Indian Journal of
Physical Medicine and Rehabilitation

IJPMR 1992 April; Volume 5

Contents

Original Articles

Editorial Board
IAPMR Executive and Editorial Board

Print Edition

Editor:
Dr AK Agarwal

ISSN
0973-2209

Go to
IAPMR

Web administration and designing: Dr U Singh. *First built:* April 15, 2004. *Last updated:* November 10, 2012

BURN CARE AND REHABILITATION

BARRY C. GENDRON, D.O.[1], SUDESH S. JAIN, M.D.[2] & JOEL A. DELISA, M.D., M.S.[3]

Survival rates for burn injury patients have increased significantly over the past several decades in the United States. Several factors have been cited for decreased mortality following burn injury, including the development of 150 burn units with 1700 specialized burn care beds. Additionally, improved understanding of the pathophysiology of burn injuries has led to major advances in volume resuscitation, antibiotic management, and skin grafting. Rehabilitation of burn-injured patient begins on the day of injury and may continue for years. A review of current rehabilitation practices in treating burn injuries is presented.

Burn injury occurs when the ability of the physiologic system to dissipate heat is overwhelmed. This leads to protein denaturation, coagulation, and cellular death. Cutaneous burn wounds can be classified as either partial thickness or full thickness injuries. Partial thickness burns may be superficial or deep injuries. Superficial partial thickness burns involve the epidermis and outer dermis, generally resulting in minimal physiologic and anatomic damage. Pain and erythema are major components of these injuries, which usually heal within 1-2 weeks. Deep partial thickness burn wounds involve injury to all surface epidermis and some portion of the deep dermis, leaving viable portions of epidermal skin appendages capable of re- epithelialization. In deep partial thickness burns, affected areas may be blistered, erythematous, moist, and blanch when touched. Full thickness burns involve complete destruction of both the epidermis and dermis. The wound generally has a white or black appearance, and is dry and anesthetic to touch. Full thickness wounds cannot re-epithelialize from epidermal remnants within the wound, and skin grafts may be required.[1]

Causative agents of burns include thermal, chemical, electrical, and radiation sources. The extent of the burn injury can be described by total body surface area burned (TBSA). A rule which may be helpful in quantitating small burns is that the patient's palm is approximately 1.0% of the total body surface area. To estimate TBSA, one may use the Rule of Nines developed by Pulaski and Tennison[1]. In this scheme, the body is represented by nines or multiples of nines, with the perineum comprising the final 1%. This method is particularly unreliable in children less than 15 years of age, in whom it underestimates the burn area of the head and neck, and overestimates the burn area of the legs. A more accurate estimation, developed by Lund and Browder in 1944,[2] accounts for changes in growth during childhood and adolescence.

ACUTE MANAGEMENT

Acute management of burn injury includes a thorough history and physical examination. The patient should be assessed for inhalation injury, concomitant skeletal or soft tissue trauma, and

1. Academic Chief Resident, Department of Physical Medicine and Rehabilitation, UMDNJ – New Jersey Medical School, Newark, New Jersey.
2. Assistant Professor, Clinical Physical Medicine and Rehabilitation, UMDNJ – New Jersey Medical School, Newark, New Jersey.
3. Professor and Chairman, Department of Physical Medicine and Rehabilitation, UMDNJ – New Jersey Medical School, Newark, New Jersey.
Medical Director, Kessler Institute for Rehabilitation, West Orange, New Jersey, Chairman, Department of Physical Medicine and Rehabilitation, Saint Barnabas Medical Center, Livingston, New Jersey, U.S.A.

state of hydration. Various fluid resuscitation schemes have been devised as correction of electrolyte disturbances is essential. Hyponatremia, a frequent sequelae of fluid resuscitation, must be corrected slowly to prevent the complication of central pontine myelinosis.[3]

Immune defects have been identified in patients with major burn injuries, and the leading cause of death in the burn population remains infection. Except for gram positive organisms located in the depths of the sweat glands or hair follicles, the burn wound is initially free of major bacterial contamination. If topical antimicrobial agents are not used prophylactically to reduce the rate of bacterial proliferation, the wound may become colonized with millions of gram positive bacteria within the first 48 hours. Use of topical antimicrobials (e.g. silver sulfadiazine) has been shown to decrease mortality among patients with burns less than 40% TBSA. However, they have had little effect on mortality among patients with larger burns, particularly among those with more than 70% TBSA.[4]

WOUND MANAGEMENT

Burn wound management depends on the depth of the injury. Superficial partial thickness burns are usually allowed to re- epithelialize on their own.[5] However, a temporary closure with a biologic dressing may be used. Appropriate temporary skin substitutes include xenografts, allografts, cadaver skin, or the amnionic surface of the amnionic membrane. Concomitant immunosuppressant therapy may prolong graft survival.

Deep wounds (deep partial thickness and full thickness burns) do not heal efficaciously by re-epithelialization. Studies have shown that deep wounds heal best with early burn excision and wound closure.[5,6]

Permanent skin substitutes may be obtained from either a split thickness or full thickness autograft. Alternatively, permanent skin substitutes may be obtained from tissue cultures from either the patient or a skin donor. Sheets of human epidermal cells can be grown from cultures of human keratinocytes on a feeder layer of lethally irradiated mouse fibroblasts.[7] Unfortunately, cultured autografts require twenty-one days to produce once the skin sample is taken from the patient.[8]

Hydrotherapy techniques can be classified as either immersion or non-immersion. Non-immersion techniques involve placing the patient on a plinth which is angled over a Hubbard tank. A variety of spray or shower modes can then be used from this position. Immersion hydrotherapy in a Hubbard tank has been shown to increase the incidence of autocontamination of wounds, especially with GI flora and is therefore being discontinued at many centers in the U.S.[9,10]

POSITIONING

Therapeutic positioning is designed to induce edema resolution through elevation of the extremities; positioning also preserves function by promoting proper body alignment which helps prevent contractures. Prevention of other morbidity, especially localized compressive neuropathies, is also a primary goal of the positioning program. Table – 1 describes the proper body positions during periods of inactivity.[11]

