm that extendsthe wrist, fingers and thumb. Person is unable to use the hand or extendthe wrist, fingers and thumb. The high radial paralysis cause wrist dropdeformity. It can be easily tested by asking patient to extend the wristagainst resistance which he cannot do, followed by testing for the finger andthumb extension.

Nerves of the lower limb

Most commonly affected nerves in the lower limb in leprosy are lateralpopliteal nerve which is a branch of common peroneal nerve and the posteriortibial nerve which is a branch of the tibial nerve.

Lateral popliteal nerve

The lateral popliteal nerve (a branch of common peroneal nerve) gets affectedat the knee, precisely behind the neck of the fibula on the lateral aspect of theleg. During early stages of involvement, patient may complain that big toegets in way while walking, and may find running difficult, due to weaknessof big toe. Later, it may cause foot drop deformity in which foot is unableto dorsiflex the ankle. Its sensory supply extends on the dorsum to 1st webspace. This fact is taken advantage in the surgical aspect for designing theneurovascular island pedicle flap to resurface the ulcers in the 1st metatarsalregion. Voluntary Muscle Test (VMT) for each nerve to detect nerve damageat early stage

Posterior Tibial nerve

Posterior tibial nerve is palpable at a site just below and behind the medialmalleolus, approximately at the midpoint between medial malleolus andheel. This nerve supplies the skin of the entire sole. Posterior tibial nerveinvolvement does not experience any noticeable disability in the earlystages. Later it produces claw toes and plantar anaesthesia, a major cause ofsecondary disabilities like anesthetic foot with plantar ulcers. Nerve suppliesthe small muscles of the foot and there may not be any noticeable disabilitydue to involvement of this nerve. However, spreading of toes can be tested.

The test to detect early muscle weakness

The muscle power of both hands and feet are categorized as:

S = Strong, W = Weak and P = Paralysed

Cases with Grade – 0 disability who are at risk of developing disability arethose who have thickened nerves, positive skin smear, impairment of vision,early nerve damage, skin lesions over / near trunk, puberty, pregnancy, onhormonal therapy.

The findings of the examination are first noted in the Disability AssessmentForm (form P-II) by PMW separately for right and left eyes, hands and feet.Thereafter each eye, each hand and each foot is given its own grade.

Eye involvement

People who have corneal damage or iritis (denoted by red eye, pain orphotophobia) should be referred for specialist diagnosis and managementat a centre properly equipped for eye care. Corneal ulcers and keratitis areinflammatory conditions of the cornea. They are often caused by exposure,as a result of the person being unable to close the eye properly: there is pain,redness and often some loss of vision. The treatment usually consists of localantibiotics, sometimes with a pad to keep the eye closed.Iritis, uveitis, iridocyclitis and scleritis are all types of inflammation insidethe eye and they can all occur as part of a Type 2 reaction. These conditionscause pain, redness, photophobia and loss of vision, although the symptomsare not always severe. The treatment includes atropine eye ointment toprevent adhesion.

Lagophthalmos

The muscles which close the eye can become weak or paralyzed, if the facialnerve is damaged in a leprosy reaction. The result is that the eye cannotclose properly. There may be watering of the eye. Sometimes there is lossof sensation in the cornea (the clear part at the front of the eye) also, whichleads to loss of normal blinking.In the early stages, lagophthalmos can be treated like any other case ofneuritis, with steroids. When the condition is permanent, surgery to the eyelidsmay help to prevent corneal damage. Regular blinking and complete closureof the eyes at night keep the cornea healthy. In lagophthalmos, the corneais at risk of damage which makes it less and less transparent. Blindness is acommon end result. When there is such inability that on closure of the eyelidcornea remains exposed, it is considered as severe lagophthalmos threateningfurther damage and needs to be treated on urgent basis. Patient is taughtforced closure in mild case and closure by pulling the lateral angle of theeyelid skin in severe cases. All people who are unable to close their eyes, orwho do not blink should wear glasses.

Mild Lagophthalmos:

When asked to close eyes lightly the person has a slight gap (< 6 mm) betweenthe eye lids. In such cases ask the person to try and close their eyes withforce. If the face muscles are still strong enough, the person will be able toclose the gap. They should keep the eye forced closed while counting to 10.They should do this exercise as often as possible every day.

