

Having a traditional health concept on leprosy and practicing leprophobia to hate to the victims is a real obstacles on leprosy control in this area. Back to the leprosy transmitted is "man to man", the intervention of behavioral health change on health promotion, early diagnosis and prompt treatment and rehabilitation can be chosen as an alternative. Supported by a couple of experiences based on two researches by using health behavior change in qualitative and quantitative researches in South Sulawesi, Ngatimin offers a model to support leprosy control include to take care to subclinic patients which were caught by serologic or microbiologic detection.

### PS60

NUTRITION, GROWTH AND MENTAL DEVELOPMENT OF CHILDREN OF URBAN LEPROSY PATIENTS

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This paper describes a cross-sectional study of physical and mental development of a high-risk group of 182 socially deprived healthy children of leprosy patients in their pre-school age to early teens. They were rescued at the age of 4 years from the distress of leprosy colony where they were born, and brought up in government after-care homes, under better environmental and messing facilities. Of them, 135 children could be followed clinically for the development of childhood leprosy. Another 84 children of leprosy patients, but living with their parents in the colony were included for comparison. A group of 159 normal children of similar economic status and age group were included as another control group. It was observed that although better environment, food and training were provided in the after-care-homes, so that the children could be brought into the national mainstream, nevertheless 5 children developed indeterminate type of leprosy during the course of 10 years. This is the first report describing the growth and mental development of children of leprosy patients from the Indian subcontinent.

## REHABILITATION

### RE1

INTEGRATION OF LEPROSY INTO GENERAL REHABILITATION SCHEMES - AN EXPERIMENT IN BOMBAY.

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In Bombay city, there are 6 institutes which are working for rehabilitation of persons disabled due to causes other than leprosy and 8 institutes in voluntary and Government sectors doing antileprosy work through their 153 leprosy clinics. In 1985, a combined workshop was organised for representatives of these organizations to acquaint them with leprosy and discuss possibilities for including leprosy patients in general rehabilitation programmes. Periodic follow up meetings were organised to review progress and resolve difficulties in implementation. Visits of the staff of leprosy institutes to vocational centres and workshops of non leprosy agencies were organised which acquainted them about facilities available at these centres. A booklet giving these details was printed and made available at 153 leprosy clinics in Bombay for ready reference. Since 1987, 206 referrals have been made by leprosy agencies of which 97 were accepted by non-leprosy agencies for the training programme and 95 patients got job placement and loan facilities.

Such an integrated rehabilitation programme for leprosy patients can be practised in cities and district towns where non-leprosy rehabilitation organisations exist.

### RE2

A MODEL FOR THE HEALING OF LEPROSY IN KOREA

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Leprosy patients in Korea, regardless of their socioeconomic status, had been roaming around near villages to beg the food for their survival, and they were the symbol of fear, rejection, prejudice, hatred, and segregation, until 30 years ago. Since, drastic changes have been noted. For example, a. According to the WHO definition, leprosy as a public problem has already been eliminated since 1983 (before MDT), but the prevalence of tuberculosis is still one of the highest among southeast Asian countries. b. the living standard of the

HEALED, once beggars on the street, is now better than that of the ordinary population. These are the results of the unique Korean way of approach. Of course, the chemotherapy, physiotherapy, and corrective surgery played one of the major roles -- Physical Rehabilitation. But, the focus should be on the unique Korean way to implement spiritual & socioeconomic rehabilitation. It was not emphasized to the patients that they were the ones to get help from others, instead, it was emphasized that they themselves should do their own best to support themselves with whatever ability they had and furthermore they should seek the opportunities of helping others -- Spiritual Rehabilitation.

The patients themselves gathered together and settled at resettlement villages. They started with the scratches donated from various resources, raising pigs or chicken. The business at the resettlement villages was not run by the government or charitable organizations, but by themselves. The poultry product from the resettlement villages, now, occupies about 1/4 of that in Korea. And, furthermore, they are now the managers of the industry and the general public provides the labor -- Resettlement Village Movement -- Socioeconomic Rehabilitation. It is roughly estimated that this Resettlement Village Project in Korea has conferred a benefit of about 12 billion US Dollars. Over 70-80% of the residents at Resettlement Villages are not patients. And all of the patients have left, in some Resettlement Villages, which have become ordinary villages.

The victims of Hansen's disease in Korea are now happy, prosperous and are no longer the symbol of fear. They are healed and have become a man with all rights and dignity. Even an active case of this disease is considered as a patient with a disease called leprosy. They restored their MANSHIP fully.

I propose that my experience in Korea, Resettlement Village Project run by the patients themselves not by others, be extended to other parts of the World, and my colleagues here be my partners of this campaign.

### RE3

COMMUNITY BASED REHABILITATION PROGRAMME OF THE LEPROSY MISSION, INDIA.

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Mr. P. K. Roy, Mr. Shirish Shegaokar.

The community based rehabilitation programme was launched in 1990 at 27 different leprosy hospitals of The Leprosy Mission, India. This programme was planned in a systematic way with in build training programmes for the P. M. W. with emphases on proper selection of leprosy patients, trades and market research.

Six hundred nineteen leprosy patients received the benefits of this programme. Following are the observations:

64.45% leprosy patients had a deformity, 47% patients were staying in thatched houses, 78% leprosy patients do not have agricultural land, 82% patients were rehabilitated in rural areas, 78% were male and 22% were female. Twenty different trades were selected to rehabilitate these patients. 8% patient showed failure in this programme.

This study shows that deformity is one of the important factor of debilitation of the leprosy patient. But at the proper time, if the community extends the financial help and encouragement, patients can be rehabilitated in their own society.

## RE4

FREQUENCY OF LEPROSY NEUROPATHY IN HYPERENDEMIC AREAS OF MEXICO AND ITS CORRELATION WITH CLINICAL, EPIDEMIOLOGICAL AND STRUCTURAL FINDINGS.

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Disability from leprosy neuropathy is a major problem for Mexican patients. According to the National Register of the Programme for Leprosy Control up to 30% of cases present nerve damage at the time of diagnosis. In many cases, morbidity due to peripheral neuropathy increases after diagnosis due to complex logistic problems in the availability of MDT and following withdrawal of patients who live in isolated rural areas. Moreover, multibacillary patients suffering Type 2 reactions receive treatment with thalidomide, a drug known to produce peripheral neuropathy in a proportion of patients. The purpose of this study was to investigate distinct patterns of neuropathy among patients across the leprosy spectrum from different endemic regions in Mexico.

It was found that 70% of all known leprosy patients are multibacillary, and different endemic areas present characteristic patterns of frequency by disease type. In particular, diffuse lepromatous leprosy was found in the Northwest of the country, and patients with this type of polar disease present characteristic nerve damage. Particular disease types were found to determine specific patterns of nerve involvement and correlation of findings was carried out using the following variables: age, sex, type of disease, history of reactions, treatment, electromyography, BCG status, involvement of nerve trunks, nerve biopsy, and biopsy of skin lesions.

Actions to prevent progressive nerve damage and a rehabilitation programme were drawn from our findings to be included in the National Programme for Leprosy Control.

## RE5

IMPROVEMENT OF HAND IMPAIRMENT AND LIFE QUALITY BY FIELD DELIVERED SPLINTS AND GRIP AIDS IN DEFORMED LEPROSY PATIENTS

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In view of less number of institutions available for comprehensive leprosy care and considering the success of MDT programmes it has become imperative that field programmes should concentrate on related aspects of leprosy deformity, its prevention and correction by such techniques that patient benefits from existing services. In our experience over the last few years, we visualise two important advances made in the deformity care by a new type of simple splints

devised by Atul Shah and the Modulan grip aid concept pioneered in India by Ganapati. The presenting author standardised the technique of prefabrication of splints and tested in urban situation for its benefits. The hand impairment particularly claw hand was not only improved but was completely corrected in many instances. In those patients who are beyond reconstructive surgery, modulan grip aids prepared by Kingsley enabled them to carry out activities of daily living and occupational functions in a better ergonomic way thereby improving the quality of life. The principles, techniques, statistical and functional analysis of data of 168 patients receiving these modality of deformity care will be presented.

## RE6

INTEGRATION OF CARE OF THE HIGHLY DISABLED IN MDT PROGRAMME - A FIELD EXPERIMENT ON REHABILITATION IN DISTRICTS HYPER ENDEMIC FOR LEPROSY.

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No field technology aiming at reasonable care of leprosy patients with high degree of mutilations is still available. Experience gained in a low endemic area by "Borsad Model" (reported elsewhere) in offering comprehensive leprosy management, integrating care of all categories of disabled with an ongoing MDT programme emboldened us to extend studies to two hyper-endemic districts, Ongole and Kurnool in Andhra Pradesh, contributing to a pool of over 3000 disabled patients. Care of the highly disabled at the field level using 'Modulan' grip-aids (Ganapati et al 1983) formed a special subject for training of the government staff of the National Leprosy Eradication Programme. The integrated package of training imparted included usage of pre-fabricated splints (Atul Shah 1991). 332 patients with grade III disability received 473 grip-aids in both the districts, coverage of deformed patients reaching 100% in Ongole. 75% of the patients found the grip-aids useful for daily activities. Patients belonging to the monotherapy era would never have received any care, had it not been for this field intervention. Many deformed patients have been rehabilitated at the community level entirely due to the initiative shown by the government staff.

This experiment has shown that integration of deformity care with MDT programme is feasible in high endemic areas.

## RE7

AN IMPROVED METHOD OF ASSESSING 'WORK' AND 'HAND FUNCTION' IN LEPROSY

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The term 'WORK' is used in relation to the physical and psychosocial capabilities of an individual. Many testing systems have been evolved in the past to assess this. Similarly, there are at least 15 well known tests to assess another closely related activity, namely 'HAND FUNCTION'.

At Karigiri, assessment procedures of these two vital parameters of patient management have been used regularly for some years. However, in the process of continuous improvement of all such activities, these too have undergone a major revision recently, to enable more effective monitoring of both WORK ABILITY, and HAND FUNCTION. Additions that were incorporated, were from similar standard tests used in other neuromuscular diseases.

1) WORK ASSESSMENT is now carried out under (a) Physical Capacity, where actual capabilities related to the use of eyes, hands, and feet are recorded; and (b) Work behaviour, where a sample evaluation of a specific task is carried out. Additionally, psycho-social aspects, such as attitude towards work, trainability, stigma etc., are evaluated.

2) HAND FUNCTION ASSESSMENT includes tests of grasp, grip, pinch strength and fine manipulation, are now standardised and graded into three ranges Normal/Poor/Unable, along with Normal values, to assist the clinician in making a better evaluation of functional ability.

This presentation specifically deals with test procedures for these two assessment areas, including rationale of each sub-test, scoring techniques and interpretation of such scores.

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Portions of this work include information presented by the First Author, in the yet un-published "Manual on Rehabilitation, for Primary care Rehabilitation workers", Ed. Dr V P Macaden, Hubli, India

## RE8

LEPROSY AND REHABILITATION - A PRIMARY HEALTH CARE APPROACH.

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The disease of leprosy is dreaded because it produces deformities. It is in the context of leprosy as a deformity - producing disease that the concept of Rehabilitation comes in.

Due to the low cost effectiveness of institution-lised rehabilitation centres on one hand, and the unsuccessful efforts to combine case detection and chemotherapy with Rehabilitation on the other, the desirability of a new approach that addresses the shortcomings of the aforementioned rehabilitation strategies obviously suggests itself.

The primary Health Care based Rehabilitation programme, currently in operation in Kaduna State of Nigeria, is suggested in view of its acceptability, affordability and accessibility.

The programme involves active participation by patients PHC workers and especially the district level governments who contribute a minimum of 150 dollars each, and provide farmlands for use by leprosy patients both on treatment and RFT. The funds are used in provision of farming and cooking equipments, ulcer care materials, subsidy on protective footwear, and surgical operations and health education posters on Rehabilitation.

This method provides a holistic approach to rehabilitation and makes it practicable for rehabilitation and efficient leprosy control programmes to complement one another.

## RE9

MODIFIED DISABILITY GRADINGS - A NEW CLASSIFICATION FOR DISABILITY EVALUATION

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The disability grading to be adopted for the field programme had undergone innumerable changes from 1970 to date. The WHO technical report 1969 classified the hand, feet and face into 5 grades. In 1980, the WHO suggested the 3 grade classification for hand, feet and eyes and in 1988 it suggested 3 grades but essentially it is 2 grade if one disregards grade '0' and it has combined hands and feet primarily for collection of general data on disabilities and impairments. With increasing importance being given to deformity care programme, it cannot be naturally used as guide to deformity care service (or) a reflection of improvement by physical, medical and rehabilitative intervention. Therefore, a patient who has recovered from sensory motor peresis may still continue in visible deformity data or a patient with visible deformity, who has progressed into contractures may still be in the same grade. Therefore it is imperative

that a working classification be designed which can reflect the extent of deformity and disability, the need of the patient for deformity care services, health education, or rehabilitation as well as improvement recorded through deformity care services. A new classification is proposed which reflects the above mentioned needs.

## RE10

ANALYSIS OF STRESSES IN TWO DIMENSIONAL MODEL OF LEPROTIC FOOT

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The internal stresses developed in the foot skeleton cannot be measured directly in vivo or post mortem. However, using a modelling procedure such stresses can be calculated. A two dimensional articulated model of the foot skeleton, which include cartilages and ligaments, is used in this study and the stress analysis is done by using the GIFTS finite element program. The model is used to analyse stresses in leprosy subjects with deformed feet combined with partial or complete paralysis of certain muscles. Stress patterns in the feet of 3 patients (in different stages of tarsal disintegration) are analysed. The analyses shows that in one patient (where the bone in the mid-foot region has collapsed, leading to plantarward protrusion), the maximum principal stresses are the highest at the protrusions during push off. The clinical data for this patient shows an ulcer at the same spot. The stress analysis for the second patient shows very high stress in the portion where cartilage has become thinner due to a strong local compression and possibly causing the navicular bone to become ejected out (as observed from the X-ray). The third patient analysis shows highest stresses at the forefoot support (where the foot is shortened due to disintegration of the forefoot metatarsal bone, as seen in the X-ray). It is found, from the analyses, that the shape of the foot and the paralysis of muscles are factors which contribute to the development of high stresses in different regions of the foot. It could be stated (from the analyses) that these high stresses developed in certain regions of the foot could be one of the important factors contributing to the process of tarsal disintegration in leprosy.

## RE11

ANALYSIS OF STATIC AND DYNAMIC FOOT PRESSURE IN LEPROSY PATIENTS

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Static and dynamic foot pressure measurements are carried out for normals and leprosy subjects using image processing technique. In this method, light images of the foot are obtained by scattering of light (at areas of contact of the foot) on a device called barograph. A software package is developed on an IBM PC-AT to present on-line variations of foot pressures and the path of centres of pressure during walking. Some procedures that are developed for representing the standing and walking foot images are: depiction of centres of pressures, perspective view of pressures, pseudo colouring and half toning. Pressure distributions under normal feet while standing are even and symmetrical. The range of normal average pressures are 2 to 4 N/Sq.cm. In leprosy patients while standing the pressures are uneven, localized and unsymmetrical. The average pressures are higher and the peak pressure is found to increase with deformity. A normal walking pattern is characterised by low mid-stance pressure and high pressures at heel strike and push off phases; the push off pressure being the highest coinciding with high instantaneous centre of foot pressure velocity (CFPV). The normal walking pressures are 3-4 times the

standing pressures. In leprosy subjects, the high pressures are found to coincide with the scars or ulcers. Separate localized peaking of pressures is found to occur in case of early tarsal disintegration (TD) and peaking of pressures in larger area and shortening of foot, in later stages of TD. In the advanced stages of TD, the highest foot pressures are observed during mid-stance compared to heel strike and push off phases. The magnitude of impulse during mid-stance is also found to be the highest for the advanced TD leprosy patients as compared to the normals and it is about 3-4 times the normal value.