TABLE – 1

Guidelines for Solving Common Problems in the Acute Phase[11]

Problem	Intervention
1. Anterior neck burns	1. Avoid pillows 2. Position in extension 3. Soft collar/watusi collar optional

2.	Ear burns	1. Position without pillows 2. Prevent lateral rotation with soft donut head support
3.	Mouth burns	1. Early exercise followed by mouth spreader
4.	Axillary burns	1. Position shoulder in 90° abduction with supination of the forearm and extension of elbow 2. Airplane splint
5.	Cubital fossa burns	1. Position elbow in extension and supination 2. Avoid medial elbow pressure 3. 3-point elbow extension splint
6.	Hand	1. Position in 30 degrees of wrist extension with 60 to 90 degrees of metacarpal-phalangeal joint flexion and full interphalangeal joint extension 2. Gauze roll
7.	Anterior chest burns	1. Position in shoulder abduction and external rotation 2. Small towel roll down midline of back 3. Avoid pillows
8.	Perineal burns	1. Position with 20 to 30° abduction hips 2. Avoid flexion and external rotation of hip 3. Soft foam positioning wedge
9.	Popliteal fossa burns	1. Position in full extension 2. 3-point knee extension splint
10.	Posterior calf and ankle	1. Position with foot board 2. Dorsiflexion splint
11.	Volar foot burns	1. Provide padded slippers 2. Encourage ambulation with elastic bandages in place
12.	Dorsal foot burn in children	1. High top shoes with optional conformer splint to position toes and ankle in plantar flexion
13.	Exposed tendons	1. Cover with moist gauze/biologic dressing 2. Splint in slack position; avoid exercise

SPLINTING

Splinting is an extension of the therapeutic positioning program. It is indicated when the patient is unable to voluntarily maintain proper positions, or is immobilized after surgical wound closure or grafting. Splinting may be initiated at any time during the acute burn period.[11]

Positioning and splinting of the hand is of paramount importance, given the functional implications of burn contractures of the hands. Without proper positioning, the hand assumes a position of deformity which is radial deviation with wrist flexion, metacarpal extension with hyperextension of the fourth and fifth metacarpophalangeal joints, and proximal and distal interphalangeal flexion (see Figure–1). The longitudinal and palmar arches diminish, causing flattening of the palmar surface of the hand.[12]

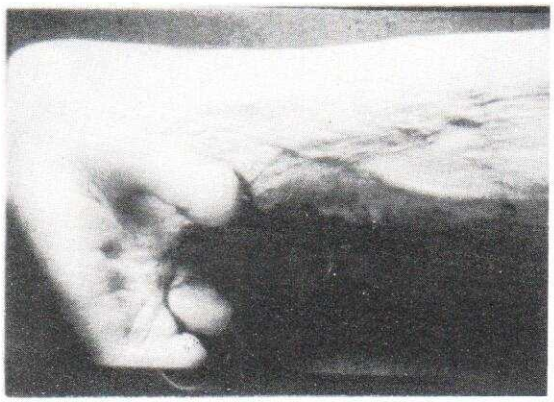

Fig. 1

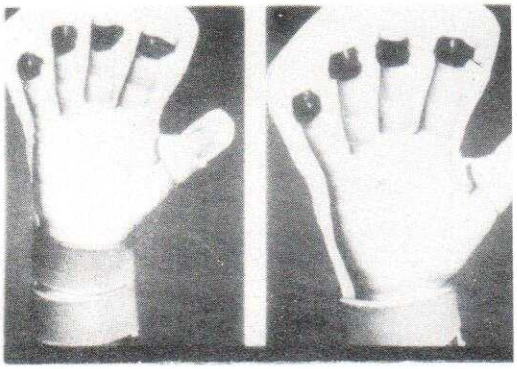

Fig. 2

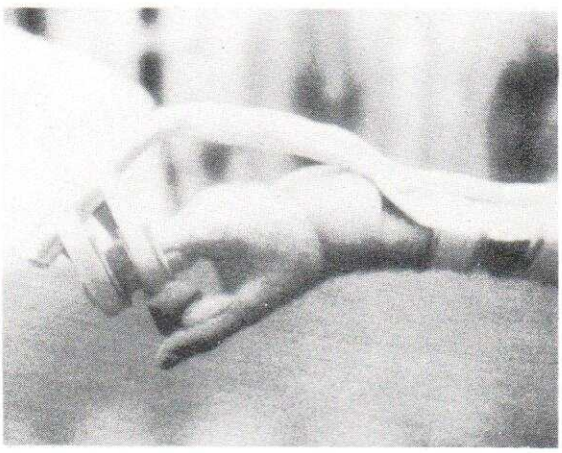

Fig. 3

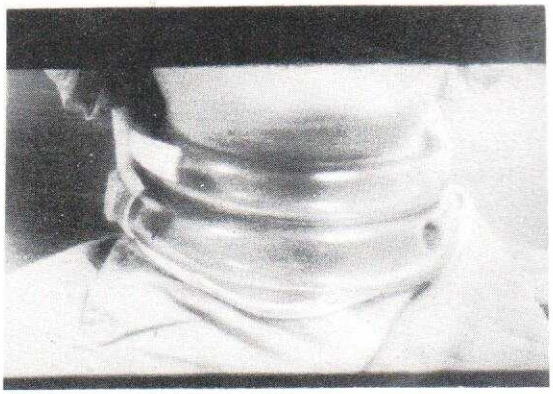

Fig. 4

Fig. 5

FIGURES

Figure 1 – Severe head flexion contracture
Figure 2 – Dorsal hand orthosis used for palmar burn
Figure 3 – Dynamic wrist-hand orthosis allowing active distal phalangeal flexion
Figure 4 – Watusi collar
Figure 5 – Thermoplastic face mask