Severe Lagophthalmos:

When asked to close eyes lightly the person has a large gap (> 6 mm) or signof exposure Keratitis between the eye lids. In such cases, ask the person to tryand close their eyes with force. Sometimes the face muscles are too weak toforce the eyes closed. If the person still has a gap between the eye lids, theywill need to do passive exercises to prevent the deformity from worseningand help keep the eye as healthy as possible. When eyes cannot be closedfully, the person should place their fingers at the outer corner of the eye andgently pull outwards until the eye closes. This exercise should be done to acount of 10 as often as possible through the day. All people who are unableto close their eyes, or who do not blink should wear glasses.People who don't blink should develop the "think blink" habit. They shouldbe encouraged to force themselves to blink whenever they see a commonobject, such as a tree, a cow or a motorcycle. If they carry out the exerciseof "think and blink" for long enough, the action will become a habit.

Visual acuity

Check how well people can see by using a Snellen chart or by asking theperson to count fingers at six meters distance. If there is recent visual lossin one or both eyes, so that the person cannot count fingers at six meters(visual acuity of < 6/60), they should be referred to an eye clinic. Cataractsare the most common cause of significant vision loss in the community andthis is especially true in older people. People who have had leprosy can havetheir cataracts operated on in exactly the same was as those who have not

Red eye

A much less common complication of leprosy is inflammation inside theeye itself. The main signs of inflammation are pain and redness of the eye.Conjunctivitis and corneal exposure cause redness of the eye: they can betreated in a general clinic with antibiotic eye ointment and an eye pad.However, if the redness persists after a few days of treatment the personshould be referred to an eye clinic. Red eye during type 2 reaction / ENLindicates Iridocyclitis which needs referral to eye specialist. An eye that ispersistently red may have exposure which needs surgical treatment or theremay be inflammation inside the eye which requires special treatment beyondthe scope of this book.

Corneal anaesthesia

When the cornea does not have sensation it is at risk of damage from objectslike sand, insects or eyelashes. These can cause ulcers on the cornea. If thecornea (the clear front of the eye) has a white spot on it and the eye is red, acorneal ulcer should be suspected. In such cases the person should be referredto a specialist immediately. Corneal ulceration is an emergency. If it is nottreated very quickly the person may become blind.

Assessment & Grading of Disability

Assessment of sensory function of nerve trunk

Test the sensory loss in the area supplied by the affected nerve. To detect thesensory loss, use a ball pen and test the sensation at four points in the handas well as in the foot. Impairment or absence of sensation at any of the pointneeds testing of the sensation at more points in that area to identify the exactextent of sensory loss.

Assessment of the motor function of nerve (VMT)

Check the active range of movement of joints. If the voluntary movementof the joint is reduced or absent, it means that the muscle is either weakor paralysed. If movement is normal, test the strength of movement of themuscle by applying pressure gently in the opposite direction of the movementand gradually increase the pressure while asking the person to maintain theposition. Judge whether resistance applied by the person is strong (normal),Weak (reduced) or absent (paralysed). Compare the strength of the two sides.

Grading of muscle strength is done as follows:

. S (Strong) = Able to perform the movement against full resistance.

. W (Weak) = Able to perform the movement but not against fullresistance.

. P (Paralysed) = Not able to perform the movement at all.

Note: In order to remove any anomaly passively move the joints throughnormal range of movement to assess stiffness of the joints and/or developmentof contractures of weak/paralysed muscle.

Management of deformities

Paralytic deformities for tendon transfer surgery

Pre and post-operative physiotherapy is essential for a successful outcomeof tendon transfer surgery and needs to be arranged. The conditions whichrequire tendon transfer surgery are claw hand due to paralysis of ulnar,median or both nerves, foot drop due to paralysis of lateral popliteal nerve,claw toes due to the paralysis

of posterior tibial nerve, lagophthalmos due toparalysis of facial nerve and the wrist drop due to paralysis of radial nerve.

Facial deformities for cosmetic / plastic surgery

Madarosis: The loss of lateral parts of eye brows is due to lepromatousinfiltrate destroying the hair follicles. Free graft from scalp or a temporal artery island flap usually gives satisfactory result

Sagging face / Mega lobule: This is due to rapid disappearance of thelepromatous infiltrate following treatment with chemotherapy anddestruction of elastic and collagen fibres in the dermis. The defect producesan appearance of premature ageing. Pre auricular or naso-labial face-lift isindicated in selected cases.