## RE12

### DEVELOPMENT OF PLASTIC FOOTWEAR FOR ANAESTHETIC FEET IN LEPROSY

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The requirements of protective footwear in leprosy are a) It should provide sufficient rigidity to prevent excess pressure under weight-bearing areas of foot and yet have controlled flexibility b) Footwear appearance should not carry stigma of disease c) Acceptable cost. The first can be achieved by inclusion of a spring steel shank between the sponge insole and the plastic sole.

A number of models have been developed for 4 different sizes of footwear. These are currently being evaluated. Changes in material and design are being considered to optimize the life of the footwear and reducing cost. More accurate information is being sought about foot pressure distribution before and after use of this footwear. Trials demonstrate acceptability of the footwear and its protective effects in leprosy and in diabetic patients who exhibit anaesthesia of the feet.

## RE13

### RISK FACTORS FOR DEVELOPING DISABILITY BEFORE THE DIAGNOSIS OF HANSEN'S DISEASE

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A set of 3302 Hansen's disease patients diagnosed between January 1970 and April 1991 in Rio Grande do Sul State, Brazil, had their grade of disability evaluated at the moment of the diagnosis. Out of these 3302 patients, 689 (20.8%) had disabilities of grade 2 or 3. The multivariate analysis has shown that the time elapsed between the beginning of the disease (referred by the patient himself) and the moment when Leprosy is identified by a physician is an important risk factor for developing disability before the diagnosis: risk of having disability duplicates each three years that Leprosy remains without diagnosis. Other variables identified as significant risk factors by multivariate analysis were: sex (higher risk for males); age (higher risk for older patients); bacteriological status (higher risk for patients bacteriologically positive); clinical form (lepromatous cases had the highest risk) and mode of detection (cases detected by active methods had the lowest risk). These results show the importance of early diagnosis to prevent disabilities in Hansen's disease.

## RE14

### IMPAIRMENTS AND DISABILITIES. THE DIFFERENCE AND IMPLICATIONS FOR LEPROSY CONTROL.

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Leprosy workers are very familiar with the term disability and the compound terms in which the word disability is used e.g. disability prevention and disability grading. Yet, what is usually meant and understood by disabilities in leprosy control projects are impairments as defined by the World Health Organization (WHO). In 1980 the WHO published the International Classification of Impairments, Disabilities, and Handicaps (ICIDH) as a classification for trial purposes to enable health workers to classify health related problems at three different levels:

*impairment*; organ level, dysfunctioning or changes of an organ or organ system; *disability*; the personal level, the possible effect(s) of impairment(s) on the functioning of the person in areas such as locomotion, personal hygiene and household activities;

*handicap*; social level, the consequences of disease, impairments and disabilities in maintaining or attaining a normal role in the community/society.

In order to be able to describe the health status of a patient and to evaluate the effect of treatment policies on the individual patient or control programs as a whole, it is essential that use is made of a common language and a uniform terminology. The ICIDH offers a conceptual framework to describe and evaluate the overall health status of a patient. Use of the ICIDH concept and terminology will also facilitate the gathering of epidemiological data in order to assess and evaluate the impact of health policy and treatment approaches on the incidence and prevalence of sequelae of leprosy and leprosy neuropathy.

A common language will also facilitate communication. The ICIDH has been widely used in the field of rehabilitation medicine by various disciplines for many purposes. There has been much criticism also. A formal revision procedure of the ICIDH will soon be initiated and WHO collaborating Centres on the ICIDH have already made proposals for a better structured and more practical ICIDH. 'Impairment' and 'disability' are defined and it will be explained how the ICIDH can contribute to a common language regarding the health status of patients and thereby will facilitate registration and research in leprosy control programs.

Brandsma JW, Heerkens YF et al. The International classification of impairments, disabilities and handicaps in leprosy control projects. *Lepr Rev* 1992;63:337-344.  
World Health Organization. The International Classification of Impairments, disabilities, and handicaps. Geneva, 1980.

## RE15

### A SYSTEMATIC PROGRAMME FOR DISABILITY PREVENTION AT KARIGIRI ('DISLEP') A PRELIMINARY REPORT

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The feasibility of vigorous Disability Prevention being included into routine leprosy control activities was considered at the SCHIEFFELIN LEPROSY RESEARCH AND TRAINING CENTRE, KARIGIRI. It was noted that in the last few years, all over the world, major fundings had been accorded to the implementation of MDT. It was felt that with minimum additional resources, a systematic disability prevention programme could easily be added on to the existing activities, with good results anticipated.

A comprehensive DISABILITY PREVENTION & LIMITATION PROGRAMME IN LEPROSY was therefore initiated, in 1990, aimed at "preventing/limiting the progression of disabilities among patients, (by the application of existing knowledge and methods), as part of a leprosy control programme"

This programme has inducted about 3000 patients, including those who are Newly-Added, Under-Treatment, and Released-from-Treatment-but-still-under-surveillance. On induction, patients are assessed in detail to identify (1) those who are at a higher risk of developing disabilities; (2) risk factors that are likely to cause initial or recurrent disability; and (3) their need for disability prevention aids, which are provided if necessary. Patient intake was completed in December 1992. They are scheduled for reassessment at 6-monthly intervals for a period of three years after RFT. The study is about half way through the total period of investigation.

Patients and their families are given intensive education to help them identify possible areas of danger and causes of disability, especially in the earliest stages. Our experiences in the implementation of the project, new methods of Health Education, and problems and pitfalls, are presented. A preliminary analysis of baseline disability levels, and periodic changes in the profile, is also presented, as an index of the efficacy of the various intervention activities undertaken.

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This project was funded by the IMPACT Foundation, UK.

## RE16

### PLAN PARA PREVENCIÓN DE INCAPACIDADES EN MÉXICO

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El compromiso en México de eliminar la lepra con el uso de PQT, ha permitido curar al 47% de los casos y el 17%

ya está en vigilancia postratamiento, lo que obliga a intensificar las acciones de rehabilitación y prevención de incapacidades con técnicas sencillas, como una estrategia para lograr la curación más integral de los casos. Para ello se aplicó una encuesta que determinará la frecuencia y tipo de incapacidades en los enfermos y su distribución geográfica para ubicar "Módulos de prevención de incapacidades en lepra".

El 1er. módulo piloto se instaló en 1990 para iniciar la capacitación del personal.

Las funciones de estos módulos ubicados en unidades de atención primaria comprenden:

- Capacitación del personal sobre educación a enfermos para prevención de incapacidades.
- Atención de pacientes para la práctica de medidas sencillas como: aplicación de férulas, curación de úlceras, modificaciones al calzado para cambiar puntos de apoyo viciados y a los utensilios de trabajo para evitar quemaduras y traumatismos.
- Referencia de pacientes que requieran atención en unidades de rehabilitación de 3er. nivel.

Resultados de la Encuesta justifican la instalación de estos módulos que han sido bien aceptados por personal de salud y población.

## RE17

### INFLUENCE OF MDT ON THE INCIDENCE OF DISABILITIES IN HANSEN'S DISEASE

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35 cases who had not disabilities before MDT were investigated. 13 cases have occurred disabilities during 5 years after start of MDT. The incidence of disabilities was 13.63%. Among the 13 cases, 61.54% cases (8/13) of disabilities occurred during the first year after start of MDT. 53.85% cases (7/13) of disabilities were occurred associated with leprosy reaction. Leprosy reaction is still the most common factor associated with disabilities. 46.15% of disabilities occurred without any leprosy reaction. Among them there were 4 disabled patients were found during the first year of MDT. In addition, the incidence of disabilities was also associated with sex and leprosy type, but not associated with the duration of disease and the age of patients. The incidence of disabilities in male (17.15%) was much higher than female's (0.45%), and multibacillary's (MB) was much higher than paucibacillary's (PB). All of the 13 cases were MB patients. None of PB patients in this group had occurred disabilities. Finally, the authors note that although MDT can reduce leprosy reaction, there are still some of the patients could occur disability during or after MDT. Therefore, it's very important to prevent deformities and carry out rehabilitation, when we are widely implementing MDT. It's quite necessary to carry out a more detailed investigation to make clear the association between MDT and disability.

## RE18

### A STUDY ON THE EFFECTS OF PREVENTION OF PHYSICAL DISABILITIES IN HANSEN'S DISEASE AND TREATMENT BY SIMPLE TECHNIQUES AT A CONTROL PROGRAM ON THE STIGMA

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Hansen's Disease (HD) is a peripheral neurologic disease with high incapacity risk. The surveillance of precocious disabilities can prevent deformities and interrupt the misuse syndrome. It is only possible when prevention and treatment by simple techniques are part of the specific treatment of HD. This study is based on

2122 records collected during the last ten years (1983-93) at the Metropolitan Health Center in Curitiba, Brazil, and it intends to evaluate efficacy of Simple Techniques at the HS Control program. The hypothesis is that the adoption of routine procedures avoid disabilities, or their progression, and favours the normal activities. The present situation of the patients will be known through a questionnaire applied to 90 persons (a random sample from the file), in home visits. The sample include 61% men and 39% women, between 15 and 70 years old, living in the metropolitan area of Curitiba. The initial and final degree of disability will be compared, and related to the amount of preventive measures adopted. The data will be submitted to basic statistic treatment, including association test, besides qualitative analysis of significant answers.

## RE19

### THE DANGERS OF UNDERESTIMATING PERMANENT LOSS OF SENSATION

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It is generally accepted that the WHO disability grading is useful only as a measure of how effectively the programme is detecting cases early. It cannot be used for individual patient follow-up.

This being so, is the WHO causing leprosy workers to underestimate the importance of permanent loss of sensation by calling it Grade 1, compared with, for example, a mobile claw hand which is Grade 2?

In order to determine what happens to patients with Grade 1 disability, 200 patients who were diagnosed in 1987 and 1988 (before the 10gm filament was used) are being followed up by the ALERT Leprosy Control Programme on a 'one-off' visit. The condition of the feet and the hands and any history of ulcers are noted.

The hypothesis being tested is that a two grade disability scale would be more useful. "Presence of Disability" means loss of pressure sensation or any visible disability. "Absence of disability" means no disability or loss of light touch sensation only.

The results of the study will be discussed.

## RE20

### THE DEVELOPMENT AND ADAPTATION OF THE SEMMES-WEINSTEIN LIGHT TOUCH/DEEP PRESSURE SENSORY TEST IN BRAZIL

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The purpose of this paper is to demonstrate the complexities of adapting technology and developing the sensory testing technique of the Semmes-Weinstein (S-W) monofilaments in Brazil to enable early detection and monitoring of peripheral nerve function in Hansen's disease (Hd). The adoption and diffusion of this innovation involves: identifying and understanding attitudes, knowledge, and beliefs about sensory testing; developing the ability and skills of the testers using the sensory testing instruments; making access to materials and equipment available for sensory testing; and gaining support of governmental and non-governmental agencies and local professionals and experts in decisions to adopt, produce, and teach new sensory testing techniques.

This history of adoption and implementation of the use of the S-W monofilaments in Brazil follows the sequence described in adoption and diffusion theory of innovations. This theory shows how behavior changes

over time and the stages through which new innovations are adopted by individuals and society.

In conclusion, the authors note the sensory testing instrument produced in Brazil facilitated the utilization of the S-W sensory testing technic. It proved to be more accessible, durable, portable and practical in meeting the local needs. Its availability increased health care worker awareness and desire to want and use better sensory testing technology to prevent disability. As a result sensory testing techniques improved, facilitating patient evaluation and treatment and lessening disability.

## RE21

COMPARISON OF SENSORY RESULTS OF THE THERMAL TESTER AND THE SEMMES-WEINSTEIN LIGHT TOUCH/PRESSURE IN PERSONS WITH HANSEN'S DISEASE AND WITHOUT KNOWN DISEASE

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Two sensory modalities tested in Hansen's disease have been heat/temperature and light touch/pressure sensation. Results of test using these modalities have been discredited because instrumentation or methods used in field testing have been shown to be variable and not repeatable in the hands of different testers. Two instruments which have been developed that are simple, consistent and repeatable by others are the Thermal Tester sponsored by WHO and the Semmes-Weinstein (S-W) monofilaments. The electric heat tester and the monofilaments were used in field trials to compare the ability of the two systems to detect early sensory loss and to determine which single sensory modality would be most effective for use in the field.

Ninety persons with Hansen's disease were tested in pre-selected sites on both hands and feet and skin patches with both instruments. Sixty-one persons with no known disease were tested with both instruments in the same pre-selected sites on both hands and feet. Both groups were analyzed separately.

The results demonstrate a significant difference between the findings of both sensory tests. The S-W monofilaments were more sensitive in detecting and quantifying early sensory loss related to peripheral nerve involvement. The Thermal Tester detected a more gross loss of sensation and was influenced by increased skin keratin layer and battery power.

## RE22

RELIABILITY OF MANUAL MUSCLE STRENGTH TESTING IN THE EVALUATION OF PERIPHERAL NERVE DYSFUNCTION IN LEPROSY PATIENTS.

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Manual muscle strength testing is one of the most commonly practiced evaluation techniques in the assessment and evaluation of peripheral nerve dysfunction in leprosy patients. The results of manual muscle strength testing often determine and guide decisions regarding pharmaco-therapeutical treatment (e.g. cortico-steroids and other anti-inflammatory drugs), change of anti-leprosy drug therapy, or surgical interventions (neurolysis and tendon transfers). It is therefore important to have knowledge about the reliability of manual muscle strength testing (MMST). Little is known about the reliability of MMST in general and nothing about the reliability of MMST of the intrinsic muscles of the hand.

In 28 leprosy patients with complete or partial damage of the ulnar or median nerve or ulnar and median nerve the strength of nine intrinsic finger muscles was assessed manually. Muscle strength testing was assessed for one hand only and the testing was performed by two examiners.

The following strength tests were performed:

- Abduction and adduction of the little finger;
- Abduction of the index finger;
- Abduction and opposition of the thumb;
- "Intrinsic" strength test for the four radial fingers.

Testing was performed according to a standardized protocol and grades were given independently by the examiners using the Medical Research Council Scale

(grades 0-5). One examiner performed the strength tests again on the third day following the first examination. The reliability coefficients ranged from .84-.99 for both the inter- and intratester reliability. In the presentation it will be explained why the strength testing, testing positions and point of application of resistance, deviate from the 'classical' strength tests of the intrinsic muscles of the hand. Guidelines and suggestions for further research into manual muscle strength testing of the intrinsic muscles of the hand will be given.

## RE23

INTER-OBSERVER VARIABILITY IN THE ASSESSMENT OF NERVE FUNCTION IN LEPROSY PATIENTS IN ETHIOPIA AND NEPAL

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One of the major problems in leprosy is to detect early enough changes in nerve function so as to increase chances of recovery and prevent disability. Several tests have been developed to evaluate and measure nerve function and it is extremely important that their results are comparable, especially when performed by different workers on different occasions. We studied inter-observer variability of sensory testing (ST), using a set of nylon monofilaments (NF) and a ball-point pen (BP), of voluntary motor testing (VMT) and also of the assessment of clinical signs of neuritis in leprosy patients, in Ethiopia and Nepal. Duplicate measurements were performed in random order on 50 leprosy patients by two physio-technicians (PT) and recorded using pre-determined scoring scales. In addition, duplicate measurements were performed on 50 similar patients by two para-medical workers (PMW) in Ethiopia.