Dorsal hand burns occur twice as frequently as palmar hand burns because the dorsal skin is thinner. Dorsal skin elasticity allows the joints to move as the skin stretches and loss of this elasticity may cause a functional deficit. The proper position of the hand in dorsal skin burns is neutral wrist extension, metacarpal-phalangeal joint flexion between 60 and 90 degrees, and interphalangeal joint extension.[1,12] Extrinsic finger extensor tendons beneath the dorsal skin may be injured in dorsal hand burns. Injury to the central extensor mechanism may result in a Boutonniere deformity.[12]

The palm of the hand is covered by a very tough glabrous skin that is tethered to the underlying deep fascia. Palmar skin is usually spared in serious burn injury except in contact burns or large surface burns. The nine flexor tendons of the digits are usually protected by the thick palmar skin and fascia. The intrinsic hand muscles are rarely involved because of their depth. The proper position of the palmar burned hand is 30 degrees of wrist extension with 60 to 90 degrees of metacarpal- phalangeal joint flexion and full interphalangeal joint extension. The thumb should be positioned in abduction and opposition, with the arches of the hands preserved (see Figure 2). If the hand is too edematous for a splint initially, a gauze roll may be placed in the hand to maintain proper positioning.[1,13]

Dynamic splinting of the hand can be initiated as the wound begins to re-epithelialize. These splints are used when directional pull and stable static support are required. They can be somewhat cumbersome because, in addition to providing directional pull, they must accommodate dressings and wraps[1,13] (see Figure 3).

Splinting of the knee and elbow is accomplished via three point extension splints which maintain these joints in full extension. An airplane splint maintains the shoulder in 90 degrees of horizontal abduction to prevent the axillary web space from contracting. The ankles should be maintained at neutral dorsiflexion using a posterior splint.[1,2,13]

Anterior neck burns may be treated with a watusi collar which has rubber rings to prevent contracture (see Figure 4). Thermoplastic molded inserts can be added under the ring to concentrate pressure in specific burn areas.

PAIN

Pain managment in burn patients is of extreme importance for successful rehabilitation. Pain is severe in the acute phase; it may be described as throbbing, stinging, stabbing or lancinating. As the wound begins to heal, the pain lessens and is described as aching, burning and tender. Pain for burn patients does not necessarily end with the healing of their wounds. In rare cases causalgia, dysesthesia, and phantom pain syndrome have been reported to develop as late occurrence in burn wounds, especially when there is healing through granulation.

Pain management in the acute resuscitative phase (first 72 hours post injury) for patients with more than 20% TBSA may require opiates. Opiates help to manage the patient's pain, with little chance of respiratory depression. They may be given as continuous intravenous drip or as small frequent intravenous doses around the clock. Additional narcotics may be needed for painful procedures, e.g. dressings, exercise, etc.[14]

Standard narcotics may be considered later in the acute phase. Patient controlled analgesia (PCA) takes advantage of strong narcotics which can be self-administered in small frequent doese. PCA has been shown to effect pain relief with half the total doses, and fewer post-operative complications.[14] Nonsteroidal anti-inflammatory agents are also used alone or in combination with narcotics to treat pain in the acute phase.

Burn patients may continue to complain of pain during the late rehabilitative phase even if the wounds are closed. Itching and tingling can occur during scar maturation and the scar may be painful during exercise. Nonsteroidal anti-inflammatory drugs may be used during this time.

The patient may experience periods of depression and anxiety due to altered body image and restricted function, which may necessitate psychological intervention. Antidepressants and mild tranquilizers may help relieve the depression and anxiety.

EXERCISE PROGRAMS

An exercise program should be developed for the patient on the day of admission and should be started early in the rehabilitation process to prevent contractures (skin and joint), loss of muscle bulk, and respiratory complications. An exercise program is contraindicated when viability of the tissue is in question, or immediately after skin grafting. The exercise program is frequently initiated during hydrotherapy sessions and is limited to 20 minutes. Active exercises are usually initiated between five days and two weeks post-grafting. Active and active assistive exercises are most desirable. Passive range of motion is the least desirable exercise technique and is used only when the patient is noncompliant or cannot achieve full range of motion. Patients with superficial burns can participate in full, active ROM exercises. Pain control is a major issue during the exercise period and opioids are commonly used as a treatment.[14] As the patient improves, functional activities are added to the treatment scheme. Joint mobilization and stretching of scar contracture has an important role. However, caution must be used. Stretching should never be used on patients with exposed tendons or open joints. Care must be taken not to fracture recently healed fragile skin which will not tolerate stress and manual forces. Each burn patient should have a self-exercise program that he or she can perform in the absence of therapists, which begins with isometric exercises, and progresses to full joint range of motion against resistance.[7] The use of continuous passive motion machine (CPM) in the treatment of the burned hand is very helpful in maintaining ROM.

HYPERTROPHIC SCAR

Hypertrophic scarring and scar contractures are common sequelae of deep partial and full thickness thermal injury in which the reticular dermis is destroyed. Most superficial partial thickness burns heal without hypertrophic scarring. Clinically, the hypertrophic scar is red, raised, and rigid. It consists of an overgrowth of dermal components, often thickening to more than one centimeter with a thin atrophic epidermis. Hypertrophic scars may also occur at donor sites, precluding thermal trauma per se as the cause and suggesting an epidermal influence on dermal synthetic activity which is believed to result from overactive myofibroblasts.[15] The scar is often accompanied by a contracture which usually occurs on the flexor surfaces of joints, or where skin margins are unopposed by fixation points, e.g. eyelids, nares, lips. The scars will blanch, flatten, and soften with maturation. The end results of the hypertrophic scar are deformity, discomfort, and a less durable scar.[15]

Pressure is the standard method of preventing hypertrophic scar formation and accelerating its maturation. It is usually applied at 25 mm Hg or more (i.e. above capillary pressure) using a variety of materials including synthetic conformers and pressure garments. The pressure must be continuous and evenly applied for as long as the myofibroblasts remain active (usually six to twelve months). Many centers use a custom nylon elasticized garment such as a Jobst garment, because it provides enough pressure to prevent burn scar hypertrophy. Pressure therapy is believed to exert its effect via mechanical actions. One theory is that the pressure inhibits blood flow, which aggravates a pre- existent condition of vascular stasis and relative hypoxia and results in occlusion of the vessels in the scar. Another postulated effect of reduced blood flow is the inhibition of factors that impede scar breakdown.[15] The effects of pressure garment therapy include an immediate

superficial blancing and thinning.