Nasal deformity: These are due to the invasion and destruction of the nasaltissues by M. leprae. Depressed nose is mainly due to the destruction ofthe nasal septum. The septal perforation is caused by non-specific infectiondestroying the cartilage. Nasal deformities are the most prominent stigmaof leprosy cases, the nasal mucosa is replaced by scar tissue which pulls thenose inwards. In a saddle nose defect, if the tip of the nose is in the normalposition, a bone or cartilage graft would be the operation of choice. Inadvanced cases, a post–nasal inlay graft over a stent mould is to be preferred.In rare cases, with total destruction of nose, a forehead rhinoplasty is themethod of repair.

Other deformities

Gynaecomastia or enlargement of male breast: This causes a lot ofembarrassment to the patient. In lepromatous leprosy, destruction ofseminiferous tubules of the testis by lepromatous granuloma results inhormonal imbalance producing gynaecomastia. It may follow testicularatrophy resulting from the orchitis of type 2 reaction. This deformity canbe corrected by a modified Webster's technique.

Recurrent wounds of hands and feet

Common causes of wounds include injury due to sharp objects that cutor pierce through the skin like thorns or broken glass, repetitive pressure,friction or shearing forces (e.g. foot ulcers from walking or hand ulcers fromusing unprotected hand tools), burns etc. The abscess develops followinginfection and need to be drained surgically. The deep infection may lead toosteomyelitis. Such patients may have sequestra (pieces of dead bone) inthe hand or foot which require removal. An X-ray of the affected part canhelp confirm the diagnosis. Sometimes in severe cases of recurrent wounds,amputation is the only solution, however this should only be considered asa last resort.

Management of wounds in brief

Probe the wound gently to search pus collection. Drain the pus, and flushthe wound cavity with saline solution. Pack the wound with paraffin gauzeand bandage it. Ask patient to elevate the part to facilitate healing and startsystemic antibiotics. Change the dressings daily and decide regarding surgicaldebridement after 3 days when inflammation has reduced, pus discharge iscontrolled, dead and avascular tissues are removed and wound is clear. Packwound with gauze soaked in antiseptic solution. Dressings are continuedon alternate day. Plaster cast may be considered after two weeks. Propercounseling of patient is required for better compliance and coordination.

Complicated ulcers & Osteomyelitis

If an ulcer is found to be broken down in tissue only in the dermis andepidermis, it is termed a "simple ulcer". If any ulcer is infected it is nolonger simple ulcer. If the breakdown of tissue goes deeper than the dermisand other body parts are affected (i.e. tendons, tendon sheaths, bones andjoints) the wound is termed a "complicated ulcer". When the tissue aroundbones (periosteum) becomes infected the condition can lead to inflammationof bones (osteomyelitis). Osteomyelitis is very difficult to treat and can cause chronic, non-healinglesions in bones. Without enough nutrients the infected bone dies and thesmall pieces of dead bone break away. These loose pieces of dead bone,called sequestra, will cause irritation in the wound which will not heal untilthe sequestra are removed or fall out. If the normal process of granulation iscontinuously interrupted by the irritation of sequestra the wound responds byproducing hypergranulation tissue. Hyper granulation will be seen as masses

of bright red tissue that bulge out of an ulcer. Wherever hyper granulationis seen it indicates that there is something irritating the wound and shouldbe taken as a sign that further investigation is necessary.People with deep or dirty ulcers or osteomyelitis should be referred for septicsurgery and antibiotics. You should suspect osteomyelitis if the person'shand or foot is warmer than normal, with or without swelling. Any personwith a wound discharging pus should be referred for surgical advice anddebridement (removal of dead and infected tissue) before taking steroids,or osteomyelitis may develop. Starting steroids before such treatment maylead to a worsening of the sepsis and more permanent damage, includingthe need for amputation.

All wounds are the result of tissue stress. Common causes of ulcer include:

. Sudden injury (e.g. sharp objects that cut or pierce through the skinlike thorns or broken glass)

. Repetitive pressure, friction or shear forces (e.g. foot ulcers from walkingor hand ulcers from using unprotected hand tools)

. Burns

. Secondary infection in macerated skin of web space with candidiasiscan lead to deep abscess
. Rarely rat bite can also lead to ulcer

There are a few major principles that should be remembered when planningulcer management. If these principles are followed, simple ulcers will healwithout any medication:

These principles are rest, good wound environment, hygiene and protection

Rest:

Almost all wounds will heal if they are rested. Regardless of the cause ofinjury, the first line in treatment of wounds is to remove the cause of tissuestress and then to allow the injured part to rest so that damaged tissue canrepair itself. So long as the person with a wound is healthy, damaged tissuewill repair itself. Rest doesn't necessarily mean that the patient must stay inbed (although for foot ulcers this is often the best option). If the person isunable to rest it may still be possible to rest the injured body part by splints.