Observers are compared by plotting for each test the differences in measurements against their mean and calculating the limits of agreement. Proportions of agreement are examined with various criteria. Systematic bias between observers is estimated with matched paired t test. Repeatability and reliability are calculated for each test.

Although comparability depends upon measurement scale, it is found that VMT (MRC scale) is the least variable between observers for all tested nerves except the facial nerve, when performed either by physio technicians or by para-medical workers (72% to 98% complete agreement). The assessment of neuritis signs is extremely variable between observers (complete agreement: 14% to 41%), with a systematic bias and a large spread of values around the mean. For nylon filaments and ball-point pen, inter-observer variability depends upon the type of observer (PT or PMW), the site of test and the status of the patients. When performed by PMWs, agreement between observers appears better for BP (73% to 92% complete agreement) than for NF (35% to 53%), partly explained by the use of a different scale. When tests are performed by PTs, the pattern is less clear, with 32% to 58% complete agreement for NF and 71% to 80% complete agreement for BP. The mean difference in scores vary according to the site of the test, and there is a systematic bias in either direction depending upon the observer. Implications of these findings are discussed with the view to improve comparability for an early detection of nerve damage.

## RE24

RELATIVE SIGNIFICANCE OF ABD.DIG.MIN.  
PALM. INTER, AND 1ST DOR.INTER,  
WITH REGARD TO DETECTION FOLLOWUP,  
EVALUATION OF ULNAR NERVE DAMAGE

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and K.Uday Kiran

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In patients with ulnar nerve damage instead of testing all the muscles in the hand for convenience, simplicity and field use it is commonly agreed to test the muscles ADM, 1st D.I. In most cases these muscles are sufficient for detection and follow up. We have studied an additional muscle in 50 cases, Palmar interossei of the little finger - adductor of the little finger. This was found to be involved earlier than the other muscles and better suited for detection but has certain disadvantages for follow up. Whereas the other two muscles were suitable for detection and evaluation, provided the trick movements are avoided. Necessary precaution taken be mentioned in this regard. We feel that this additional muscle testing may be helpful in the field for early detection and hence be recommended since it is simple.

This muscle belly is small and cannot be seen as compared to 1st dorsal interossei. Hence the gradient of the muscle on MRC scale is not possible for grading.

**RE25****LATE RESPONSES IN TUBERCULOID LEPROSY**

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A study of late responses (F-wave and H-Reflex) of posterior tibial nerve was done in 25 patients of freshly diagnosed tuberculoid leprosy and data were compared with 15 normal persons which served as control.

F-wave latency was delayed in 18 patients (72%, mean  $\pm$  3SD = 54.34  $\pm$  16.04 msec,  $t=7.21$ ,  $p < .001$ ) and F-wave conduction was prolonged in 20 patients (80%, mean  $\pm$  3SD = 38.72  $\pm$  12.84 m/sec.,  $t=7.66$ ,  $p < .001$ ) showing significant involvement of alpha motor axons as F-wave is produced by centrifugal discharges from individual neurons each of which is initiated by antidromic axonal volley.

H-Reflex latency was delayed in 12 patients (48%, mean  $\pm$  3SD = 31.93  $\pm$  4.44 msec,  $t=5.54$ ,  $p < .001$ ) and H-Reflex conduction was prolonged in 4 patients (16%, mean  $\pm$  3SD = 49.33  $\pm$  7.35 m/sec.,  $t=4.46$ ,  $p < .001$ ) showing involvement of H-Reflex arc which is a monosynaptic reflex depending on group Ia afferent fibers from muscle spindles and alpha motor axons.

Late responses were deranged regardless of clinical involvement of posterior tibial nerve, thus study of late responses is an important tool in evaluating nerve damage in early stages of tuberculoid leprosy.

**RE26****MONITORING OF PERIPHERAL NERVE INVOLVEMENT UNDERLYING DISABILITY OF THE HAND IN HD: A SEVEN YEAR FOLLOW-UP IN A U.S. POPULATION**

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This study expands upon traditional disability measurement to include, as simply as possible, direct measures of peripheral nerve involvement of the hand in a U.S. patient population. Patients treated in the National Ambulatory Hansen's Disease Program, and the Gillis W. Long Hansen's Disease Center were given standard hand screens based on that developed in the Hand and OT Department at the Center beginning in 1984. 4,000 evaluations are reviewed. Patient data is reviewed in two-year intervals for frequency and severity of peripheral nerve involvement as compared with disability, and for progression/regression in function of patients on subsequent exams. Particular attention is given to patients who had zero disability at the time of beginning antileprosy medication treatment. Results show a number of patients continue to have peripheral nerve changes during treatment, that patients who change in peripheral nerve status more often become worse than improve, that peripheral nerve involvement and disability of the hand continue to occur across the disease spectrum, that the frequency of peripheral nerve involvement in the U.S. although slightly less than in patients seen at the GWLHDC is as high as over half of the patients measured, and that some patients who were normal by monitoring measures on initial treatment later develop peripheral nerve complications. These findings underline the need for such measures in HD populations, and for continued research into treatment capable of reducing the peripheral nerve involvement common in the disease, in particular loss of sensory and motor function of hands.

**RE27****SEMME-WEINSTEIN MONOFILAMENT DETECTION THRESHOLDS: A COMPARATIVE STUDY**

Judith Bell-Krotoski and Val Coor

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Semmes-Weinstein monofilaments have been found to be repeatable within a small standard deviation relative to other sensory testing instruments, making this test an optimum choice for an objective sensory test. Normal sensory detection thresholds for the entire body have been established by Weinstein for the test. The stimuli force produced by the filaments was originally tested by Weinstein. He found a nylon filament of .005 inch diameter, 38 mm in length, produces a mean force of 68 milligrams, and is predictive of normal for the hands and most of the body. However, manufacturers of the nylon filament material accept an 8-10% tolerance in diameter when making filaments. This small change in diameter results in a small variation in force among filaments of a given size. It has not been previously determined what effect this small variance in force makes on accuracy of the .005 inch filament to detect normal thresholds. This study compares the 2.83 (index number) filament available through the Gillis W. Long Hansen's Disease Center (mean of 60 mg) with those from North Coast Medical (mean of 95 mg). These along with heavier and lighter filaments of measured force are used in a standard testing protocol for hands, arms, face, legs, and feet in 100 subjects by 6 examiners. Results show little difference in the two 2.83 filaments, and confirm this filament a good predictor of normal for most of the body. It is suprathreshold for the face, making use of a lighter filament possible, and subthreshold for the plantar surface of the foot which requires a slightly heavier filament for normal threshold detection.

**RE28****MONITORING PERIPHERAL NERVE INVOLVEMENT DURING REACTIONS**

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Reduced sensibility and muscle function is common in Hansen's disease especially in patients experiencing reactions. Monitoring sensory and motor status is important in establishing a baseline and for monitoring worsening or improvement in patients under treatment. The Semmes-Weinstein Monofilaments are an objective measurement device used to map sensation in the hands and feet. The resulting map provides a visual diagram of the level of sensation. Mapping is combined with the manual muscle test of intrinsic hand musculature. Repeating sensory and motor evaluations at regular intervals during the treatment of reactions provides feedback on the effectiveness of treatment including anti-inflammatory medications etc. in reducing the changes in function. Three case studies are presented. The first shows a patient experiencing reaction with normal sensation that remains normal throughout treatment. The second is a patient who has a loss of sensation in the ulnar nerve distribution without improvement under drug therapy. The third patient demonstrates varying levels of sensation as prednisone and thalidomide dosages are increased and tapered. This paper discusses the use of an objective repeatable technique to track improvement and degradation of sensory and motor function which can be directly compared with treatment during reactions in Hansen's disease.

**RE29****NYLON FILAMENT MEASUREMENTS IN LEPROSY PATIENTS AND NORMAL SUBJECTS IN THAILAND**

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Gillis W. Long Hansen's Disease Center, Carville, LA, USA

Semmes Weinstein filament measurements were made on the hands and feet of 112 normal subjects and 25 leprosy patients at the McKean Rehabilitation Center, Chiangmai, Thailand to determine reliability and normal thresholds. In 64 normal subjects occupation was rated on a 3 point scale for degree of physical activity. Testing was also made on 34 patients with a known history of ulceration to obtain hand and foot injury thresholds. Between tester and between session reliability was found to be

high (ICC = .88 - .93) for all sites tested. Statistical analysis showed normal filament thresholds were significantly related to age ( $p < 0.002$ ) and occupation ( $p < 0.001$ ). Subjects who performed heavy and medium work had significantly higher sensory thresholds than subjects engaged in light work. Normal filament thresholds are presented for five sites in the hand and foot, for subjects under 50, and over 50 years of age. Injury thresholds based on a history of ulcerations in 30 feet and 24 hands are also presented.

Results demonstrate the reliability of nylon filament testing in a field setting. In this study age and the physical nature of occupations significantly increased normal threshold values. Care should be taken in interpreting sensibility tests based on normative data.

### RE30

IDENTIFICATION OF PERIPHERAL NERVE DAMAGE IN HANSEN'S DISEASE AND ITS IMPLICATIONS FOR CONTROL PROGRAM MANAGEMENT

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Peripheral nerve (PN) damage is the primary cause of disability and deformity in Hansen's disease. Disability and deformity are the visual reminders to society that the individual has had the disease.

This study included 85 patients on MDT at Citrolândia Health Center in Betim, Minas Gerais-Brazil from February 1987 to May 1990. The study analyzed all patients with more than 2 exams by February 1992. The study analyzed the first and last upper extremity exams of peripheral nerve (PN) involvement and compared them with the World Health Organization (WHO) Disability Grade.

Results demonstrated that 91% had PN involvement in the beginning compared to 26% with WHO disability. Of those with no WHO disability, 88% had peripheral nerve involvement in the beginning which significantly decreased to 51% with PN involvement at the last evaluation. The authors concluded that individuals with PN involvement were at high risk of permanent disability if nerves were not monitored and if adequate treatment was not provided for neuritis and reactions. Adequate abbreviated base-line neurological exams and periodic monitoring demonstrated that permanent disability and PN damage could be avoided or lessened. In this study the WHO disability grading showed an inadequate ability to identify and monitor persons at risk. It also underestimated resources needed for prevention of disability control programs.

### RE31

ASSESSMENT FOR QUIET NERVE PARALYSIS IN FIELD

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A seven grade scale for nerve damage status (grade-0 indicating no evidence of damage and grade-6 indicating complete sensorimotor paralysis) was developed and tested in the field. Reproducibility of the technique could be improved to 82% with experience and training.

12 contiguous villages, with a population of 25,000 was the study area, and 246 patients needing treatment were identified. 64 (26%) of them were found to have thickening of one or more nerve trunks.

Nerve thickening was found to be primarily a male gender related problem. Multiple nerve trunk thickening was primarily an adult male problem. 58 (91%) of the 64 patients with nerve trunk thickening had some evidence of nerve trunk damage. Most of

the thickened nerve trunks (95% or 144/152) showed evidence of damage. About half of the 238 non-thickened nerve trunks also showed evidence of damage.

In leprosy patients having one or more thickened nerve trunks, other nerve trunks also must be assessed for evidence of nerve damage. Our studies also show that in patients without any thickened nerve trunks, risk of nerve damage is extremely low.

### RE32

QUIET NERVE PARALYSIS ASSESSMENT WITH RESPECT TO MDT AND CORTICOSTEROID THERAPY

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CJIL Field Unit (Indian Council of Medical Research), 271 Nehru Bazaar, Avadi, Madras 600 054, India.

Observations reported here are based on prospective field studies for evaluating the seven grade Quiet Nerve Paralysis (QNP) assessment scale. Nerve damage status was assessed in 187 nerve trunks of 24 patients before putting them on Multi Drug Therapy (MDT), and again 3 months later. Variability data on the status of nerve damage was obtained through a parallel study on comparable 272 nerve trunks. After MDT, in most cases there was no change in nerve damage status while there was deterioration in a small though statistically significant number of nerve trunks.

From another group of 64 patients with thickened nerve trunks, from 12 villages with 25,000 population, 31 patients were allotted for MDT along with oral corticosteroids for three months; and another comparable group of 25 patients was given only MDT. All patients were reassessed for nerve damage at the end of three months. Of the 31 patients belonging to the first group, steroids could not be administered in 13 because of contraindications, and 6 patients were irregular. Observations on the remaining 12 regular patients did not suggest any role for steroids in preventing or correcting quiet nerve paralysis.

### RE33

A STUDY ON FACTORS INFLUENCING THE RECOVERY OF MOTOR NERVE FUNCTION WITH STEROID THERAPY

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This Non concurrent prospective study was conducted on leprosy patients receiving steroid therapy for motor nerve paralysis during the period 1988-91. Patients received 30 mg prednisolone daily during the period 1988-89. Due to a policy change, patients received 45 mg daily during the period 1990-91.

Of the 61 patients, 36 received 30 mg and 25 received 45 mg. 44 were males and 17 were females.

In both groups the dosage was reduced by 5 mg. once in 2 weeks. The patients were assessed by voluntary muscle testing once in 2 weeks. The effect of the duration of muscle paralysis at diagnosis and muscle power at the first visit, on recovery rate were also studied.

There was a significantly higher recovery rate in those who had been administered 30 mg prednisolone daily. The recovery rate was significantly higher when the muscle power at the first visit was greater than grade 3. There was a

greater chance of recovery if the duration of paralysis was less than 3 months. The preliminary findings suggest that higher dosage of steroids do not increase the recovery from muscle paralysis among leprosy patients.

### RE34

THE NATURE AND THE LOCATION OF PERMANENT DAMAGE TO PERIPHERAL NERVES IN ADVANCED TREATED LEPROSY

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Neuropathological observations in leprosy are usually confined to cutaneous sensory branches. The few reports on nerve trunks in leprosy, of invariably active cases, give little or no account of nerve regeneration. However, in treated leprosy, we had previously observed large-scale nerve regeneration at the 'predilective damage sites' of nerve trunks. The regeneration, which followed the decrease of inflammation, was functionally ineffective.

In order to characterize the permanent damage to and the regeneration in peripheral nerves of advanced treated leprosy nine full-length nerves dissected from amputated legs of leprosy patients were studied. All patients (2 BT, 3 BL and 4 LL cases) had lost sensation 10-40 years ago and they were released from antileprosy treatment. The main histological findings included: 1. The resection line in the posterior tibial nerve showed numerous regeneration clusters. 2. The regenerating axons persisted for decades. 3. The numbers of Schwann cell processes and regenerating axons decreased centrifugally and were inversely proportional to the endoneurial fibrosis. 4. The dermal nerves and superficial sensory endings were destroyed beyond recognition. 5. The sural nerve was transformed into a fibrotic cord.

Conclusions: 1. Irrespective of the original classification, the leprosy nerve damage was most severe at the dermal level and decreased centripetally. 2. The total destruction of the distal neural elements was responsible for the ineffectiveness of the nerve regeneration observed proximally. 3. The sural nerve was not representative in advanced leprosy. 4. The present study also contributed to the understanding of the spreading of leprosy in peripheral nerves.

This work was supported by LEPRO grant No. 471/M.

### RE35

CLINICAL ASSESSMENT OF EARLY LEPROUS NEUROPATHY WITH ELECTROPHYSIOLOGIC CORRELATION

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This report describes the neurological and electrophysiological examination of 35 subjects with early leprosy (average duration of symptoms 3.4 years, average time since diagnosis 6 months). Clinical examination in the distribution of bilateral median, radial and ulnar nerves was performed with the following clinical modalities: Nerve palpation (NP), manual motor testing (MMT), pressure sensation with 0.05 gm. monofilaments (PS) and thermal sensation with a thermal sensitivity device (TS). 59% of ulnar nerves had abnormality of at least one of the four tests versus 53% of radial nerves and 31% of median nerves. NP was the most frequent clinical abnormality for all nerves. Leprosy cases were grouped into minimal, moderate and severe neuropathy categories based on the number of abnormal nerves, and the number of abnormal modalities for each nerve. Thirteen (37%) had minimal neuropathy, 16 (46%) moderate and 6 (17%) severe neuropathy.