Burn scar support garments can be further customized by the use of inserts and conformers which enhance pressure over problem areas such as the central face and the palm of the hand. These areas cannot be provided with adequate pressure by the pressure garment alone.[7] Some burn centers fabricate special plaster or thermoplastic face masks in an attempt to gain a better match of facial contours (see Figure 5). However, plaster and thermoplastics masks prevent dynamic facial movements. At present, elastic support face masks are the most commonly used.[16]

NEUROMUSCULAR COMPLICATIONS

Peripheral neuromuscular problems are common among thermally injured patients. Muscle weakness, all too often attributed to disuse, frequently prolongs and complicates the convalescent phase of burn treatment. A diffuse peripheral polyneuropathy of unknown etiology has been reported in 15 to 20% of burned patients, with a higher incidence among those patients with a TBSA of greater than 20%. Localized neuropathies secondary to compression or stretch are also a cause of muscle weakness and are usually avoided by proper positioning and splinting.5 There are numerous reports in the literature which document the prevalence of peripheral neuropathy in association with both electrical and non-electrical burns.[17] In a clinical and electromyographic study by Helm et al[18] which involved 88 burn patients with complaints of weakness or sensory loss, 84% had a total of 117 neuromuscular abnormalities. The most common diagnosis was generalized peripheral neuropathy (56%) which the authors felt to be secondary to burns over a large surface area, neurotoxic drugs, or some undetermined cause. Peripheral neuropathy was common in electric burn patients with less extensive burns. Hendersen[19] postulated that peripheral neuropathy in burn patients may be caused by metabolic disorders. In contrast, the Helm study found no statistical correlation between the occurrence of peripheral neuropathy and elevated blood urea nitrogen, sepsis, or the use of magnesium sulfate.[18] Neither study suggested a reason for the higher incidence of this disorder in electrical burn patients. Other late neurologic complications including seizures, headaches, paralysis, causalgia, radiculopathy, spastic paraplegia, spasticity, and myelopathy have been reported in these patients.

HETEROTOPIC OSSIFICATION

Deposition of calcium in the joint capsules causes heterotopic ossification and loss of range of motion of the affected joint. This phenomenon also occurs in a number of illnesses other than burns. The incidence is between 0.1% and 3.0% in burn patients, with the most involved joints being the elbow, shoulder, hip, and knee.

The cause of heterotopic ossification is unknown. Theories regarding etiology include overzealous joint manipulation, tissue hypoxia, local infection, circulatory stasis, immobilization, increased protein intake (greater than 150 g per day) with marked calciuresis, antigen-antibody disorders, and a possible neurotrophic factor.[20] Heterotopic bone appears to have a predisposition for the posteromedial aspect of the joints. Since injury with microhemorrhage caused by aggressive physical therapy is a postulated etiologic factor, once heterotopic ossification is diagnosed, patients should remain on an exercise program of active exercises only. Aggressive passive range of motion beyond the range of pain-free movements has been shown to result in complete ankylosis of the joint. Active range of motion exercises that maintain as much joint ROM as possible should be recommended.[21]

Cardinal warning signs of heterotopic ossification include a sudden decrease in range of motion, localized joint pain, progression to significant functional limitations, and positive confirmation by radiographs. Activity of heterotopic bone may be monitored by a triple

phase bone scan. Alkaline phosphatase is not a good indicator of heterotopic bone activity.[20] Etidronate disodium is a medication designed for prophylactic use, and may be of no benefit once heterotopic ossification has started.[20] Heterotopic bone, once formed, is allowed to mature for up to two years before a decision is made as to whether the patient will require surgical excision. However, this delay has been challenged recently. In addition, nerve entrapment has been considered by many to be a relative surgical emergency, and early resection of heterotopic bone in this setting is frequent.[22]

PSYCHOLOGY

Patients with burn injuries frequently have significant psychologic morbidity. An excellent descriptive study of the stages of adaptation following burn injury and a method of facilitating psychologic recovery was presented by Watkins.[23] However, a full discussion of the methods of psychological intervention cannot be undertaken here. Psychologic recovery after burn injury may require long-term intervention by psychologists, psychiatrists, and supportive personnel. This intervention is frequently one of the most important aspects of burn rehabilitation.

VOCATIONAL REHABILITATION

The ultimate goal of the burn team is to retrain hospitalized burn patients to their pre-injury level of function as soon as possible. Therefore, efforts should be spent not only on functional recovery, but also on vocational skills. This is especially significant since, except for children aged 1-5 who are scalded, the majority of burn victims are young men aged 17-30 years.[24] Burns are the third ranking cause of accidental injury.[25]

Emotional, social and physical issues have to be considered in prevocational counseling. Burn victims may lose their ability to feel secure and self confident at work, especially if they must return to an area where the injury occurred. Experience has shown that if injured workers do not return to work within 6-12 months, they may never return since nonfunctional habits, e.g. staying up late watching television and rising too late for work, depression, etc., become established. Work is important for physical and mental health of adults, and plans to return to work as soon as possible are important for complete rehabilitation. Burn injury patients often have decreased social contacts while recovering, and thus co-workers are encouraged to stay in touch. The patient may need to learn how to have a positive attitude to maintain social ties during their recovery.

Physical issues in vocational rehabilitation involve the presence of residual conditions, e.g. any open areas, joint contractures, residual pain, visual or hearing impairments, amputation(s), and memory or neurological dysfunction. A grotesque disfigurement of the face or hands may interfere with job function. Fear of returning to work may be another important issue. The employers may need to make work site accommodations and job modifications to allow the employee to return to their pre-burn position. Bowden[26] identified the following factors in 155 burn patients as being significant in influencing return to work : size and depth of burn, presence of hand burns, age of the patient, and type of work.