Splinting

Walking with crutches (or even with a walking stick)- It will rest foot ulcers.Whatever the circumstances, the injured part should not be allowed toperform normal functions whilst the tissue is still being repaired.The best option is for the person to spend as much time as possible, lyingdown with his foot raised above the level of his heart (bed rest). However, thisis very rarely possible amongst people who must struggle to feed themselvesand their families, so other options should be explored.It is also very important to find out whether the person is able to changehis activities so that he doesn't need to walk so much: for example, can hetemporarily swap work with another person? Other transport options shouldalso be considered: for example, riding a bicycle.

Management in brief

1. Examination of general condition of a case and local wound area.Probe the wound gently to search pus collection. drain the pus,if any.
2. Flush the wound cavity by saline solution.
3. Pack the wound with gauze and bandage it.
4. Elevate the part to facilitate healing.
5. Start systemic antibiotics.
6. Change the dressings daily and check for any further pus collection. Surgical debridement after 3 days when inflammation is reduced, pusdischarge is controlled and wound is clear. All the dead tissues andavascular tissues are removed. Wound space is packed with gauze soakedin Savlon solution. Dressing on alternate day after checking any morecollection of pus, to be done.
8. Plaster cast with off-loading device may be considered after twoweeks when wound is totally clear, healing has started and no signs ofinflammation are there.
9. Wide spread use of antiseptics and topical antibiotics are to be avoided.
10. Oral preparation of zinc, vitamin C and vitamin A may be supplemented.
11. Proper counseling of patient is required for better complianceand coordination.

Treating the ulcer is a great opportunity to reduce fear & stigma throughdemonstrating ulcer care without any discrimination. Family members arealso encouraged to learn and practice the dressing of ulcer and nursing careof patient.

Salvage procedures of the limbs such as arthrodesis ofthe subtalar or ankle joints

This is done for fixed equines deformities of the foot or totally paralysed feetwith a flail ankle or forefoot deformities. These procedures are followed byimmobilisation for long duration followed by specialised foot wear

Criteria for referral of cases for RCS

The general criteria have been grouped into three categories: social andmotivational, physical and the leprosy treatment criteria. The patients and thehealth worker both must be involved in the decision of referral for surgery.

Social and motivational criteria

All patients who would be benefited occupationally, economically or sociallyare considered suitable for reconstructive surgery. The employed technique ofsurgery must have the potential to make a difference to patient's acceptancein the family, improve the socioeconomic situation and be reintegrated asergonomically independent member of the society.Patients must be well motivated and should have demonstrated that they areresponsible for their own health and follow instructions on treatment andcare of their eyes, hands, and feet before surgery. Patients who are not wellmotivated in self-care are not likely to be willing to participate in essentialpre and postoperative physiotherapy.

Physical criteria

The best age for referral for tendon transfer is between 15-45 years, butpatients younger than 15 years or older than 45 years may be operateddepending upon the particular circumstance.The muscle paralysis should be present for at least one year and preferablynot longer than 3 years. There may exceptional cases where

there has beenmuscle paralysis for longer than 3 years and the individual has kept thejoints supple through passive exercises. The patient may not rememberaccurately how long muscle paralysis has been present, so suppleness of thejoints may be a more useful criterion. Patients with severe contractures orstiff joints are not suitable, although physiotherapy or surgery can reversesome contractures. There should be no infection of the skin such as scabies,and any deep cracks, wounds or ulcers at the time of referral.

Leprosy treatment criteria

Patients should have completed the scheduled course of MDT or at leasta minimum of 6 months MDT. Patients should be free from reactions andsymptomatic neuritis for at least 6 months. Patients should not have takensteroids in the immediate past (about 4 to 6 months) unless the surgery is forneuritis. There should be no tenderness of any major nerve trunk in the limbs.The proposed surgical procedure and its positive consequences should bebalanced against the consequences of not doing surgery. This should bediscussed with the patient and the decision whether to undergo surgery shouldbe taken by the patient. Methods of managing to live with the deformitieswithout causing further damages to the affected parts should be explainedto patients who do not want or are not suitable for surgery.For most patients there is a period of few years during which surgery is mostlikely to be beneficial. This starts when the disease is stable (free of reactionsand neuritis), MDT course is completed and the muscle paralysis is not likelyto progress or recover.Motivation is a key factor as patients may need to be in hospital for at leastsix weeks and will have to work at physiotherapy. Patients in whom surgerywill make a difference are considered for referral.