Unilateral electrophysiologic studies were performed on the leprosy subjects and 32 age matched normal subjects. Abnormal or absent responses were found in 54% of ulnar sensory, 37% ulnar motor, 37% radial sensory, 29% median sensory and 20% of median motor responses among the leprosy subjects. Low sensory amplitudes and drops in amplitude and NCV over the across-elbow segment of the ulnar nerve were the most important findings. Both clinical and electrophysiologic abnormalities were positively associated with duration of symptoms, but not with age or type of leprosy. The four clinical modalities were compared by cross-tabulation with the electrophysiologic data. This yielded the

following overall positive predictive values: TS= 95%, PS= 92%, MMT= 84% and NP= 70%. Overall negative predictive values were: NP= 75%, PS= 71%, TS= 69%, MMT= 66%. An index for rating diagnostic tests showed the thermal sensitivity device and monofilament pressure sensation testing to have nearly equivalent accuracy in predicting electrophysiologic abnormalities. Both were superior to NP and MMT as tools to identify neurofunctional deficits in leprosy.

### RE36

A LONG-TERM OBSERVATION ON THE EFFECT OF TENDON TRANSPLANT OF THE POSTERIOR TIBIAL MUSCLE IN THE CORRECTION OF FOOT DROP OF LEPROSY

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A 4-15 year observation on the effect of tendon transplant of the posterior tibial muscle through the subcutaneous tube or through the interosseus membrane in correcting 37 foot-drops of 35 leprosy patients was reported. The recent results of the above mentioned two kinds of surgical procedures were satisfactory. The long-term effect of 30 footdrops which were corrected by transplanting tendons ended and fixed at the foramen of the intermediate or lateral cuneiform bone remained satisfactory ("excellent" in 15, "good" in 13, "improved" in 2) for a stronger contractility of the transplanted tendons, as regards the results of those corrected by transplanting tendons which were ended and fixed at the tendon of the anterior tibial muscle, the results of the first 4-10 year observation were "good" in all 7 foot drops corrected, but their results changed to "improved" in 3 and "no effect" in 4 cases 9-15 years after the correction due to the relaxation of the tendons transplanted. The longer the post-operation time, the more serious were the complications. In the 37 feet treated, there were 4 feet with plantar ulcers, 5 with shortened toes, 1 with arch reversed, 1 with joint problem and 6 with claw toes during the period of the first 4-10 year observation, but there were 14 feet with plantar ulcers, 10 with shortened toes, 4 with arch reversed, 2 with joint problem and 9 with claw toes during the 9-15 year observation. Some cases of them suffered from a combination of several kinds of deformities.

The importance of regular follow-up, health education of self care for patients and implementation in self care through out the life time was emphasized. The author suggested that the method of tendon transplant of the posterior tibial muscle ending and fixing at the tendon of the anterior tibial muscle was only suitable for patients of old age with low labour intensity.

### RE37

TENDO-ACHILES LENGTHENING ALONG WITH TIBIALIS POSTERIOR TRANSFER FOR CORRECTION OF FOOT-DROP - A FIVE-YEAR FOLLOW UP

Lobo D, Chellam P, Arulprakasam P, Kamala.

Tibialis Posterior Transfer is the routine procedure for the correction of FOOT-DROP due to common peroneal nerve damage in Leprosy. If done, correctly, it gives good results with a good range of movement and satisfactory gait.

However, we have observed that in due course, the action of the transfer tendon weakens and the foot reverts to plantar-flexion because of the powerful Tendo-Achilles muscles acting against the transferred Tibialis Posterior.

In order to avoid this problem, we have routinely performed a Subcutaneous Lengthening of Tendo-Achilles simultaneously with Tibialis Posterior Transfer. It facilitates additional range of dorsi-flexion and weakens Tendo-Achilles, thus preventing its counter-action.

A follow-up of SEVENTY ONE (71) patients who underwent the combined procedures in our Centre from 1984-1988 is presented using the following parameters:

- Range of dorsi-flexion
- Gait

The advantages/disadvantages of the procedure are discussed.

**RE38**

"TRAC OPERATION" - A NEW TECHNIQUE FOR RECONSTRUCTION OF TRANSVERSE METACARPAL ARCH ALONG WITH CORRECTION OF ULNAR CLAW HAND

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The lesions of leprosy in the ulnar nerve at elbow level tend to paralyse the intrinsic musculature and produce characteristic deformity in ring and little finger which is called ulnar claw hand. The procedures aimed at correction of such claw disregard the movement of transverse metacarpal arch which is essential for pulp to pulp pinch action of thumb and little finger as well as cupping of the hand required for eating rice or making a bolus of food. More often it is not possible to attain these functions by tendon transfer because of its straight line of action. Some surgeons have attempted to correct this anomaly with varying results. The author has devised a new technique by modifying "lasso" procedure using ulnar slip of flexor superficialis to attach it to the Abductor Digiti Minimi at the base of the proximal phalanx. Thus the flattened transverse metacarpal arch is corrected and protraction movement occurs as in normal hand.

The technique in detail and results will be presented.

**RE39**

EXTERNAL FIXATORS & DISTRACTORS IN LEPROSY. Vimala Dermatological Centre, Bombay, India

A. Salafia, G. Chauhan

Soft tissue contractures in the hand are usually overcome with POP casts, skin grafts, flaps, dynamic splints. However, contracture of volar capsule is not easily corrected by these methods. For the last two years we are using the external fixators and distractors devised by Dr. B. B. Joshi (used in cases of fractures) in: (1) Fixed flexion deformity of PIP joints: to release soft tissue, including capsule, contracture. (2) Thumb paralysis with fibrotic adductor. (3) After sequestrectomy of fingers or toes, to keep temporary the normal length, till further surgery is done. (4) In wrist drop correction, after bone grafting, to keep the wrist in extension. The advantages are: (1) Lengthening of all tissues, including neurovascular bundle, is achieved gradually over a period of 3-4 weeks. (2) The volar capsule resistance is easily overcome without surgery & risks of joint damage. (3) In cases of first web contracture the distractor keeps the thumb in the desired position while preventing the split adductor from re-uniting. (4) The fixators can be inserted under local anaesthesia, with minimal or no trauma. (5) As the distractor completes a full rotation a 1mm lengthening is obtained and the desired results are achieved in 3-4 weeks, as against the usual 2-3 months required by POP casts or physiotherapy. Results: out of 36 fingers/thumbs operated so far, 29 had excellent results (i.e. PIP at 180°, thumb in full opposition), 3 had good results; 2 fingers had pin-track infection; in 2 cases the fixators came out after 2 weeks, however good results were achieved by that time. We feel that external fixators and distractors can and should be used more frequently in leprosy.

**RE40**

CORRECTION OF CLAW HAND AND RESTORATION OF METACARPAL ARCH BY INTRINSIC REACTIVATION

LONG TERM FOLLOW-UP STUDY IN 158 HANDS

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Clawing of fingers due to ulnar paralysis in leprosy patients is often associated with either flattening or reversal of distal transverse metacarpal arch. Restoration of this arch is necessary to facilitate cupping of palm. In order to correct both these deformities, intrinsic reactivation procedure with insertion of five tails of the motor into interossei and hypothenar tendons was performed in 238 hands at this centre since 1977. 158 of these hands were followed up for periods ranging from 1 year to 13.5 years (mean 4.5 years). The results were as follows: Appearance was good in 60.4%, fair in 18.2% and poor in 21.4%. Function was good in 70.4%, fair in 23.4% and poor in 6.2%. Fist closure was good in 81.9%, fair in 14.1% and poor in 4%. Restoration of distal transverse metacarpal arch was good in 78.5%, fair in 13.4% and poor in 8.1%. The reasons for poor results were analysed and suggestions for better results recommended.

**RE41**

CORRECTION OF CLAW FINGERS BY LASSO PROCEDURE IN HANSEN'S DISEASE

Dr. M. K. Siddalingaswamy, Dr. K. S. Rao

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Lasso procedure (Zancolli) is a combination of dynamic and static principle. In this technique the transferred tendon is attached to proximal pulley (A<sub>1</sub>) under proper tension. This transfer helps in preventing hyper extension of metacarpophalangeal joint and initiates flexion of proximal phalanx during flexion of fingers. From March 1987 to June 1992, 135 hands were corrected by this procedure at Central Leprosy Teaching and Research Institute, Chengalpattu, India. Out of which 113 patients came for post operative follow up varying from 6 months to 5 years. Left hand in 53 and Right hand in 60. Age of the patient varied from 11 to 60 years. Deformity and function of the hand was assessed pre and post operatively. Correction of deformity was good in 99, fair in 12 and poor in 4. Functional improvement was good in 64, fair in 45 and poor in 4. Direct Lasso was done on 109 hands and Indirect Lasso on 4 hands. The complications were Swan neck deformity in 5 hands and infection in 5 hands. The correction failed in four hands. One due to severe infection and the other three may be due to stretching of the transferred tendon. The results of the procedure were better (97% satisfactory) compared to other tendon transfers (70%). The procedure is simple, complications are less and reeducation is easy.

**RE42**

INTRA OCULAR LENS IN LEPROSY

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Intra Ocular Lens has been accepted as the best method of rehabilitation for aphakia. Though it is known that simple cataract extraction is well tolerated in Leprosy, one is not sure whether the same is true with Intra Ocular Lens. There is no specific report in the literature about this aspect. This paper describes our experience with 20 Leprosy cases. Both Lepromatous and Tuberculoid type were included in the study. Out of the 20 cases 9 were active cases with Bacillary Index ranging from 0.7+ to 3.3+. In Lepromatous Leprosy 7 patients had Erythema Nodosum Leprosum reaction at the time of surgery. Five of these were treated with Thalidomide. Patients were followed up for a maximum period of 5 years. Visual recovery, Post-operative complications and their management are discussed.

### RE43

#### 1. DENATURED MUSCLE AUTOGRAFTS IN PERIPHERAL NERVE REPAIR - SURGICAL TECHNIQUE

JH Pereira, Jill Curtis and JL Turk  
Royal College of Surgeons of England, Lincoln's Inn Fields,  
London WC2A 3PN, UK.  
DD Palande, A Subramanian and TS Narayanakumar  
Sacred Heart Leprosy Centre, Kumbakonam, Thanjavur District,  
South India 612401

Denatured muscle autografts for peripheral nerve reconstruction is a novel technique, that has proved useful in the repair of traumatised nerves, and has now been adapted for use in leprosy nerve trunk damage. Localized lesions in the median nerve, at the wrist, and the posterior tibial nerve, at the ankle, were excised in carefully selected patients, and the nerve gap repaired with a muscle graft. The details of the surgical technique will be described.

Results of clinical trials in South India and at ALERT will be described in the accompanying papers.

### RE44

#### 2. DENATURED MUSCLE AUTOGRAFTS IN PERIPHERAL NERVE REPAIR - RESULTS ON LEPROSY PATIENTS

JH Pereira, Jill Curtis and JL Turk  
Royal College of Surgeons of England, Lincoln's Inn Fields,  
London WC2A 3PN, UK.  
DD Palande, A Subramanian and TS Narayanakumar  
Sacred Heart Leprosy Centre, Kumbakonam, Thanjavur District,  
South India, 612401

Autologous muscle grafts were used to repair 41 mixed peripheral nerves (8 median, at the wrist, and 33 posterior tibial, at the ankle) in 32 leprosy patients, who had total anaesthesia and analgesia of the area supplied by the nerve. The aim was to assess the effectiveness of this technique in restoring protective sensation to such patients. The study has been in progress since November 1989, and the current clinical results will be presented. Follow-ups of 3 to 36 months indicate that the progress in sensory recovery, after grafting, is slow, but encouraging, particularly in the recipients of grafts in the median nerves.

### RE45

#### REPLACEMENT OF THE MAIN SENSORY NERVES OF HANDS AND FEET IN LEPROSY PATIENTS WITH FREEZE-THAWED MUSCLE AS GRAFT MATERIAL.

Roland Kazen, Tivadar Miko, Connie le Maitre, Zewdu Kebret.

All Africa Leprosy and Rehabilitation Training Centre, Addis Ababa, Ethiopia.

Autologous nerve graft material for leprosy patients has previously not been available since conventional graft material in most cases has been affected by the disease. A method of using autologous freeze thawed muscle is now available.

To study the possibility of restoring sensation of the palm of the hand and the sole of the foot of treated leprosy patients with total loss of sensation, 13 patients had 19 nerves (18 Post. Tibial and 1 Median) resected and replaced with freeze thawed autologous muscle grafts. The myelinated axon population at the upper and lower resection line was assessed per-operatively on frozen sections.

Pre-operative assessments and 3 monthly reviews, including tests for Tinel's sign, pain, light touch, 2-point discrimination (static and moving), temperature, vibration, joint position, sweat, texture discrimination and NCV, were made. Longest observation time was 28 months. Graft length between 45 and 90 mm.

In all grafted nerves the Tinel's sign has migrated past the distal end of the graft. Return of sensation for vibration, weighted pins and sweat function have been observed. Subjective remarks such as 'beginning to feel the ground' and 'getting less ulcers' have been observed.

The results are displayed and discussed.

### RE46

#### NEUROLYSES ET DECOMPRESSIONS NERVEUSES

Raymond Bernardin, Thomas Bernan

Institut Cardinal Leger contre la lepre (HAITI)

Etude de 162 cas de decompression et neurolyse pratiques a l'Hopital Cardinal Leger de Sigouneau Haiti.

Essai de classification anatomo-clinique.

### RE47

#### RESULTS OF ULNAR NERVE DECOMPRESSION IN LEPROSY PATIENTS

Marcos Virmond, Lucia Camargo, Stella Almeida and Frank Duerksen

The ulnar nerve is the most commonly involved nerve in leprosy leading to clawing of the fingers, instability of the thumb pinch and lack of sensation in the hand. Although clinical treatment of ulnar nerve neuritis with steroids is of some help, the peculiar anatomical condition of this nerve in the elbow calls for surgical release to achieve full management of this condition.

Tirty leprosy patients with ulnar nerve involvement previously treated with steroids were submitted to ulnar nerve decompression at the elbow, including opening of the Osborne's ligament and epireurotomy. The results were assessed by means of progressive Semmes-Weinstein monofilaments test and VMT. The conclusion is that surgical decompression of the ulnar nerve is valuable in most cases of ulnar nerve neuritis.

**RE48**

RECOVERY OF SENSATION BY NERVE DECOMPRESSION  
USING SELECTIVE MESHING OF THE EPINEURIUM.

Kentarō Hatano, Aprue Mong, Philomena Commons,

Christian Leprosy Centre Chandraghona, CTG,  
Bangladesh

Following the presentation by W.J.Theuvenet et.al. at the 13th International Leprosy Congress on nerve decompression by selective meshing of the epineurium, 125 cases of Posterior Tibial nerve decompression have been performed.

Recovery of sensation of the plantar surface of the foot was observed as follows :

- 24% : Good improvement
- 43% : Moderate improvement
- 32% : No improvement

We also noted a decrease in the frequency of hospital admission for ulcer care in many of these cases.

We believe that this operation should be considered a standard procedure for the anesthetic foot.