A controlled environment at the work site may be important, as some healed patients may not tolerate a dry environment while others may not tolerate high humidity. Some may never gain enough thermoregulation to tolerate heat above 70°F, Electric burns may cause permanent loss of sensation. Cataracts may also develop following electrical injury, with could impede vocational rehabilitation. A hearing aid should be provided if hearing loss is of recent origin. A patient with an inhalation injury may never regain full respiratory capacity. Neurological injury secondary to anoxia from inhalation may preclude return to pre- burn functional level.

A complete evaluation is needed so that adequate vocational guidance may be provided.

Flexibility of employers, creativity of the rehabilitation team, and motivation of the injured employee all contribute to successful vocational rehabilitation.

SUMMARY

Rehabilitation of the burn patient is an exciting, challenging, and rewarding process. These patients do benefit from a comprehensive rehabilitation approach.

BIBLIOGRAPHY

1. Kealey GP : Physical Therapy : A Vital Aspect of Burn Care. Critical Reviews in Physical Medicine and Rehabilitation 2(4), 1991.
2. Fisher D : Comprehensive Rehabilitation of Burns. Williams and Watkins, Baltimore, 1984.
3. Cohen R : Pontine Myelinosis After Correction of Hyponatremia During Burn Resuscitation. J Burn Care and Rehabil 16(3), 1990.
4. Lutterman J : Infections in Burn Patients. Am J Med 81(1A), 1986.
5. Demerry R : Burns. N E J Med 313(22), 1985.
6. Punch J : Hospital Care of Minor Burns. Postgrad Med 85(1), 1989.
7. Petersen S : Characterization of Cellular Elements in Healed Cultured Keratinocyte Autografts Used to Cover Burn Wounds. Arch Dermatol 126, 1990.
8. Teepe : The Use of Cultured Autologous Epidermis in the Treatment of Extensive Burn Wounds. J Trauma 30(3), 1990.
9. Richard R : Autocontamination of the Burn Patient by Hydrotherapy. Bull Clin Rev Burn Injury 1(40), 1984.
10. Thomson P : A Survey of Burn Hydrotherapy in the US. J Burn Care and Rehabil 11(3), 1991.
11. Helm P : Burn Injury : Rehabilitation Management in 1982. Arch Phys Med Rehabil 63, 1982.
12. Puddicombe B : Rehabilitation of the Burned Hand. Hand Clinics 6(2), 1990.
13. Ward R : The Rehabilitation of Burn Patient. Critical Reviews in Phys Med and Rehabil 2(3), 1991.
14. Strattery PG, Harmer M, Rosen M, et al : An Open Comparison Between Routine and Self-administered Postoperative Pain Relief. Annals Royal College of Surg of England, 18-19, 1983.
15. Jensen L : Post Burn Scar Contractures : Histology and Effects of Pressure Treatment. J Burn Care and Rehabil 5(2), 1984.
16. Gallagher J : Survey of Treatment Modalities for the Prevention of Hypertrophic Facial Scars. J Burn Care and Rehabil 11(2), 1990.
17. Rosenberg D : Rehabilitation Concerns in Electrical Burn Patients. J Trauma 28(6), 1988.
18. Helm P : Neuromuscular Problems in the Burn Patient : Cause and Prevention. Arch Phys Med Rehabil 66, 1985.
19. Hendersen B : Peripheral Polyneuropathy Among Patients with Burns. Arch Phys Med Rehabil 52, 1971.
20. Peterson S : Post-Burn Heterotopic Ossification : Insights for Management Decision Making. J Trauma 29(3), 1989.
21. Crawford C : Heterotopic Ossification : Are ROM Exercises Contraindicated ? J Burn Care and Rehabil 7(4), 1986.
22. Peters W : Heterotopic Ossification : Can Early Surgey be Performed with Positive Bone Scan ? J Burn Care and Rehabil 11(4), 1990.
23. Watkins P : Psychologic Stages Following Burn Injury. J Burn Care and Rehabil 9(4), 1988
24. Fick F, Baptiste M : The Epidemiology of Burn Injury. Public Health Rep 94 : 312-318, 1979.
25. Accidental Facts. Chicago, Illinois. National Safety Council, 1983.
26. Bowden M, Thomson P : Factors Influencing Return to Employment After a Burn Injury. Arch Phys Med Rehabil 70, 1989.

EARLY SURGERY IN POLIOMYELITIS

DR. A.K. PANDEY* SURESHWAR PANDEY**

In developing countries the poliotics are usually brought late for proper management; parents, basic doctors, and patients remain either ignorant or develop negative attitude towards this disease; orthotics, even though supplied free of cost, are hardly/sparingly used; social medical workers' coverage remain negligible—in such situations majority of the patients ultimately land up in gross deformities, marked shortening, contractures, subluxation/dislocations of the joints and faulty postures and gait.

It is becoming more and more controversial, especially under the dictates of Western literature and books which have more or less stopped applying attention and space to deal with the prevention and/or correction of the attack of the disease and/or deformities. Rather they have adopted the attitude of compassion against the residual poliotics and clinicians of the developing countries. It appears quite logical that surgical intervention should be done only after the patient reaches the age of understability, co-operation and maturity. However, till that time the child must be cared by regular assessments; needed exercises; proper orthotics; timely soft-tissue or bony operations, regular follow up, care of sociomedical workers, physiotherapist and rehabilitation surgeons. Let us frankly admit, that the above norms are hardly followed, and that too in quite a few patients. The majority of the rest have to suffer resulting in shortened limb, grossly deformed joints and markedly weak (even flail) limbs.