Priorities for reconstructive surgery

Operations for lagophthalmos are usually considered as a high prioritybecause of the possibility of secondary damage to the eye leading to blindness.Feet are usually considered the next priority for mobility followed by handsbut this may depend on the needs of individual patients.

Physiotherapy

Physiotherapy is helpful in restoring the normal tone of muscles andpreserving the physiological properties of paralysed muscles. It also helps inpreventing muscle atrophy and the over stretching of paralysed muscle. Itsmain aim is to prevent contractures and keeping joints mobile, keeping theskin soft and supple and improve the blood circulation of the part.

Physiotherapy comprises exercises, oil massage, wax baths, hydrotherapy,splinting, electrical stimulation of muscles, shortwave diathermy, ultrasonicmassage etc. Physiotherapy is very useful in the management of deformitiesand is essential in both pre as well as post-operative care of deformitypatients. RCS requires the patient to use a different muscle in place of theparalysed muscles. The operated part is still vulnerable, and patient needspost-operative muscle training and instructions in the use of anaestheticextremities. Instructions given by surgeon at the time of discharge shouldbe followed. In general, the common postoperative muscle exercises

Self-care Empowerment of patients with kit or materials

Considering the fact that majority of ulcers undergo cleaning and debridementin the operation theater, its dressing on regular basis becomes necessary eithertill it heals or it becomes fit for RCS. Often patients are discharged withadvice on dressing as OPD Case. In place of that empowerment of patientsin their self-care has been suggested and is practiced over a decade. Self-careforms a vital part of the program and considering the fact today that nearly60% cases have ulcers and wounds on anesthetic extremities, educating thepatient on self-care is of paramount importance. ‘Self-care Kit’ has necessarytools and materials with which self-care is made compliant, patients can beeducated, empowered and even homemade materials can be replaced in thekit if necessary. Good results have been obtained with this technique.

The Self-Care kit is a transparent plastic zip pouch containing the following items:

. Foot scraper about 20 cm long, 6 x 3 scraping surface
. Antiseptic liquid
. Antiseptic or antibiotic skin ointment
. Moisturising cream or Vaseline
. Sterilised gauze packs of 5 x 5 cm
. Bandages 3” width x 3 meter
. Adhesive tape

In addition, a plastic tub (20” diameter and 8” height) is given separately aspart of the kit to all patients. The materials are enough for 30 applicationsand replaced after a month. All patients are also given MCR footwear atthe end of the session.

Technique of using the Self-Care Kit

1. Soak the feet
2. Scrape the sole of the foot and margin of the ulcer
3. Wipe the feet dry between toes
4. Apply antiseptic ointment on the ulcer
5. Apply moisturising cream in dry areas of foot and leg
6. Put two sterile gauze pieces on ulcer and apply bandage
7. Wear MCR footwear

Guidelines for Surgeons

Reconstructive surgery aims to restore function and form as far aspossible and to prevent further disability. It also plays an importantrole in the prevention of disability and rehabilitation process. Somepatients can benefit from reconstructive surgery but not all patients aresuitable. Pre and post-operative physiotherapy is essential for a successfuloutcome of surgery and needs to be arranged. Leprosy leads to physical,functional, social and/or economic problems. Physical rehabilitationincludes physiotherapy and occupational therapy, orthotics andprosthetics services, assistive and protective devices and reconstructive surgery. Persons affected by Leprosy with disability and deformity can bereferred to specialist for surgical correction.The following are the major points in the guideline on RCS:

. Besides completion of treatment and being free from reactions,the joints should be mobile. In case any stiffness is noted pre-operativephysiotherapy and splintage needs to be carried out.

. In case patient is undergoing nerve decompression surgery for neuritis thecorticosteroid treatment should be stopped at least before 2 to 3 weeks.Despite that anesthetist or the operating surgeon must be aware of patienthaving been on steroid therapy. A single dose of steroid at the time ofsurgery may prevent any complication arising. Post operatively too if anyproblems due to steroid withdrawal is encountered patient must be givensteroid overriding the fact of delayed healing or marred result.By and large, for tendon transfers patient should not be undergoingsteroid therapy and should have completed steroid therapy at least sixmonths prior to being taken up for surgery. There should be no focus of infection like ulcer or blister on the limbto be operated. The patient should not have any complicated ulcers ofthe other limbs or in another part of the body.