**RE49**

NEWER TECHNIQUES FOR RESURFACING THE PLANTAR ULCERS

Atul Shah

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With the advances in plastic surgery the plantar ulcer defects in leprosy no longer should remain an enigma to surgeons dealing with the same. The newer techniques applied by author are (a) reconstruction of heel defect by flexor digitorum brevis myocutaneous flap (1985), (b) neurovascular island pedicle flap for 1st and 2nd metatarsal head ulcers (1990). (c) retrograde medial plantar artery island flap (unpublished) for ulcers on 3rd, 4th, 5th metatarsal head or the lateral aspect of the sole of the foot.

From a series of 53 cases operated 15 for (a) 35 for (b) and 3 for (c). The inference of benefits and drawbacks of each technique is derived. The details of surgical techniques and results will be presented.

**RE50**

A TEN-YEAR OBSERVATION ON THE CURATIVE EFFECT OF SURGICAL OPERATIONS FOR CORRECTION OF LEPROSY DEFORMITIES --- A REPORT OF 86 CASES

Niu Songlin☆ Li Futian△ Xu Shicai☆ Liu Kewu★ Zhang Xiaobo☆

☆ Anhui Provincial Institute of Dermatology and Venereology, China

△ Shanghai Zunyi Hospital, China

★ Jiashan County Sishancun Hospital, Anhui Province, China

Several kinds of surgical operation for correction of leprosy deformities performed on 86 cases are reported. The indications and the criteria for curative effect assessment are also discussed. The long-term effect are satisfactory. The authors emphasize the importance of restoration of the function of adductor muscle for the correction of thumb deformities and they believe that the corrections of foot and ankle deformities are important in the treatment of plantar ulcer.

**RE51**

SURGICAL REHABILITATIVE NEEDS OF  
LEPROSY PATIENTS RELEASED FROM CONTROL  
THE KARIGIRI EXPERIENCE

Samuel Solomon, Vijayakumaran P, and Jesudasan K

S L R T C Karigiri, Tamilnadu, India 632 106

The Karigiri Leprosy Control Project, in Tamilnadu, South India, has, since the early 70's, Released From Control (RFC), as cured, about 20,000 leprosy patients. A study was undertaken to evaluate the surgical rehabilitative needs of such patients, and the magnitude of the problem.

Information could be obtained only for 16,601 patients. 56% who were alive, were assessed for their surgical needs, based on a three-tier referral system. The first screening was undertaken by Para-Medical Workers, who then referred 13% for more comprehensive assessment by a physiotherapist, specially trained in line with the objectives of the study. The final review was by a Surgeon, who then decided the type of surgical intervention, if required.

To our surprise, only about 15% of these patients actually required surgical assistance. Again, of those who were identified as requiring surgery, only a small proportion actually felt they needed it, since they had adapted themselves fairly satisfactorily, to living with the disability. Cured leprosy patients do not come under the purview of routine leprosy control activities. It would be best to provide for their needs in the regular programme itself. However, since the magnitude of the problem is actually fairly small, one must aim for an equitable distribution of available resources.

**RE52**

CORRECTION OF MILD AND MODERATE SADDLE NOSE DEFORMITY IN  
LEPROSY BY ONE STAGE PROCEDURE

Malaviya,GN and Husain,S

Central JALMA Institute for Leprosy, Agra (INDIA)

Leprosy sometimes causes deformities of nose in certain groups of patients where nasal ulcerations and destruction is substantial. One such deformity is saddlenose deformity. The conventional procedures involving acrylic processes are not only cumbersome but the result of correction does not correctly match the nose of facial features. A single stage correction procedure to restore nasal shape for moderately deformed noses involving bone graft has been in practice at Central JALMA Institute for Leprosy, Agra for almost a decade. The results are gratifying with fewer donor site problems. The Osteo-Periosteal grafts from second metatarsal have been used to restore the dorsal crest. These grafts not only ensure better take-up but also a satisfactory moulding and insitu survival for long time.

Over-riding of toe is a post-operative problem which has been tackled by correcting the surgical syndactyly. Plantar ulceration in the donor foot has not been observed. Technical details, clinical results will be discussed supplemented with post operative radiological findings.

**RE53**

EYEBROW RECONSTRUCTION BY MEANS OF A FREE GRAFT TAKEN FROM THE HAIR BEARING SCALP OF LEPROMATOUS PATIENTS

Monica Jeha Maakaroun, Aldemar Vilela de Castro, Joao Afonso Moreira Neto, Fernando Oréfice  
Leprosy Unit - Department of Ophthalmology  
Universidade Federal de Minas Gerais  
Belo Horizonte - Minas Gerais - Brazil

30 missing eyebrows were reconstructed by means of a free graft taken from the scalp. This method appeared to be relatively simple to perform and safe. It was completed in a single stage and didn't require hospitalization. Eight months after each operation we could evaluate the appearance of the patients, the growth of each eyebrow and also the relation between the mode in which the hair bearing skin grafts took to their recipient bed and further growth of the hair.

**RE54**

EVALUATION OF COMMUNITY BASED REHABILITATION FOR LEPROSY PATIENTS IN SOUTH INDIAN EXPERIENCE

DR.G.RAJAN BABU

THE LEPROSY MISSION  
PHILADELPHIA LEPROSY HOSPITAL, SALUR,  
ANDHRA PRADESH, INDIA.

59 Leprosy patients were chosen for community based rehabilitation over a period of four years. These patients are from the Leprosy Control Unit, Philadelphia Leprosy Hospital, Salur, of South India.

The following were the trades:

Vegetable, Flower & Tanning business,  
Tea Stall, Petty shop, Cycle shop, Cart &  
Bullock, Buffalo and Caster Oil production.

The data was collected by interviewing the patients. The interview schedules were prepared after pretesting on ten rehabilitated patients of other Leprosy Control Unit.

The parameters taken for evaluation were marital status, family size, educational level, caste, presence of deformity, income, community acceptance and repayment of loan.

The results of the study will be discussed.

**RE55**

ELIMINATION OF LEPROSY AND ITS COMPLICATIONS: THE CASE OF HAND NEUROPATHY.

M.G.Vergara-Vargas, F.Vega-López, A.Ramos-Figueroa\*, and A.Arévalo-López.

Department of Dermatology and Medical Mycology, National Medical Centre, IMSS, and \*Hand Surgeon, Medical Services, DDF, Mexico.

Ulnar, radial, and median nerve involvement clinically manifest as sensory loss, autonomic and motor dysfunction of the hands are common findings in a high proportion of Mexican patients with leprosy. In specialised centres, up to 70% of the total of cases present symptoms and signs of peripheral neuropathy involving one of both hands. This study was carried out in 100 patients in order to provide

early diagnosis, and therefore, to prevent complications leading to disability and deformity of the hands.

The diagnosis of leprosy was carried out by dermatologists using the Ridley and Jopling criteria. A detailed anatomical map of clinically normal and damaged nerves was used and patients were classified accordingly. Nerve biopsy was taken in a proportion of patients included in this study, and correlation with electromyography and other clinical data was performed. The role of secondary amyloidosis in hand neuropathy was investigated and surgical procedures for hand rehabilitation were performed in cases expected to recover 30% or more by established functional criteria.

Strategies to prevent and treat leprosy complications secondary to neuropathy of the hands, were included in the National Programme aiming at the elimination of leprosy.

**RE56**

REHABILITATION OF LEPROSY HANDICAP BY MODULAN GRIP-AIDS AN EVALUATION

Atul Shah, P Dave, S Kingsley, Neela Shah and R Ganapati

Comprehensive Leprosy Care Project, Leprosy Management Training Centre, Ciba Compound, Diana Cinema Lane, Tardeo, Bombay 400 034, India

Rehabilitation of advanced deformed patients who are beyond the scope of reconstructive surgery is a challenge to scientists and social welfare workers. One of the modality recently employed in "Borsad Model" was 'Modulan' grip aids. The grip aids were provided to 34 patients on 59 articles used for daily living and occupational activities. Detailed evaluation study by a special questionnaire was carried out on 21 patients within the follow-up period of 6 months to 3 years after using the articles with grip aid. The important observations were 90% patient regularly used Modulan grip aids. It not only facilitated the normal grip with crippled hands but also provided protection from pressure, abrasions and heat. The patients could perform activities of daily living and job comfortably and personally without dependance on others. Thus Modulan grip aids improve the quality of life of handicapped leprosy patients by making them not only psychological, physical and economic independence but also help the patients to get fresh grip on life. The grip aids were prepared by leprosy workers trained by physio technician under special deformity care programme of the project. The format of questionnaire and detailed evaluation of the results will be presented with case studies.

**RE57**

INK IMPRESSION TECHNIQUE - A NEW METHOD FOR RECORDING THE IMPROVEMENT IN CLAW HAND

Atul Shah, Neela Shah, S Kingsley and R Ganapati

Comprehensive Leprosy Care Project, Leprosy Management Training Centre, Ciba Compound, Diana Cinema Lane, Tardeo, Bombay 400 034, India

The common problem encountered in the field area deformity care service programme is the unavailability of any simple technique to record the deformity and improvement in claw hand. The improvement in the deformity before and after by any type of intervention whether medical, physiotherapeutic or by reconstructive surgery needs to be assessed by field workers.

The method of measurement of proximal interphalangeal joint angle ie, unassisted,

assisted, contractural angles cannot be taught to leprosy workers in the field area. As well as patient himself may not remember subjectively the partial improvement brought out by any intervention, unless the deformity is completely corrected. It is equally important that leprosy worker is able to gain confidence of the patient by demonstrating that there is gradual but definite improvement.

This technique designed and published by the first author in training series booklet on splintage has been field tested. It was found to be simple and reasonably accurate. Its applicability in field area, advantages, disadvantages and results of field testing will be presented.

### RE58

COMPREHENSIVE PROTECTION EFFECTS ON LEPROSY SOLE ULCER AND SIMPLE SOLE SENSORY LOSS

Xu, Shaomei and Jean M. Watson

Hubei Provincial Health Bureau, P.R. of China

Comprehensive protection measures were taken according to the unitary guidelines of ILEP Sole Wound Study Project. Here is the result of a three-year observation of 47 patients having sole ulcers (64 ulcers in total) and 48 patients having simple sole sensory loss.

Among the 64 ulcers, 54 healed; 1 improved markedly; 4 improved; 2 remained unchanged; 1 worsened; and 2 recurred. The total effective rate is 92.2%; healing rate 84.4%. Of total ulcers, the effective rate and healing rate of 56 simple sole ulcers were 96.4% and 92.9% respectively; the effective rate and healing rate of 8 cases of complicated ulcers were 62.5% and 25% respectively.

Among the 48 cases of simple sole sensory loss, 2 cases of ulcers occurred during the first-year observation with an incidence of 4.2% and in the second and third year, no new case was found, the incidence being zero.

We analysed causes for the unhealing, recurring and new occurring of ulcers and put forward the concrete proposals of fulfilling comprehensive protective measures enhancing protective effect further.

### RE59

DEVELOPMENT AND APPLICATION OF PROTECTIVE SHOES FOR LEPROSY PATIENTS

Xu, Shaomei and Jean M. Watson

Leprosy Assoc. of Hubei Province, P.R. of China

From Dec. 1989 to Dec. 1992, we started to develop protective shoes for leprosy patients. We designed and manufactured five kinds of shoes - Cloth Shoes, Army Shoes, Travel Shoes, Sports Shoes and Basketball Shoes and two kinds of microcellular rubber (MCR) insoles. We also provided the patients in four pilot units of rehabilitation in China with shoes (five kinds) and insoles for field use. Moreover, we sent 140 pairs of sample shoes to TLMI, ALERT, DAMIEN FOUNDATION and 11 leprosy hospitals in 9 countries, and also provided 10,000 pairs of Army Shoes with high uppers to ALERT (ALL AFRICA LEPROSY & REHABILITATION TRAINING CENTRE).

After application of three kinds of shoes in Hubei Province, our observations show the differences of the shoes: Among 5 kinds of

protective shoes, Army Shoes are well accepted by patients because of their good appearance, comfort, cleanliness, long-wear, good ventilation, cheap price and use all the year round. The percentage of patients satisfied with the hardness of sole, softness of insole and comfort is over 95% after they used Army Shoes.

A two-year observation of the experimental use of Army Shoes shows the result: healing rate in 130 cases of sole ulcers is 60%; ulcer occurrence rate in 236 cases sole insensation 2.1%; protective effective rate 97.9%.

### RE60

CAN SELF CARE PREVENT ULCERS IN ANAESTHETIC LIMBS?

Ratna Philip, Jayaprakash Mulyil and C. Vijayakumar.

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In the control program run by CHAD hospital Bagayam Vellore, all patients at risk of ulcers are taught self care activities to reduce ulcers.

This study was done to measure whether patients without ulcers showed increased self care activities as compared with patients who developed ulcers. The study group consisted of 30 patients with ulcers and 30 similar patients without ulcers. Self care activities were measured in the 2 groups for the use of protective aids during work, foot care activities, regularity of use of MCR chappals, distances walked to the work spot and distances walked during the day.

Analysis of the results showed that the group of patients without ulcers, demonstrated increased self care activities such as inspection & frequency of inspection, more regular use of MCR foot wear and foot care as compared with patients who had developed ulcers.

This study demonstrated that getting patients to increase their self care activities helps in the reduction of ulcers.

### RE61

IMPACT OF HEALTH EDUCATION IN THE PREVENTION OF PLANTAR ULCERS IN A LEPROSY CONTROL PROJECT - PRELIMINARY FINDINGS -

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Dayapuram Leprosy Control Project, Manamadurai, Tamilnadu, South India - 623 606.

Plantar Ulcers are a major cause for admission to the hospital. During 1990 & 1992, 245 patients from the Leprosy control project area were admitted for inpatient management of ulcers. A significant proportion of the inpatient costs of the hospital were directed to managing these patients.

An intensive health education program was launched for patients at risk of developing plantar ulcers and with plantar ulcers. Health Education measures included drama, printed material and practical demonstration in self care in the control area. The methods are described in detail.

Preliminary analysis of the impact of health education suggests that these measures are contributing to a decrease in the prevalence of plantar ulcers. The full analysis of the data is being done.

As MDT treatment effectively cures patients, the care of disabilities and prevention of plantar ulcers becomes a greater priority. This study design demonstrates practical methods of patient self care and ulcer prevention.

## RE62

FREQUENCE ET EVOLUTION DES MAUX PERFORANTS PLANTAIRES: EXPERIENCE HAITIENNE.

Nicole Belliard, Raymond Bernadin, Gisette Blanc, Marlene Dambreville, Florence Desvarieux, Florence Foucauld, Claude A. Leveille, Claude Pean

Institut Cardinal Leger contre la lepre ( HAITI)

1) La fréquence et le pourcentage des maux perforants plantaires, suivant l'âge, le sexe et la forme clinique de la maladie.

2) L'avantage de la mise en platre sur les techniques traditionnelles de traitement.

3) Les moyens de prevention.

## RE63

THE EFFECT OF THE ILEP JOINT STUDY PROJECT ON SOLE WOUND PREVALENCE

Jean M Watson

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80 Windmill Road, Middlesex TW8 0QH, England

The objective of this presentation is to demonstrate that improved management of disability prevention activities can in many cases result in a reduction in the prevalence of impairments.

Projects participating in the ILEP Study were invited to make a concerted effort to reduce sole wound prevalence in a selected group of patients having sole sensory loss, through systematically improving foot-care and footwear. 30 projects in 9 countries took part.

The aims of the study are:

- to see if it is feasible to reduce the wound prevalence year by year in the selected group,
- to see what useful lessons in disability management can be learnt in the process and
- to encourage project staff to adopt continuing habits of monitoring change in levels of impairment and of improving the efficiency of activities where indicated by findings.