Considering the above we are now convinced that early surgery has a great role to play (i) in preventing the deformities and gross limb length disparity; (ii) correcting deformities if they are developing or developed (in neglected cases deformities start developing even by 3 weeks); (iii) minimise the extent, the bulk and intricacy of orthotics; (iv) retarding the possibilities of subsequent stabilising procedures; (v) and above all boosting up the morale of patients and parents in developing positive attitude towards the disease and the utility of life (even if with paralysed limbs). Early surgery in polio-paralysis can be basically divided into :

(A) Ballancing procedures play great role by virtue of (i) controlling the flailism (ii) depressing the deforming forces (iii) developing the otherwise dormant weaker group of muscles (iv) improving the stability of weaker limbs (v) minimising the bulk, extent and intricacy of orthotics (vi) providing favourable environment for the ballanced growth of the limb (vii) preventing otherwise inevitable deformities (viii) by even proving as definite final procedure.

Such procedures can be done by the age of 18 months onwards and even after 6 months of attack of poliomyelitis. They prove more useful in the lower limbs. Fortunately the muscles tendons which appear as such useless (with minimal power) can be utilized to ballance the joint. Peroneus brevis has been mostly utilized around ankle and foot followed by flexor hallucis longus, extensor hallucis longus, tibialis anterior and so on, mainly to check the lateral instability and foot drop. Around the knee, a rolled band of fascia lata, semitendinosus, and gracillis tendons have been used. Around shoulder, extended

* MBBS, CORM. Ph. D. (Orth), Certified Paed. Orth. Surgeon (Japan).
** M.B.B.S. (Hons.), M.S. (Gen.), F.I.C.S. F.I.A.M.S., M.S. (Orth.), F.A.C.S.
Professor, Head of Dept. & Sr. Consultant. Dept. of Orthopaedic Surgery, Rajendra Medical College & Hospital, University of Ranchi, Ranchi.

fibrotendinous slip of trapezius has been utilized.

After the long follow up, this simple procedure has been seen to serve much more purpose than for which it was commissioned. Of course in few instances it even started producing the opposite deformity (to that where it was used to balance) eg. peroneus brevis, used to balance the foot drop, started producing calcaneus.

(B) Extra-articular fusions : The principle of such operations are well thought of. The most useful site for such procedure has been the sinus tarsi, for subtalar fusion to check the lateral instability of hind and mid foot. A segment of subperiosteally resected fibula passed from the neck of the talus through the sinus tarsi in the body of calcaneum was observed to be more reliable procedure than the screws. The blocking of the sinus tarsi with trapezoid shaped tibial graft or synthetic spacers/screws had, on the whole, less reliable results. In the upper limb, more or less extra-articular fusion of flail shoulder was done from the age of 5 onwards, using a conical tibial graft across the acromian into the medullary cavity of humerus. On the whole, it provided a fairly sound base for transfering of tendon to improve the abduction, besides the cosmetic effect.

(C) Dynamic tendon transfers : To work as definitive procedure it must be done at age when the child is wise enough to understand and obey the command for active exercises and utility of the transferred tendon. Unfortunatelly, though expected, at few occasions only, the tendons with good power are available for transfer as an isolated procedure. Some basic supportive procedures, like balancing and stabilization, were found to be useful adjuvant to dynamic tendon transfers. Comparatively the primary tendon transfers appear to have more useful roles in the upper limb than the lower, where stabilization procedures proved to be more useful.

(D) Stabilization procedure : Hitherto recommended age for stabilization procedures is only after skeletal maturity. Dominating cartilaginous element; damage of ossific nucleus; affection of dimensional growth of the bones and zones are main objection against performing the stabilization procedures at early age. These objections appear genuine. However, waiting till the age of skeletal maturity without proper care and follow ups of the paralysed children, will have probably much more adverse effects than carefully and properly done stabilization procedures at younger age.

Considering the aforesaid, stabilising the joint at early age has been practised and observed to be rewarding. After providing the base of stabilization it was seen that otherwise dormant muscles have developed even upto the level of power four or more. The apprehension for fusion did not appear true in majority of cases. Even if there was pseudoarthrosis of any joint, the overall shape, size and stability of the joint remained quite acceptable. We performed modified triple arthrodesis, whenever indicated, from the age of seven onwards with almost uniform success.

For flail ankle and foot, modified pantalar arthrodesis (without affecting the growth from lower growth plates of tibia and fibula) has been successfully performed beyond the age of eight and a half years.

In upper limb, arthrodesis of the wrist has been done from the age of three onwards (for flail wrist), utilizing the transmedullary fixation of subperiosteally resected ulnar segment pegged from radius to third metacarpal. Surprisingly there were variable recovery in the muscles controlling the fingers and thumb in good number of cases, besides cosmetic hands in all.

(E) Osteotomy : If the growth plate is avoided, osteotomy of a bone can be done at any age. In poliotics of early age, the following osteotomies have been performed with obvious benefits. To correct, the varus with or without cavus and/or adduction of the foot; 'T' osteotomy of calcaneum has been succesfully done from the age of three onwards.

In managing the calcaneus/calcaneo-

valgus/calcaneo-cavo-valgus, the calcaneal-sling-sliding-osteotomy has proved its definite role. Along with this, plication of tibialis posterior tendon helped in creating the longitudinal arch of the foot. For moderate to severe cavus of foot with or without varus and mild to moderate clawing of the toes, "Obliquesliding-osteotomy" of the foot, was observed to be superior procedure than the Dwyer's and Japas osteotomies.

Reeds osteotomy of tibia for correction of residual bowing, and supracondylar corrective osteotomies of femur for genu valgum and varum, have been performed at the age of four onwards.

Subtrochanteric de-rotation and/or pelvic supporting angulation osteotomies have been done to improve the stability of paralysed hip. Salter's innominate osteotomy has also been done to improve the stability of the paralysed dislocated hip.

(F) Surgery for limb length disparity : Fortunately the limb length disparity at early age has been seen to be less than 3 cms in most of the cases. As the range is within compensation by boots, the lengthening procedures can be withheld till the age of maturity. However, so to say, physiological lengthening (by circumferential subperiosteal stripping at the growing ends of the affected bones) has been observed to be worthwhile trial procedure beyond the age of four years. In our series we have achieved the gain in length upto 4.2 centimeters by this technique.