The patient should be willing to be admitted for the surgery, bewilling to spend one week preoperatively for physiotherapy ifindicated and three weeks in plaster cast and later be admittedfor a period of four weeks for post-operative physiotherapy.He may go home in between these periods with the permission ofsurgeon. For the foot drop the duration must be at least one year ofdeformity and it may take as long as six weeks in plaster and anothersix weeks for physiotherapy.In cases of contractures or restricted mobility, the surgeon may decideon surgical and or non-surgical like serial POP splintage or continuoususe of dynamic (elastic) gutter splints to release these contractures, makethe skin soft and then take the patient up for tendon transfer surgery. . In the cases with lagophthalmos if cornea is exposed and thereis threat to eye, immediate surgery of tarsorraphy may be doneoverriding other precautions but for tendon transfer same ruleslike hand apply. Only different advice is that he/she will be puton liquid diet for three weeks post-op. However, some recentoperations (not tendon transfers) do not need such advice.

Resurfacing for sole of the foot for plantar ulcer may require muchlonger duration of hospitalisation for skin graft or flap cover and patientshall be informed about the same.While operating on the nose for collapsed or depressed nose a goodclinical examination is necessary to rule out presence of ulcers inthe mucosa. As this deformity generally occurs in MB and smearpositive cases, they should have completed at least 12 monthsof MDT and duration of collapse also should be longer than12 months. A negative nasal smear report is must before surgery. . Septic surgery threatening the life of patient like gangrene may be dealtwith as emergency in septic OT and previously mentioned guidelinesdo not apply to these cases.

Criteria for Surgical Management

. Unemployed - RCS
. Employed + deformity but NO handicap - Cosmetic reasons
. Employed + deformity + handicap - RCS for function
. Rehabilitated patient with problems - Minimum surgery
. Female patient + household problems - surgery for ADL

Deformities requiring RCS

Primary Deformities

Primary deformities arise due to involvement of peripheral nerves or followthe infiltration of the skin or mucosa by M. leprae. Neural involvementis generally seen in the tuberculoid type while mucosal and cutaneousinvolvement is seen in the lepromatous type. However, nerves can also beinvolved in the lepromatous type during the episode of reaction as well as ata later stage of the disease. In the neuritic type, primary and/or early affectionof the nerves may occur.The examples of primary deformities which result from neural involvementare claw hand, foot drop and lagophthalmos. Cutaneous involvementleads to the loss of

eyebrow, wrinkling or sagging of facial skinand thickening of ear lobules. The nasal mucosal involvement andits subsequent sequelae produce the characteristic depressed nose.All these features constitute the prominent stigma of the disease.

Secondary Deformities

Secondary deformities occur due to failure of realisation that the anaestheticareas such as the hands, feet and cornea require special attention. Deformitiesof hands occur following unnoticed and uncared for injuries that may resultfrom burns due to holding hot utensils, pressure necrosis, injuries at work,etc. the anaesthetic skin being dry, cracks easily and secondary bacterialinfection in these cracks leads to formation of abscesses, inflammation ofsynovial sheaths, or osteomyelitis of the phalanges.In the foot, plantar ulcers occur due to pressure damage and otherunnoticed accidental injuries. These ulcers if neglected lead toosteomyelitis with sequestrum formation and finally shortening of the limb. Inaffection of eyes, keratitis, corneal opacities and other eye complications arelikely to occur due to suppression of blinking reflex or due to lagophthalmos.

Reconstruction of sole following plantar ulcers

In the recent years lot of momentum is gained for resurfacing the soleof the foot following plantar ulcers. Right from skin grafts to localtransposition flaps, from myocutaneous flaps to neurovascular islandpedicle flaps have revolutionised the surgery for plantar ulcers. Therefore,it is important to understand that such cases may need prolongedhospitalisation, immobilisation in the POP casts, walking with crutchesfor non-weight bearing even while in the hospital and specialisedfootwear after healing has taken place.