Almost all of the projects which persevered in their efforts succeeded in obtaining a year to year reduction in sole wound prevalence. Results are given and some useful lessons relating to activities are described, for example lessons relating to use of protective footwear. The main problems encountered by projects which either did not complete the study or did not succeed are outlined in the hope that awareness of them may encourage others to avoid similar problems.

## RE64

MANAGEMENT STEPS NEEDED TO IMPLEMENT A SYSTEMATIC APPROACH TO PREVENTION OF SOLE WOUNDS

Jean M Watson and Paul Sommerfeld  
The Leprosy Mission International  
80 Windmill Road, Middlesex TW8 0QH, England

Participants in this ILEP study were required to endeavour to obtain a year to year reduction in sole wounds in a selected group of present and former patients having sole sensory loss, 50% initially having sole wounds or cracks. Results are encouraging in those who persevered.

This paper outlines lessons regarding the management of prevention of disability that were learnt through the study. For example:

- The importance of the commitment of senior management. This need not be time-consuming.
- How critical is the development of record forms that are designed to show change in impairment over time and used to monitor change and guide activity.
- The importance of ongoing monitoring of change in level of impairment, in patients having peripheral nerve impairment, after discharge from chemotherapy control.
- The disruption of activity that can be caused by lack of small amounts of funding, for example to visit a patient at home.
- The motivating influence on grass root staff members of actively involving them in planning through team discussions.
- The motivating effect of adopting an Action Learning Management Component that encourages staff to interact with one another and to learn from the experience of change ... where feasible together with other, nearby teams struggling to attain similar targets.

## RE65

MANAGEMENT OF COMMON PERONEAL NERVE DAMAGE (FOOT DROP) IN HANSENS DISEASES  
DHOOPET LEPROSY RESEARCH CENTRE APPROACH

Dr. Solomon V.K.  
Mr. Muzaffer, Dr. Uday Kiran,

During 1982-1992 early diagnosis and treatment of type I Reactions with recent Nerve damage are reversible, with regard to foot drop, due to reasons which will be dealt, we have treated these patients on an out patient basis. Without any special foot wear for the foot drop and without POP. They were given instructions with regard to care of the foot, on weak muscles, anaesthesia and exercises. All cases with Recent Nerve damage were treated with steroids and most cases showed improvement. Although management of Nerve damage with steroids is an established phenomenon, our work shows that in the field set up, where facilities are not available for admission/transportation/special foot wear/for such patients it may still be possible to give acceptable good results in cases of foot drop. Since our approach is simple and acceptable, the same can be applied in fields set up, without Institutional way of management.

The essential feature related to foot drop will be discussed in details. (Volume of Muscle, Weight, gravity).

Dhoolpet Leprosy Research Centre (DLRC) Hyd.

## RE66

EFFECTIVENESS OF PROTECTIVE ORTHOPAEDIC SHOES IN NEUROPATHIC AND DEFORMED FEET IN LEPROSY

Ayşe Yüksel, Nuri Erkiç.  
Istanbul Leprosy Hospital, Istanbul Leprosy Research Center, Istanbul, Turkey.

The orthopaedic shoe workshop was initiated in our hospital in Bakırköy, Istanbul in 1980. The objective of this workshop is to help prevent foot injuries as a result of loss of protective sensation, also to provide protective and corrective footwear and orthoses to patients with deformities.

410 leprosy patients were studied in this survey and they were evaluated according to their age, sex, level of education the regions they live, as well as the condition of their feet and the type of shoes they required. 74 % of these patients were male and 26 % were female; the average age was 52.62. 56 % of these cases came from rural areas, 56 % were illiterate, 37 % of them were unemployed and 80 % of them were seen to have

insensitive feet, 66 % to have claw toes and 11 % to suffer from drop-foot.

57 % of them had healed ulcers on their feet and 56 % of these ulcers were on the first metatarsal head. 39 % of these 410 patients were seen to have ulcers at the present and 51 % of these ulcers were on the first metatarsal head. 5 % of the patients with ulcers had orthopaedic shoes and 95 % did not have orthopaedic shoes. 6.5 % of the patients have charcot joint and 81 % have plantar ulcers.

All the other results will be analyzed and the advantages of orthopaedic shoes will be discussed at the congress.

## RE67

### REHABILITATION OF PEOPLE WITH LEPROSY

In many diseases, rehabilitation is an after thought. When a patient is cured, then think about getting him back to work, to his home e.t.c.

In Leprosy, rehabilitation is an integral part of the programme of prevention as well as of treatment and of final restoration to National Social relationships.

Being a Crippling and disabling disease, it (Leprosy) is second to Poliomyelitis - in developing Countries. Affected persons are disturbed and find it difficult to live in communities like those not afflicted by the disease.

Without effective rehabilitation leprosy control is a failure because patients are not willing to expose themselves for treatment unless they can see that others who have done so have been able to return to a meaningful existence.

Without effective rehabilitation measures medical treatment may also be a failure because patients who are rendered free from mycobacterium Leprae can never be called cured if they are left with blindness and Crippling deformities as a sequel of the disease.

To realise the dream of eliminating Leprosy by the year 2000 AD will be possible if, and only if the problem of (social and economic) rehabilitation of leprosy persons is effectively addressed.

## RE68

### WLEREC PROTECTIVE FOOTWEAR

Dr. B. Naafs and W. Brandsma

World Leprosy Rehabilitative Engineering & Training Centre

Loss of sensory perception in the feet is a major handicap, often leading to secondary ulceration and deformity. It is estimated that at least 1,000,000 leprosy patients and former leprosy patients have insensitive feet and need protective footwear. Over the years a score of shoes has been developed, ranging from simple sandals made of local materials to highly sophisticated orthopedic boots. However, none of these solutions was generally applicable, particularly since leather was often the major material used. Leather under "poverty conditions" has been found unsuitable for protective footwear, because it becomes hard, dry, inflexible and therefore deformed, causing ulcers instead of preventing them. Therefore, polyurethane was chosen as the material to manufacture the WLEREC shoe. The final shape of the shoe was determined by extensive research in both the laboratory and the field. This report will focus on the final test results based on 375 test reports from 5 leprosy centers located as far apart as Brazil, Nigeria, Turkey and Pakistan. The results showed that the shoe satisfied 77.5% of the patients. Moreover, of the initial 69 ulcers only 8 were still present after six months. The rest had healed. The importance of

unmended socks must be emphasized. Data on the durability of the material will also be presented. It suggests that at last acceptable, durable and affordable leprosy footwear has been developed.

## RE69

### PREVENTION OF FUNCTIONAL IMPAIRMENT, DISABILITIES AND DEFORMITIES

Claudia Hirtzel, Michel-Yves Grauwain and Jean-Claude Naudin

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The tardy detection of any neurological alteration may result in irreversible disability. The prevention of functional impairment and disabilities should be based on continuous surveillance of leprosy patients.

Therefore at the moment of diagnosis, as well as during MDT and during follow-up, basic preventive measures should be taken such as : regular nerve function assessment, information on the possible onset of nerve alteration and health education.

This strategy should result in early treatment of neuritis and in a decrease of the number of disabled patients. In order to prevent the functional degradation of disabled patients, a supportive program of care and cure should be included in public health activities.

The authors present a poster showing all measures to be taken according to different clinical situations.

## RE70

### AN EPIDEMIOLOGICAL SURVEY OF DEFORMITIES AND DISABILITIES AMONG 14,257 CASES OF LEPROSY

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This study was planned and conducted in Yangzhou Prefecture covering 11 counties. Out of 14,257 leprosy patients, 8,122 (56.97%) cases with deformities and disabilities were found. The disability rate was much higher in patients with MB leprosy (81.15%) than in PB (53.04%). Males were more often disabled than females ( 58.21% for males, 53.68% for females). The disabilities became more common and more serious with the increase of age. The disabled rate increased with increasing duration of disease. Out of 8,122 cases disabled, 62.04% belonged to Grade 3. Among 14,257 cases of leprosy, 3,656 (25.64%) lost sensation of the hand, 4,762 (33.40%) and 2,064 (14.48%) had hand deformities as claw hand and thumb paralysis respectively, 3,327(23.34%) lost sensation of the foot, 2,237 (15.69%) with foot drop needing surgical treatment, 1,882 (13.2%) had plantar ulcers (608 simple ulcers, 1,274 complicated ulcers), 2,114 (14.13%) had a deformity of lagophthalmos and 1,587(11.13%) had vision loss or blindness, 3,485 (24.4%) had different kinds of facial deformities such as lateral/bilateral facial paralysis, loss of eyebrow, or collapsed nose.

In this study, 10-25% of 8,122 disabled cases were suitable for reconstructive or plastic surgery. However, according to patients' attitude during the survey, the majority of them (58.54%) refused surgical treatment. Analysis of disability in this study showed that health education in the self-care of hand, foot and eyes, and protective shoes, etc., had a greater potential in reducing disability than reconstructive surgery in leprosy.

## RE71

### SURGICAL TREATMENT FOR THE BILATERAL FACIAL PALSY IN LEPROSY

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Facial deformity in leprosy, particularly bilateral facial palsy with ectropion of lower lip, is the most markable sign of leprosy, which can prevent patients' being accepted in society. The bilateral static slings used to be taken for the correction of this deformity, but the long-term result was not good. Since

1970's, a bilateral dynamic slings have been used for the correction of lower lip. Eighteen cases who had this operation have been followed up for 3 years averagely (the longest for 6 years) whose results are excellent. The procedure of the dynamic slings: A strip of fascia lata is taken from the thigh, this should be about 20-25cm and under 0.5cm in width. The slip of fascia is passed from one side of the face to the other side of the face through the lip tunnels using the middle incision on the center of the lip as a step. The end of the slip goes around a bundle of each side of masseter and is attached to each side of masseter. Or the end of the slip is attached to a more vertical bundle of temporal muscle of each side.

## RE72

"DISCAPACIDADES EN EL ENFERMO DE LEPROA"  
REPUBLICA DOMINICANA  
1979-1992

Rafael Isa Isa, Freddy Simonó, Sócrates Canario.

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Se hace un análisis de las discapacidades producidas por la enfermedad de Hansen en un grupo de 4,236 enfermos diagnosticados en el período 1979-1992. Los afectados se dividieron por grado de discapacidad, forma clínica, sexo y lugar de localización de la lesión (manos, pies y ojos). Se observa que de un 20% de discapacitados, el grado II alcanza el 8.48 y que la forma leproatosa es la que produce más discapacidades. En cuanto al sexo el masculino es el más afectado, encontrando la misma situación en el grupo menor de 15 años.

La localización de las manifestaciones, por orden de frecuencia, se observa en manos, pies y ojos.

## RE73

IMPACT OF MDT ON DISABILITY PROFILE:  
CULES EXPERIENCE IN AN URBAN CUM RURAL PROJECT

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& Venkata Ramana

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Coimbatore, Tamilnadu, India

Deformity rate (Grade I and II) among 5655 Urban and 6104 Rural patients who were selected to receive Chemotherapy was 13.6% and 19.6% respectively. The rate was higher among MB patients; a slightly higher rate was encountered in rural patients.

During the course of therapy, deformity status downgraded in 1.8% of Urban and 2% of Rural patients. 25.9% of Urban and 19.4% of Rural patients manifested some recovery of sensation.

Deformity rate in newly detected patients has declined to 1.3%

This paper will seek to identify and present the determinants of these varying deformity profile in the two situations. It will also focus on disability prevention and limitation as critical components of leprosy eradication strategy.

## RE74

PREVALENCE OF DEFORMITIES IN THE LEPROSY PATIENTS IN MOZAMBIQUE.

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Mozambique is one of the African countries with the highest prevalence of leprosy (L) (1.3%; Africa 0.68%). It is generally known that among the L pts there is a high prevalence of deformities (Def) and disabilities, with considerable variations between different areas. No data were available for Mozambique.

So, during 1992, all active pts in two different areas were observed and the presence, kind, grade (WHO criteria) of Def were registered along with sex, age and clinical classification (PB or MB):

1- a rural area (Nampula town, NPL) with a high prevalence of L (4.7%) and less organized health services: 550 pts, 307 males, 243 females; 166 PB and 384 MB;

2- an urban area (Maputo town, MPT) with low prevalence (0.1%) and better organized services: 101 pts, 52 males, 49 females; 20 PB and 81 MB. Statistical analysis: Epi-Info 5.1 computer programme.

A preoccupantly high rate of Def was encountered:

Deformities	Grade	M		F		PB	MB
NPL 218 (39.6%)	I	55 (10%)	41	14	8	47	
	II	163 (29.6%)	98	65	36	127	
MPT 54 (53%)	I	16 (15.4%)	7	9	2	14	
	II	38 (37.6%)	25	13	7	31	

Male pts presented higher prevalence and higher grade of Def both in NPL and MPT ( $P < 0.05$ ) (kind of work, less self-care, less familiarity with health facilities). A more prolonged natural history and a greater number of involved nerves may explain the higher prevalence of Def in MB pts, if they are associated with other factors (e.g. low level of knowledge, low level of health services, access problems; only for NPL:  $P < 0.001$ ). Only for the pts in NPL, a correlation was found between age and Def grade ( $P < 0.001$ ). No difference was found between the prevalence of Def on the right and those on the left side of the body.

In conclusion, the high prevalence of Def encountered indicates:

- 1- the problem has a relevant social impact,
- 2- a high percentage of pts delay many years before contacting the health services, thus indicating the of improving early diagnosis,
- 3- there is an urgent need of reorganizing the health system in order to extend primary prevention and treatment of the L complications.

## RE75

THE APPLICATION OF CIRCULAR DISTRIBUTION METHOD TO ANALYSES OF 14258 LEPROSY CASES FOR DEFORMITIES SURVEY IN YANGZHOU, CHINA

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The purpose of this study is to analyse the regularity of time distribution for onset, detection and occurrence of deformities in 14 258 leprosy cases. In this paper the author applies a circular distribution method to analyse the data collected in a survey of leprosy deformities in Yangzhou, China. The results indicate that the peaks (15% of the total cases) of onset, detection and deformities in these cases have occurred in March, June and April respectively. The periods of peak (about 4 months) of onset, detection and deformities are observed in March-June, May-August and March-June respectively, it includes nearly 50% cases in each period of the peak ( $p < 0.01$ ). The results suggest that leprosy control should have more resources to deal with case-finding and case-holding in order to detect the cases as early as possible and therefore reducing the deformities, in order to little cost to get great benefit in the months of peak and periods of peak.

## RE76

COMPARATIVE STUDY OF A HERBAL OIL PREPARATION WITH AN OIL MASSAGE WITH PLAIN EXERCISES IN WASTING OF MUSCLES.

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An oil based Herbal Oil preparation was used in wasting of muscles in a set of patients. In another set of patients, a different vegetable oil was used for massage and exercises were advocated. In the third set

of patients, no application was advised. Massage and exercises were advocated in all the three sets of patients included in the study. The results were documented and analysed.

It has been observed that in most cases exercises improved wasting of muscles. The improvement was more and time taken was less in case of herbal oil preparation. It also revealed few other findings in the course of the study.

### RE77

#### FIELD BASED DEFORMITY CARE SERVICES IN SRI LANKA

Sunil Settinaiyake<sup>1</sup>, Atul Shah<sup>2</sup>

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Until recently leprosy control efforts in Sri Lanka focused on detecting and treating patients with MDT. Little attention was paid to the care or correction of deformities. Due to the personnel constraints in the anti-leprosy campaign a highly pragmatic and cost-effective approach to deformity care was adopted, based on the experience of the Comprehensive Leprosy Care project in Borsad Taluka, India.