SUMMARY :

We have tried to put our crystalised experiences of performing more than four thousand early surgery in the patients of polio paralysis with overall gains in majority of them.

REFERENCES

1. Salter, R.B. Innominate osteotomy in the treatment of congenital dislocation and subluxation of the hip, J. Bone Joint Surg. 43-B : 518, 1961.
2. Broderick, T.F., Jr. Reidy, J.A. and Barr, J.S. : Tendon transplantations in the lower extremity : a review of end results in poliomyelitis : Part II. Tendon transplantations at the knee. J. Bone Joint Surg. 34-A : 909, 1952.
3. Herndon, C.H. : Tendon transplantation at the knee and foot. In American Academy of Orthopaedic Surgeons : Instructional course lectures, Vol. 18, St. Louis, 1961. The C.V. Mosby Co.
4. Huckstep, R.L. : Poliomyelitis : a guide for developing countries, including appliances and rehabilitation for the disabled, Edinburgh, 1975, Churchill-Livingstone.
5. Irwin, C.E. and Eyler, D.L. : Surgical rehabilitation of the hand and forearm disabled by poliomyelitis, J. Bone Joint Surg. 33-A : 679, 1951.
6. Kuhlmann, R.F. and Bell, J.F. : A clinical evaluation of tendon transplantations for poliomyelitis affecting the lower extremities, J. Bone Joint Surg. 34-A : 915 m , 1952.
7. Mayer, L. : Tendon transplantations on the lower extremity. In American Academy of Orthopaedic Surgeons : Instructional course lecturers, Vol. 6, Ann Arbor, Mich., 1949, J.W. Edwards.
8. Japas, L.M. : Surgical treatment of pes cavus by trasal V-osteotomy; preliminary report. J. Bone Joint Surg., 50-A : 927, 1968.
9. Dwyer, F.C. : Osteotomy of the Calcaneum for pes cavus. J. Bone Joint Surg. 41-B : 80, 1959.

PROSPECTIVE RANDOMISED TRIAL OF INTENSIVE PHYSIOTHERAPY WITH AND WITHOUT STIMULATION OF THE PELVIC FLOOR IN TREATMENT OF INCONTINENCE FOLLOWING TRANSURETHRAL PROSTATE RESECTION

SHIV LAL YADAV[1], K.K. SINGH[2]

22 patients referred fron Urology Department, All India Institute of Medical Sciences, who were having incontinence post Transurethral Prostate Resection (TUR) Surgery have been included in this study. They were randomised into two groups— a) the Inactive group consisting of patients who were given physiotherapy only. b) the Active group consisting of patients who were given combined therapy (Electrotherapy plus Physiotherapy). Five of the six patients in the inactive group experienced no relief at all; however, one patient developed some active control. While the patients in the active group got rid of incontinence completely leading us to conclude that intensive physiotherapy in combination with electric stimulation could be offered as a first line treatment for Post TUR incontinence.

Urinary incontinence is a major problem after TUR. Ahmed Orandi (1973) described that most men with urinary incontinence after prostatectomy for benign disease have difficulty with control of reflex bladder activity and no evidence of true sphincter weakness.

Physiotherapy has been shown to increase the power of pelvic floor contractions and lead to improved continence. Karsov et al (1986) found physiotherapy-guided exercises to be a realistic alternative to other therapeutic modules. However, many patients do not respond adequately to physiotherapy.

Urinary continence requires a complex interplay between the urethral smooth muscle, the urethral and periurethral striated muscles with fast and slow twitch motor units, urethral vascular tone, the integrity of the pelvic floor and the relationship of proximal urethra to the intra-abdominal pressure. Urinary incontinence may result from inadequacy of any combinations of these functions. A number of factors could compromise the maintenance of continence, e.g. neural damage (Snooks et al 1984); or loss of sphincter musculature.

Electrical stimulation is a method of Neuromuscular Electrical Stimulation (NME) which provides a wave form which is concomitant with normal neuronal physiology. The NME stimulators are microprocessor based, providing a physiological asymmetrical bi- phasic wave form, i.e. there is prolonged recovery phase before the next impulse.

The shape of the stimulating wave is designed to mimic a normal human wave action potential. The pulse width is in microseconds with a frequency of 20-50 Hz. Intensity for an effective stimulation may be influenced by

1. Senior Resident.
2. Professor & Head.
Department of Physical Medicine & Rehabilitation, All India Institute of Medical Sciences, New Delhi.

determining the optimal delivery of stimulation.

Work on animals has shown that it is possible to produce an increase in capillary bed density increasing the number of mitochondria and the levels of oxidative enzymes in muscle fibres (allowing more prolonged aerobic respiration and thus reducing the fatiguability of muscles) (Hudlicka et al, 1986). The changes occur from 10 days onwards; after 25 days changes in muscle protein structure become apparent. Thus after 28 days of stimulation using a frequency of 10 Hz, fast twitch muscles fibres begin to convert to slow (tonic/postural) twitch fibres. The 14 days of therapy at 35 Hz. were chosen to augment the strength of the whole muscle (Numset et al 1976).

Furthermore, it has been shown that by using electrical stimulation, EMG activity can be recorded where previously there was none (Kidd, 1984).

Regardless of the methods used, the aim must be to hypertrophy the pelvic floor musculature, increase in urethral closure mechanism, increase in circulation and normal reflex activity.

The objectives of this study were to assess the efficacy of electrical stimulation and pelvic floor exercises, compared with pelvic floor exercises only, in the treatment of Post TUR incontinence.

MATERIAL & METHODS

In this study 22 cases referred from Urology clinics having Post TUR incontinence were included. History, signs-symptoms and physical evaluation were recorded.

The manual assessment of pelvic floor muscles power was carried out subjectively as well as objectively (appendix 1). Then patients were taught and instructed to practise their pelvic floor exercises at least 3-4 times a day (appendix 2). This training was reinforced and patients remotivated on their subsequent visits to the Physical Medicine and Rehabilitation Out Patient Department.