Charcot's foot

The clinician should remember that the most common problem affectingthe anaesthetic foot and ironically the most commonly overlookeddiagnosis is that of acute neuropathic disintegration of the foot or chronicneuropathic disintegration of the foot. The patients do not complain ofany problem or it may be only of swollen foot. On palpation, if the footis warm or 'hot' this is the earliest sign of the hot foot. The conditionshould be suspected whenever a swollen anaesthetic foot is seen and isconfirmed by palpation. Regardless of X – ray findings treatment shouldbe immediately instituted otherwise the ankle may dislocate and presentwith an ugly abnormal foot which may finally end up in an amputation.The management includes total contact POP cast for 2-3 monthsfollowed by graduated walking (Partial Weight Bearing-full Weight Bearing)and watching for recurrence of swelling or heat. If it recurs, then POP shouldbe reapplied and patient will probably require a Fixed Ankle Brace (FAB).

Nerve decompression surgery

It has been established that peripheral nerves passes through the fibrous tunnelat certain points in their course. The sites of predilection of nerve affectionin leprosy are near these tunnels. Being an anatomical structure it does notexpand to accommodate the thickened nerve and thereby causes compressionon the nerves resulting in the loss of conduction power of axons.Ideally, if in leprosy nerves can be treated early deformities can be prevented.Nerve decompression is one such modality which is used by the surgeonsto get some results in cases with compression and no improvement withsteroid therapy. Its indications are varied but can be summarised as to relievepain and tenderness, drain an abscess and if there is deterioration in nervefunction. Patient may or may not be on MDT or in reaction as its outcomeis not dependent on it.Patients who have chronic pain and swelling in peripheral nerves whichdoes not respond to analgesics and a course of steroids should beconsidered for nerve decompression.

Outreach Services for DPMR and RCS

Organisation of Camps

Recently, there has been increasing focus on reaching expert services to thegrass root level through camps. These camps are basically of two types.One is where disabled patients are rendered services as well as patients inneed of RCS are identified and referred to nearby tertiary care center. Anothertype of camp is for carrying out training of local surgeons at their own setup by sending a team of surgeons and holding the RCS camp in which fewdemonstration surgeries are performed. The following tasks are undertakenat RCS selection and DPMR service camps.

Assessment of risk status

Patients with multiple skin patches, painful nerves, reactions etc. are at highrisk for developing disability. A separate list is made and given to districtauthorities for their follow up. Children are examined separately by seniordoctor. They are advised to report immediately in case of any nerve pain,loss of sensation, weakness of muscles, appearance of numbness tingling/paraesthesia in the hand, face and foot and also involvement of eye. Thosewho come with disability are told how to take care of themselves and torecognize signs and symptoms of worsening of disability.

Providing DPMR services

Besides teaching physiotherapy in group and providing splints to handdeformity cases, few patients with absorption of fingers may need Instant

Grip-Aid Kit. **Instant Grip-Aids**

These are required mainly for patients staying in colonies and havelong term leprosy with advanced deformities of the hand. With absorptionand amputations of fingers they face difficulty in holding and using articles ofdaily use like for eating, drinking, brushing teeth, combing, toilet visits etc. The"Instant Grip-Aid Kit" is a tremendous boon for such cases. This kit is alsoused to overcome handicap in other disabilities like burns and amputation offingers thereby, integrating its use in the standard tertiary care hospital.Patients with foot drop are given the foot drop splint and patients sufferingfrom ulcers are provided with self-care kit. These patients are then given ademonstration on the use of the self-care kit. Each of these patients withulcers on the foot is also provided with MCR footwear at the camp. Tertiarycare institutes need to have liaison for getting MCR footwear.

Self-Care Kit / Ulcer dressing kit

Most patients are very poor and cannot afford to buy the materials neededto care for their feet. Providing patients with the self-care kit free of chargeovercomes this obstacle.The self-care kit motivates patients to take care of their feet and givesthem the tools to do so. It also has a very positive synergistic impact,as they witness the improvement and are motivated to continue to use it.They also feel more in control of their disabilities and remove theirself-perception as an "invalid" who needs to visit a clinic ordoctor regularly.In the event of a recurrence, the patient knows how to deal with it anduses any remaining materials from the kit and contacts the health servicesimmediately, thereby promoting healing in a shorter period and preventingworsening of the disability.Patients may become dependent on the service provides for replacementand a discontinuation in the supply may lead to a sense of dejection/rejection.Hence follow-up services must be an integral part of the program. As thekit is useful in any home, there is often a demand for it as a "first aid kit".Pilferage of kits may occur at all levels of distribution, leading to the escalationof costs.