Deformity care services are provided by the leprosy public health inspectors after training in basic physiotherapy measures and in the application of pre-fabricated splints for patients with deformed hands. The collection and analysis of data on the extent and type of deformities enabled drawing up a clear strategy and priorities.

Ink impressions of the hands were taken before and 3 months after the application of splints to measure the progress. 50 of the 63 patients who received splints during the first six months and were followed-up and showed moderate to good improvement. This often increased patients' earnings. It also prevents the progression of deformities and reduces the case load requiring surgery.

This approach clearly demonstrates that deformity care services can be provided through the leprosy field workers on a national level with adequate supervision and motivation.

### RE78

#### CUSTOMIZED LATEX FINGER CAPS FOR INSENSITIVE HAND

Michelle J. Freeman

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A need continues for increased knowledge and understanding in the care of the insensitive hand. An important aspect of treatment is providing protective devices that are also functional in activities of daily living performance. One such device is a custom made finger cap. Customized latex caps are form fitted to the individual finger regardless of the degree of deformity. Each cap is individually made from the positive plaster mold of the finger.

Latex caps decrease the risk of shear stress and provide a protective barrier. Latex is softer than thermoplastic and other materials, and there is less chance of injury from the device itself. Injuries are a concern when using harder materials. The latex caps provide some padding, do not restrict range of motion of each joint of the finger, and reduce callus formation. Thermoplastic materials can be quickly fabricated, however, do not allow as close a fit. Thermoplastic and other materials also inhibit fine motor manipulation on hand grasp of an object because of absence of flexibility.

These and other advantages and disadvantages will be discussed, including enhanced patient compliance, improved durability, and enhanced gripping properties of the latex.

### RE79

#### PHYSIOTHERAPY AND HEALTH EDUCATION - A DHOOLPET APPROACH

Mr. MUZAFFARULLAH, Dr. SOLOMON, Dr. UDAY KIRAN

DHOOLPET LEPROSY RESEARCH CENTRE (D.L.R.C.) is situated in Hyderabad City, India. It is an out patient clinic. It has no admission (in patient) facility, except in its parent Hospital, Victoria Leprosy Hospital, Dichpalli situated at 150 Kms. from Hyderabad.

Being a reputed institution, more number of problem cases, self selected patients come to DLRC. During the year 1982-1992 more than 500 cases of recent nerve damage were treated completely on an outpatient basis.

Ideally, a case of recent Nerve damage can be given maximum care/physio/H.E., if admitted in the Hospital. So when we treated these cases due to lack of admission facility on an out patient basis we had to develop appropriate methods of HE/Physio which were applicable on an out patient basis and whose patient acceptability was good.

The simple exercises we advised, how we educated our patients, why each exercise is useful and required, how we made the use of double steel cups, protective utensils available in Market, and protective glasses, and how we transferred the responsibility to the patient to achieve good results and also how we planned our available resources in providing them (where they could not get immediately) will be discussed.

Colour transparencies depicting the whole process and items used will be presented. We hope that these methods will be found useful for field conditions.

### RE80

#### COMPARABILITY OF BALL PEN AND NYLON FILAMENTS IN TESTING SENSORY FUNCTION OF PATIENTS WITH LEPROSY IN NEPAL AND ETHIOPIA

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Various methods have been developed to assess sensory function in leprosy patients under field conditions. The most in use are the nylon filaments (NF) and the ball-point pen (BP). Each method has its own advantages and disadvantages, but their comparison is complicated by the absence of a "golden standard". In an attempt to compare these two methods, randomly selected leprosy patients have been tested with BP and NF in Nepal (ANANDABAN) and in Ethiopia (ALERT). In each centre, the 2 tests were performed on the same patients by the same observer on two different occasions in a random order. Each test was performed on specific sites of both hands and feet and the results were reported on a pre-determined scale. Fifty two patients have been tested in Nepal and fifty in Ethiopia.

The two methods are compared by plotting the differences in measurements against their means and calculating the limit of agreement. Percent agreement is evaluated with various criteria. Matched paired t test is applied to estimate systematic bias between tests. Kappa statistics are calculated to determine whether the agreement is better than would be expected by chance alone.

It is found that both methods compare reasonably well for ulnar and median nerves, when applied on similar conditions by a trained observer (70% to 90% complete agreement). Kappa statistics lie between 0.54 and 0.74, showing moderate to good agreement. Comparability is less good for the posterior tibial nerves (44% to 54% complete agreement) with a wider spread of values. Overall, there is no statistical evidence of a systematic bias, but a consistent tendency for BP to measure in excess compared to NF. For all nerves, agreement is optimal at the extremes of the scale, when there is full sensation or complete anaesthesia. Reasons for these discrepancies are examined in relation with the practicality of each test, the nerve status of the patients and their treatment.

**RE81****THE TEST-TRACK. A USEFUL TOOL IN TESTING SENSITIVITY OF FEET?**

Roland Kazen, Heather Currie and Zewdu Kebret.

All Africa Leprosy and Rehabilitation Training Centre, Addis Ababa, Ethiopia.

Leprosy patients with impaired sensation of their foot soles and undergoing treatment for neuritis, sometimes report a returning awareness of the ground on which they are stepping. As an alternative to conventional testing of texture discrimination a test track has been constructed consisting of a board with 5 slots into which different trays with various, standardized surfaces are fitted in a random fashion. Two additional surfaces are neutral but one is warmed up and one cooled down to check sensation for temperature.

20 cases undergoing neuritis treatment, 20 with LOS (for 10 g filament) with no ulcer for at least 2 years, 20 with recently healed ulcers, and some that have undergone nerve resection and grafting of the Post. Tibial nerve with freeze-thawed muscle have been investigated. 20 non-leprosy cases without any nerve damage were tested for control.

All patients were assessed with standard methods such as VMT-ST(graded), vibrometry, test for texture discrimination, joint position sensation, temperature sensation with test tubes, NCV, as well as questioned about their subjective sensation.

The findings are discussed.

**RE82****FOOTSOLE SENSATION IN NORMAL SUBJECTS IN ETHIOPIA**

Heather Currie and Peter Byass

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Finding a reliable instrument to measure sensation is still a problem in most control programmes. In ALERT, we use 10gm filaments for both the hands and the feet. Many health workers complain that they are registering false findings of anaesthesia on footsoles. Therefore 200 normal subjects were tested using 5, 10, 20, 35 and 50gm filaments. 100 were from highland and 100 from lowland areas. The skin was described as hard, soft or cracked. The occupation and use of footwear were also noted. The lowest filament felt was recorded at 8 sites on the footsole.

The results show a difference between highland and lowland, and call into question the use of 10gm filaments to detect sensory loss, especially in the heel.

**RE83****THE EVOLUTION OF SENSORY LOSS IN SKIN PATCHES OF HANSEN'S DISEASE AT THE TIME OF DIAGNOSIS AND DURING TREATMENT USING THE SEMMES-WEINSTEIN MONOFILAMENTS**

Sandra Lyon, Soraya Gonçalves, Cristina Fonseca, Aparecida Grossi, Linda Lehman

Centro Social Urbano do Barreiro, Belo Horizonte, Minas Gerais, Brasil

The authors observed in daily practice that sensory loss in skin patches of newly diagnosed patients with Hansen's disease improved with treatment specific to the disease and with the use of steroids.

Frequently this improvement was noted within the first month of treatment. Conflicts arose among some patients who sought second opinions to confirm diagnosis after several months of treatment. The

consulting doctor frequently did not detect sensory changes in skin patches due to either recovery of sensation with treatment or lack of detection of sensory loss due to gross sensory testing instrumentation of the consulting doctor.

This prospective study started in January 1993. All newly diagnosed patients in 1993, virgin to treatment have their skin patches mapped using the Semmes-Weinstein monofilaments. These mappings are done at diagnosis time followed by monthly mappings until discharge.

The preliminary results of approximately 20-30 cases are anticipated by July 1993. These results will be discussed and their implications on second opinions to confirm disease.

**RE84****DISABILITY IN NEW CASES IN HANSEN'S DISEASE IN THE STATE OF MINAS GERAIS, BRAZIL, FROM 1988 TO 1992 BY REGIONS OF EPIDEMIOLOGICAL PRIORITY AND TRAINING**

Linda Lehman, Aparecida Grossi, Maria Ana Leboeuf

Coordenação Estadual de Controle de Hanseníase, Secretaria de Estado da Saúde de Minas Gerais, Belo Horizonte, Minas Gerais, Brazil

The authors discuss the disability in new cases of Hansen's disease detected in the state of Minas Gerais, Brazil, from 1988 to 1992. Disabilities are compared in the 23 regional areas by regions of epidemiological priority and by the number of training courses and persons trained in each region.

The classification of regions of priority was based on prevalence and new case detection data. Disability classification utilized the WHO disability grades 2 and 3.

The results of the preliminary findings demonstrate that deformity in newly detected cases has decreased in the state from 13.9% in 1988 to 7.6% in 1992. Regions of high priority and increased participation in training demonstrate fewer disabilities as compared with less participation in training. There was an increase in new cases detected with a decrease in disabilities suggesting that training has improved early diagnosis and adequate treatment and improved program management.

**RE85****SOMATOSENSORY EVOKED POTENTIALS IN LEPROSY**

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A study of somatosensory evoked potentials (SSEP) of posterior tibial nerve was done in 25 patients of various types of freshly diagnosed leprosy and data were compared with 15 normal persons which served as control.

Significant alteration (more than mean  $\pm$  3SD) in various latencies of SSEPs were observed in 20 patients (80%). It was because conventional sensory nerve conduction studies deal with more distal portion of the peripheral nerve as the proximal segments are not easily accessible to stimulating electrodes while SSEP allow assessment of the entire somatosensory pathways and secondly nerve involvement in leprosy is segmental in nature.

Interpeak latency N7-N18 (Proximal Conduction Time) was prolonged in 3 patients while Interpeak latency N18-N35 (Central Conduction Time) remained unaltered denoting peripheral involvement of nervous system in leprosy.

Thus study of SSEP is an important diagnostic tool in evaluating nerve damage in leprosy neuropathy.

**RE86**

SPECIFICATIONS FOR THE SEMMES-WEINSTEIN MONOFILAMENTS FOR SENSIBILITY TESTING, AND CONSIDERATIONS FOR FIELD FILAMENTS

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Semmes-Weinstein Monofilaments are being increasingly used for testing sensibility in Hansen's Disease due to their advantages in improved objectivity, and usefulness in establishing an absolute baseline sensory detection threshold that can be compared with treatment. However, limited availability of the test and costs have in the past made the test out of reach of many field clinics. Various versions of the test have emerged, and with these increasing variability of the filament forces.

In order for the test to be used as a standard, the filaments must be as identical as possible in their stimuli, and in particular, the force they produce. This paper reports on research into the physical properties of the nylon material, the repeatability of the filament stimuli, and factors which are important in making them more or less accurate. The relative comparison of the force control of this instrument which varies in milligrams from one application to the next, versus other hand held instruments which vary by many grams, is shown by measurement made on testing equipment designed by a biomedical engineer specifically to measure the dynamic stimulus force. The obtaining of the filament material in bulk for making field filaments, and factors important in their force measurement in the field are discussed.

**RE87**

SEMMES-WEINSTEIN MONOFILAMENT TESTING TO DETERMINE NORMAL SENSORY THRESHOLDS IN THE FOOT AND HAND: A COMPARATIVE STUDY IN INDIA

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This study was undertaken in order to enable the PMW, therapist, and physician to utilize this integral tool for measuring peripheral nerve involvement underlying disability of the hand in HD. This tool, unlike other tools for touch-pressure testing, boasts several assets: repeatability of stimulus, identification of progression or regression of neuropathy, and practicality in the field. In order for this tool to be of optimal utility, thresholds for feet and hands need to be corroborated in an Indian population. This is crucial in India, where over 50% of the HD population may reside, and where footwear can be minimal or nil. Once normal thresholds have been corroborated, application of such a paradigm to HD patients can lend valuable insight into peripheral nerve involvement.

600 hands and feet were tested in 600 subjects, males and females of ages 7 years and up. 500 subjects were tested by one tester, 100 by 3 testers. Right and left extremities were selected on a random basis to avoid bias. 50% of subjects live and work in urban India; 50% in rural India. Three categories of hands and feet were devised according to occupation and footwear. Hands were identified in terms of light, moderate, and heavy use. Feet were identified according to degree of footwear: shoe/enclosed sandal, light/open sandal, and none.

This paper discusses minimum threshold of each of the categories, and compares them. The interrater reliability and presence of callus are also discussed.

**RE88**

THE WRINKLING TEST IN LEPROSY PATIENTS

Marcos Virmond, Lucia Camargo and Rosemarie Baccarelli

Wrinkling of the skin of the distal finger after immersion in warm water has been proposed

as a test for peripheral nerve function. It is related to the integrity of the autonomous fibers and not to the motor or sensory fibers. Twenty-four leprosy patients were submitted to this test consisting in the immersion of the hand in water at 40°C for 30 minutes. Before and after the tested hand was photographed. The results reveal that in leprosy this test is suitable to detect nerve damage in the hand since in most cases there was no wrinkling of the skin in areas where further examination with Semmes-Weinstein monofilaments revealed altered sensation. Although it seems to be no correlation with motor or sensory recovery, this test is easy, simple and cheap to carry out for initial nerve function evaluation and is particularly suitable to be used in non-cooperative patients.

**RE89**

TRANSLATING THEORY INTO PRACTICE: THE CHOICE OF SENSORY TESTING METHODS IN DIFFERENT FIELD SITUATIONS

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Prevention of Disability (POD) should have high priority in every leprosy control programme since disability still causes stigma amongst leprosy patients. A control programme cannot be called successful if it does not control disability.

Some actions required to control disability are inspection of eyes, hands and feet, nerve palpation, sensory testing, and voluntary muscle testing. These tests enable the field worker to recognise nerve damage as early as possible and to take proper action.

"The ball-point test" is the most common method used in the field to test sensation and regularly leads to wrong diagnosis. The accurate Carville (Bell) method tends to be too expensive and too complicated for field use. Hence the need to look for methods which combine simplicity and accuracy.

Points to consider while choosing a suitable testing method in specific circumstances will be presented in the poster.

The poster will show experiences from 3 POD projects in Africa and South East Asia where local circumstances have led to different choices of tools and methods.

**RE90**

PAN-SENSORY LOSS IN LEPROSY-CASE REPORTS.  
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We report the clinical and investigative features of seven patients (3males, 4 females, age 28yr-61yr) with polyneuritic leprosy (BT or BL) who developed a remarkable and disabling sensory ataxia in one or more limbs, in addition to the usual loss of cutaneous sensations.

The motor system was not severely affected. Tendon reflexes were absent in the affected limb/s. Detailed investigation for other causes of this type of proprioceptive loss were negative in all (one patient had borderline diabetes). Electrophysiological studies of the thenar muscles confirmed involvement of muscle (and cutaneous) afferents.

More widespread muscle afferent involvement in leprosy is difficult to explain. From an analysis of the clinical picture we suggest that the site of pathology in the patients described is probably not the mixed nerve trunks or the muscle spindles but more rostrally in the ganglion or sensory roots. Alterations in a spinal ganglion which was biopsied in one patient are described, and the literature reviewed. Even this explanation appears less than satisfactory and it is suggested that further elucidation of spinal ganglion or root involvement be obtained by exploiting a primate experimental model for polyneuritic leprosy. (Baskin et al. *Amer. J. Trop. Med. Hyg.* 37:385, 1987; *Int. J. Lepr.* 59:618, 1991).