MCR footwear

*Special MCR foot-wear is not recommended routinely for all patients.*Any suitable foot-wear with prerequisites such as soft inner sole, hardouter sole (to prevent piercing of thorns/nails), that fits snugly andalso has adjustable straps preferably with a back-strap can be used.The foot-wear should be stuck or stitched by thread and not bynails. Also it should be comfortable, locally available and sociallyacceptable of different designs. However, if there is a provision availablefor MCR then it should be indented as per the number of caseswith grade 1 & grade 2 disabilities of foot.

Goggles & Loose Materials

Patients with lagophthalmos are given the goggles and advised asnecessary to prevent corneal ulceration. There are also such patientswho require only some loose materials. Accordingly some Vaseline, liquidparaffin, oil, gauze pieces, anti-septic ointments etc. are also taken anddistributed at the camps. Minimum 50 patients are expected to attend each of these DPMR camps. Allthese patients are followed up monthly to substitute the given materials andare assessed for the result after four months. It is only the regular serviceswhich increase the confidence of patients and family in the health system.They tend to come forward easily later on if they have any problems.

Selection for RCS

All patients with deformities and mobile joints fall in to category forselection of RCS provided they have fulfilled the other criteria. They aregiven a date for operation and referred to the tertiary care center or districthospital as decided earlier between chief surgeon and superintendentof the hospital.

Basic Tasks for RCS Training

. Differential diagnosis and reaching the diagnosis of leprosy by clinicalexamination, skin smears and histopathology of skin or nerve biopsy.

. Management of complicated cases of MDT, Lepra Reactionsand relapse.

. Charting of Nerve Impairment after clinical examination andinvestigations, grading of disability and EHF Score of disabilities ofhands, feet and eyes.

. Physiotherapy and physical aid materials; splints, grip-aids, self-carekit, foot drop splint, crutches, walking POP cast etc.

. RCS: Criteria for selection of cases, surgical procedures in brief andguidelines on pre and post-operative care, regular follow up.

. Outreach services and organisation of camps.

. Maintenance of records and relay of information for NLEP.

. Developing interdepartmental co-ordination and linkages withvocational and occupational rehabilitation agencies and socio-economicrehabilitation.

. Training of primary and secondary level staff at tertiary care institutes.

. Training curriculum and its duration to be decided by core committee foreach category. Training to be given by resource persons from establishedsurgical units with demonstrations and trainee assisting the operations.

Logistics and Supplies

All tertiary care institutes should have:-

1. Fully equipped operation theatre and Medical Rehabilitation Centre.
2. All instruments, gadgets, aids and appliances required.
3. Adequate stock of Medical supplies like steroids, loose Clofazimine, Thalidomide, POP, dressing material etc.

Procurement of materials

The State Leprosy Societies will procure all materials required under DPMRplan and arrange to supply same to the concerned Govt. and Non-ILEPinstitutions through the concerned District Leprosy Society as decided by theState Implementation Committee. Concerned ILEP organization will procureall materials required for their respective tertiary care centres.

Drugs

Prednisolone, Loose Clofazimine, Thalidomide and other supportive drugs.

Prednisolone

Reactions in Leprosy are medical emergencies. Immediate treatment isessential to prevent disability. Steroids are the drug of choice in managingLepra – reactions, usage in the form of Prednisolone is desirable.Total number of 5 mg tablets of Prednisolone, required to treat an episodemay be 336-462-518 tablets as per the recommended schedule of 3-6 months.

Loose Clofazimine

It should be made available in loose form as 100 mg capsules apart fromits routine availability in MDT Blister Calendar Packs. It has good anti-inflammatory properties in 300 to 400 mg per day in divided doses. But ittakes nearly a month to act hence steroids should be the first line of treatment.Clofazimine is useful especially in weaning a patient from steroid therapy.Also it can be combined with steroids in patients who require prolongeddoses of steroids to control repeated reactions. It should be started as thricedaily for one/two months, twice daily for one and tapered off.

Thalidomide

It is an effective drug in the treatment of severe ENL in leprosy. Thalidomidemust be administered under the strictest possible supervision. Procurementof Thalidomide and its use may be as per GOI directions.

Other supportive drugs

Antacids, H2 receptor blockers, de-worming tablets, calcium supplements,soluble insulin for diabetic patients, antibiotics etc. requirement needs to beanticipated and kept ready.

Physical Aid Materials

Provision of splints, crutches, grip-aid, self-care kit etc. is also required inmost of the cases and these should be arranged depending on the total loadof grade 2 cases in the community. Supply chain, particularly for MCRfootwear distribution twice in a year needs to be established.