### RE91

CLAW-TOES CORRECTION. PERSONAL TECHNIQUE  
Vimala Dermatological Centre, Bombay, India

A. Salafia, J.S. Shah, G. Chauhan

Claw-toes are common deformities in leprosy. Fritschi has identified 3 degrees. Degree I & II are the most common in our clinical experience. We propose, for grade I & II a very simple procedure which can be performed in 20 minutes and it is usually done along with foot-drop correction. **TECHNIQUE.** With a tenotomy knife a stab incision is made midway between the PIP and MP joints of each toe on the plantar aspect. In grade I a stab incision is sufficient. In cases of grade II, we prefer a star-shaped incision. The knife is pushed down to the bone and both flexor tendons are cut. All the while the toe is forcibly kept in dorsiflexion. As the tendons are cut the toe, usually "gives in". Often the volar capsules of PIP and/or MP joint act as contracting forces. By moving the knife a few mm, both capsules can be reached and incised. Now the toe can be dorsiflexed maximally and it will remain straight. Minor resistances can be broken manually. If small skin grafts are required, the plantar skin is readily available as donor. No sutures. 6 weeks POP with toes in maximal extension. **STATISTICS.** 76 feet for a total of 324 toes: 53 of grade I & 271 of grade II. Excellent results (=toes straight and functional) in 289 toes (89.2%) i.e. all the 53 of grade I and 236 of grade II. Good results in 25 (grade II). Poor in 10 (grade 2). Poor results at the time when technique was not refined, and/or when the capsule was not totally excised. Clawing of toes & fingers is due to palsy of intrinsic. It is proved that if flexors are cut, the clawing disappears. This cannot do for the hand, but in the foot it flattens the toes & partly the foot which is an advantage because it broadens the weight-bearing area.

### RE92

FINGER DYNAMOGRAPHY- BEDSIDE METHOD FOR EVALUATION OF PARALYTIC FINGER DEFORMITIES BEFORE AND AFTER CORRECTION

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Finger dynamography is a new concept to study the movements of fingers at its various joints. During routine activities the fingers can acquire different postures for various purposes. Four extreme postures are possible at MCP and PIP joints. The MCP and PIP

joint angles at these extreme positions, if plotted and joined together result in a rectangle, corners of which are represented by one of these positions. Any point within the rectangle will depict a posture and any line a movement.

If intrinsic muscles of the hand are paralysed the motor capability of the hand changes and to acquire these extreme posture becomes impossible. The movement of paralysed hands when plotted, therefore, will result in a rectangle of different shape which is characteristic for the type of paralysis. After surgical correction all the activities of the fingers are not restored, hence the movement pattern of corrected fingers is different from normal. The different corrective procedure restore different set of functional capabilities therefore the movement patterns are different. This difference is obvious when the plots are examined.

The technique of finger dynamography is simple, requires minimal tools and can be performed at the bed side.

### RE93

A MODIFICATION OF SURGICAL PROCEDURE TO PREVENT POST-OPERATIVE SUBLIMIS MINUS DEFORMITY AT THE DONOR FINGER.

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In surgical reconstruction in leprosy the Sublimis Minus Deformity is frequently developing at the donor finger when its Sublimis tendon has been used as motor tendon for correction of clawed fingers in case of Sublimis Transfer (Stiles-Bunnell) or for Opponens Replacement of the Thumb.

A simple modification of the surgical procedure at the donor site, which prevents the ugly post-operative Sublimis Minus Deformity, and the pull-out-wire suture technique used is described.

The modification consists in joining one distal stump portion of the Sublimis tendon with the Flexor profundus tendon of the donor finger.

During the past two and half years 72 cases were studied, who either underwent Opponens Replacement or Sublimis Transfer.

In most of the cases a considerable degree of passive hyperextension of the proximal interphalangeal joint was present at the donor finger and the modification indicated.

In no case, where the modified surgical procedure was used, signs of post-operative Sublimis Minus Deformity developed.

The results are discussed.

### RE94

FOLLOW-UP OF POSTERIOR CHAMBER INTRAOCULAR LENSES IN FIVE LEPROMATOUS PATIENTS

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Intraocular lens implantation obviates the need to wear cumbersome thick glasses after cataract surgery. In leprosy patients with deformed hands and noses this advantage is of great significance. Despite this and other optical benefits, intraocular lens implantation has been undertaken very cautiously in leprosy patients, especially lepromatous ones, since they are prone for uveitic inflammatory reactions. As a result, scant information exists on the long term effectiveness of intraocular lens implantation in lepromatous leprosy patients.

We report the ocular status of two lepromatous leprosy patients and three borderline leprosy patients who had posterior chamber intraocular lenses implanted in seven eyes, between one and five years ago. At the time of lens implantation, all patients had had the disease for over twenty five years, were smear negative, and had no signs of uveitic reactions.

At the time of follow-up, they did not show any ocular complications, other than slight degrees of (1) posterior capsular opacities, (2) pupillary irregularities, (3) pigment deposition on the anterior surface of the intraocular lens, and (4) astigmatism, none of which reduced corrected visual acuity below 6/12.

### RE95

#### RESULTS OF SURGICAL CORRECTION OF LAGOPHTHALMOS (GILLIES TECHNIQUE) IN LEPROSY PATIENTS

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THE RESULTS OF THE TEMPORALIS MUSCLE TRANSFER (GILLIES TECHNIQUE) IN 51 EYES (34 PATIENTS) HAVE BEEN ANALYSED. THE MAIN OBJECTIVE WAS TO EVALUATE THE DEGREE AND TIME NEEDED TO RECOVER VOLUNTARY AND INVOLUNTARY EYELID OCCLUSION AND STATIC EFFECT OF THE TRANSFER ON THE LOWER EYELID IN CASES OF PARCIAL ECTROPIUM AND EPIPHORA.

ALTHOUGH THERE WAS NO RETURN OF INVOLUNTARY BLINKING IN ANY OF THE OPERATED CASES, IN 34 (66,67%) THERE WAS COMPLETE AND LASTING VOLUNTARY EYELID OCCLUSION. THE MEDIAN OF TIME TO OBTAIN COMPLETE EYELID CLOSURE WHILE BITING, WAS 8 DAYS (1-120) IN THE EXCELLENT GROUP AND 14 (1-120) DAYS IN THE GOOD GROUP. THE CORRECTION OF ECTROPIUM AND EPIPHORA WAS SEEN IN 15 (83,33%) EYES.

THE RECUPERATION OF VOLUNTARY EYELID CLOSURE AND REPOSITIONING OF THE LOWER EYELID AS OBSERVED IN THE MAJORITY OF OUR CASES CONFIRM THE EFFECTIVENESS OF THE GILLIES TECHNIQUE FOR CORRECTION OF LAGOPHTHALMOS.

### RE96

#### CHRONIC PLANTAR ULCERS OF LEPROSY PATIENTS TREATED BY MUSCULO-CUTANEOUS INSTEP FLAP TRANSFER

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Amputation for nonhealing chronic/malignant plantar ulcers in leprosy patients is one of the commonest surgical operations performed in leprosy control programme. The social and economic impact of this on the patients, the society and the programme itself is devastating.

Where conventional methods of healing fail, this method has proved effective in preserving the limbs of patients and therefore rendering them far more independent than they will be with the loss of a limb. The poster shows each ulcer pre-operatively, some 14 days post-operatively and finally at certain periods after discharge from hospital. It takes an average of 45 days to completely heal such an ulcer. Compared to the conventional method which takes about 150 days (if ever it heals). However, conventional methods have to be tried before embarking on this procedure. The modified foot wear of the patient is further modified to prevent recurrences - posters of modified foot wear also shown.

### RE97

#### NURSING CARE FOR LEPROUS PLANTAR ULCERS CURED WITH DORSO-PEDIS VESSEL PEDICLE FLAP

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Plantar ulcers of 10 leprosy patients were successfully managed by transplantation of dorso-pedis vessel pedicle flap in combination with the implementation of comprehensive nursing care. Among these patients, there were 8 males and 2 females, 2 NB and 8 PB. The age and duration ranged 18-25 years and 8-23 years respectively. The duration of ulcers ranged from 4 to 20 years with a size varying from 2×3 cmxcm to 4×4 cmxcm. Excluding one case of failure resulted from necrosis of flap for infection three days after the operation, no recurrence of plantar ulcers was found in the other 9 cases after an annual follow-up for 5 years. The authors emphasize following points: 1) Health education together with psychological nursing care should be strengthened at the beginning in order to make the patients realize of that "plantar ulcer is curable" as long as they cooperate well with the nurses during the whole period of treatment; 2) Keep wards cleaned and sterilize the related facilities to prevent cross infection, and the room temperature should be regulated at 20-25° C; 3) Monitor the status of flaps transplanted, including their temperature, color and elasticity closely; 4) Guide patients to exercise step by step two weeks after transplantation; 5) Train patients how to practice self care; 6) Patients should be followed up once a year after discharge from the hospital.

### RE98

#### A LONG-TERM OBSERVATION ON THE EFFECT OF SURGICAL TREATMENT OF LEPROUS PLANTAR ULCERS

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In the past 10 years, the recurrence rate of plantar ulcers was markedly reduced after the implementation of surgical treatment.

The results of surgical operations on 52 leprosy patients with 55 plantar ulcers were reported. The duration of the ulcers ranged from 7 months to 20 years with a size of 4 cmxcm to 80 cmxcm. The locations of ulcers were: heel 9; lateral border of the foot, 10; neutral area of the sole, 3; head of the first metatarsal bone, 7; and head of the 2nd-5th metatarsal bones, 26. As for the status of deformities, 7 cases with talipes equinovarus, 41 with claw toes, 3 with boat-shaped foot (arch reversed) and 6 with talipes planus.

Surgical operations were performed in three ways: 1) correction of the original deformities (30 cases) (group 1); 2) skin grafting, particularly with vessel pedicle flaps (group 2); 3) debridement and skin transplantation, used only for those ulcers not suitable for skin grafting (group 3).

All patients wore protective shoes and were trained in self care of foot. After an observation for more than 5 years, the overall recurrence rate of ulcer was 35% (19/55). The recurrence rates of group 1, 2 and 3 were 43% (13/30), 10% (2/20, the lowest) and 80% (4/5, the highest) respectively. The authors suggested that the success of the treatment of plantar ulcers, including the possibility of their occurrence rates, depended not only on the method of surgical operation used, but was also closely related to the degree of deformities, location of ulcers and the practice of self care.

### RE99

#### TREATMENT OF NEUROPATHIC ULCERS WITH FULL-THICKNESS SKIN GRAFTS

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When venous ulcers are treated with full-thickness skin grafts, healing takes place with a median time of 15 days (Mol et al. J Am Acad Dermatol 1991; 24: 77-82). As this is a simple method, which requires only little equipment, this technique was applied in the treatment of neuropathic ulcers in 10 leprosy patients. The ulcers were

localized at the plantar side of the feet or the lower legs. If necessary destructed bone and necrotic-inflamed tissue were removed surgically. In case of infection, proven by bacterial cultures, systemic antibiotic therapy was given. Preoperative preparation consisted of three times daily changing of gauze pads moistened in physiologic saline until the wound was clean and granulating. Five or 6 mm full-thickness punchgrafts were taken from the upper leg and laid approximately 5 mm apart on the ulcer bed and were fixed by a parafine gauze and bandaged. The first dressing change was performed after 5 days. In superficial wounds reepithelialization took place within three weeks; in deeper ulcers this period was longer. Bedrest was continued till the ulcer was completely healed; in the meantime adequate support was provided for the foot deformity. With this method in 8 of the patients complete healing was obtained.

### RE100

THE VASCULAR COMPONENT IN POSTERIOR TIBIAL COMPARTMENT SURGERY FOR PLANTAR ULCERS

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Traditional surgical decompression of the posterior tibial nerve yields equivocal results. The authors postulate that the posterior tibial artery is the most compromised structure in the neurovascular compartment. The best surgical results in healing of plantar ulcers is achieved by rechannelising of the blood flow in the posterior tibial artery during posterior tibial neurovascular compartment surgery.

This procedure has been of benefit to patients with plantar ulcers of greater than 7-10 years duration in whom all other modes of healing had failed. It has been undertaken as an outpatient procedure under local anaesthesia, supported by vasodilator drugs. The use of tourniquet, antibiotics and surgical interference with the ulcer per se was eschewed. A report of over 200 patients is presented with follow-up of up to 5 years in the earlier cases.

### RE101

A 20 YEAR REVIEW OF AMPUTATIONS IN THE NATIONAL LEPROSY CONTROL PROGRAM IN PARAGUAY

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A review of all amputations done on patients with Hansen's Disease in Paraguay from 1972 - 1992 is presented. Our hospital is the only Referral Center for surgery and prosthesis for Hansen's Diseased patients in the country. The total patient population during this period varied between four and five thousand. A total of 43 amputations were done on 36 patients. The most common level were below knee (23) and transmetatarsal (13) and the average age was 62 years (29-87). Thirty patients were classified as Lepromatous, 2 Borderline and 4 Tuberculoid. The indications for amputation

were: Foot ulcers (14) - malignancy (7) - leg stasis ulcers (6) and Charcot, rigid equinovarus, P.V.D., (3) each. Average time of follow-up was 6 years (1-20). Most patients with below knee and transmetatarsal amputations had recurrent problems. Through knee and Boyd had the least problems. We conclude that amputation is not very common in our patient population, but that it is a major disabling event, even at the TM level. Although we have a good prosthetic service available, only 50% of the patients became regular prosthesis users and most of these had recurrent problems.

### RE102

PRE/POST OPERATIVE REHABILITATION FOR TENDON TRANSFERS

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Current objectives of the World Health Organization target the elimination of Hansen's disease as a public health problem by the year 2000 A.D. Peripheral nerve damage, however, remains a glaring reality among the present Hansen's disease population underlining the need for continued attention to prevention and correction of deformity. In the Hand and Occupational Therapy Department of the Gillis W. Long Hansen's Disease Center, hand therapy is a primary focus with pre/post-operative rehabilitation a significant aspect. Tendon transfer surgery and rehabilitation is an effective option for many patients suffering from the typical "claw hand" deformity resulting from Hansen's disease.

Presented will be a case study of a tendon transfer HD patient. A suggested protocol will be discussed for pre/post operative rehabilitation including information regarding: pre-operative evaluation and preparation, post-operative treatment program based on biomechanical principles, and a time frame sequence, all of which serve to maximize surgery results producing a more balanced hand and therefore a more functionally independent person.

### RE103

THE OBSERVATION ON THE EFFECT OF EYEBROW TRANSPLANTATION BY SINGLE AUTOLOGOUS HAIR--A REPORT OF 274 CASES

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Eyebrows are not able to regrow in MB patients with madarosis. Eyebrow transplantations with single autologous hair were performed for 274 MB patients in Hanzhong Leprosy Hospital since 1980. A long-term observation showed satisfactory results, giving a total effective rate of 100%.

The method used was as follows. After a 3-month regular anti-leprosy treatment, whatever the results of smear examination followed, a split thickness skin graft (with hairs, of course) was taken from the auditory post superior area and was processed according to principles and methods for transplantation, separating each hair carefully to avoid the injury of hair follicles. Separated hairs were counted and placed in order on the wet compress macerated with antibiotic liquids. The shape of transplanted eyebrow was designed as "saber-shaped" for males and "lancet-shaped" for females in majority cases. Holes were made by slantingly stick with 8# needle in the region to be transplanted with hairs and in these holes completely separated single hairs were implanted in regular order. Usually more than 350 hairs were implanted on each side for males, while more than 300 hairs on each side for females. The region implanted was tied up with pressure dressing. The patients were given some analgesics and/or antibiotics after transplantation.