The programming and explanation concerning the stimulators were carried out. An electro-conductive gel was used as a contact medium. The cathode was placed over the perineal body, the anode was placed over a buttock held in place with adhesive tape.

The patients received stimulation for 30 minutes per day for 4 weeks at a frequency of 10 Hz with a balanced contraction and relaxation time of four seconds each and a pulse width of 80 microseconds. This was followed with 35 Hz for another two weeks.

After 6 months of completion of treatment patients were reassessed.

RESULTS

The median age of the inactive group was 55.8 years and of the active group, 58.2 years. The median number of months of incontinence for both groups was 1.5 months. Five of the six in the inactive group did not show any active control. However, one patient developed full voluntary control. In the active group, 4 patients had undergone surgery second time after a lapse of median time of 3 years. But the response to recovery was quite similar in both the subgroups of the active group. In first week there was no improvement at all; only 5 patients could contract pelvic floor actively.

The manual assessment reading for the inactive group from the first to the final reading changed from 0/1 to 3/3. The active group increased their maximum reading from 0/1 to 5/4.

On direct questioning none of the patients reported any discomfort or side effects from electrical stimulation.

The incontinence was reduced to zero in the active group patients. Only one of the patients in the inactive group achieved a zero score, i.e. no incontinence. None of the patients in the active group required further treatment. All the patients in the study were circulated with a questionnaire six months after their treatment was completed (Table 3).

TABLE – 1

PRE-TREATMENT DATA FOR ACTIVE AND INACTIVE GROUPS

	ACTIVE GROUP (Average) n = 16	INACTIVE GROUP (Average) n = 6
Age (Years)	58.2	55.8
Duration of symptoms (months)	1.5	1.5
Maximum pelvic floor assessment		
A – Objective	2	3
B – Subjective	2	2
Number of Surgery (T.U.R./more than once)	4	–

TABLE – 2

DATA FOR ACTIVE AND INACTIVE GROUPS BEFORE AND AFTER TREATMENT

	ACTIVE GROUP n = 16		INACTIVE GROUP n = 6	
	Before Treatment	After Treatment	Before Treatment	After Treatment
1. Leakage	16	0	6	5
2. Frequency	8	2	12	6
3. Mid-stream stop	0	16	0	1
4. Normal pelvic floor assessment :				
A – Objective	0	5	0	3
B – Subjective	1	4	1	3

TABLE – 3

PATIENT'S ASSESSMENT OF RESULTS AFTER INTENSIVE PHYSIOTHERAPY (INACTIVE GROUP) & PHYSIOTHERAPY PLUS ELECTROTHERAPY (ACTIVE GROUP)

	ACTIVE GROUP n = 16	INACTIVE GROUP n = 6
At the end of study require further treatment for incontinence (electrical stimulation)	0	4
6 months after completion of study :		
a) No change since end of study	15	3
b) Deteriorated	0	1
c) No reply	1	2

DISCUSSION :

This study demonstrated very encouraging results with pelvic floor muscles exercises combined with electrotherapy.

After six weeks of intensive physiotherapy one of the six patients in the inactive group, i.e. 16.5%, required no further treatment and 100% of the group given electrical stimulation and physiotherapy required no further treatment.

If severity of incontinence is measured by the number of leakage per week then the inactive group could be said to be more severely affected group. It should be noted, however, that the most severely affected patients in the active group achieved full continence, while five patients of similar or lesser degree of incontinence in the inactive group did not. The randomisation was not stratified by symptomatic degree of incontinence. The active group had fewer incontinent episodes but had been incontinent for longer.

Stimulation parameters in the study were derived from detailed analysis of the firing rates of motor unit action potentials of normal facial muscles. Pelvic floor muscle is very similar to facial muscle, i.e. it contains a similar ratio of slow oxidative motor units and fast glycolytic motor units and both muscle groups are under voluntary and involuntary control. Farrgher et al (1987) confirmed the effectiveness of this profile of stimulations when treating patients with chronic Bell's palsy.

In our study two frequencies were used sequentially, the first being a very low frequency, i.e. 10 Hz for 4 weeks which should improve the capillary bed of all structures stimulated and promote the changes which lead to an increase in slow oxidative motor units (Buller et al, 1960). This was followed for two weeks by stimulations with 35 Hz to augment muscle strength (Numsat et al, 1976).

It is unclear which of these elements made the major contribution towards the patients' control of continence, as we did not investigate the changes in vascularity or postural tone; however, we were able to demonstrate a small improvement in pelvic floor muscles power.

The six month follow-up questionnaire indicated that no patient in the active group deteriorated, none required any further treatment for their post transurethral resection incontinence, whereas 4 in the inactive group did.

CONCLUSION

The results of this study, a prospective randomised trial of physiotherapy versus physiotherapy plus electrotherapy after six months follow up, demonstrate that combined therapy is the method of choice for the treatment to all post TUR incontinence patients.

REFERENCES :

1. Buller, A.J., Eccles, J.C., Eccles, R.M. Interactions between motor neurones & muscles in respect of the characteristic speeds of their responses, Journal of Physiology, 150, 417-439, 1960.
2. Burgio, KL, Robinson, J & Engel, B. The Role of Biofeedback in Kegal Exercise Training for Stress Incontinence, American Journal of Obstetrics & Gynaecology, 154, 58-64, 1986.
3. Farrgher, D., Kidd, GL & Tallis, R. 'Eutrophic electrical stimulation for Bell's palsy,' Clinical Rehabilitation, 1 256-271, 1987.
4. Hudlicka, O., Cotter, MA & Cooper, J. 'Electrical stimulation & neuromuscular disorders'. Nixit, WA & Vborva, C (eds) Springer, Verlag, Heidelbrg pp 21-32, 1986.
5. Karskov, P., Belving, D., Bischoff, N., Gertsenberg, T., Pedersen, PH., Tikjob, G., Wormsely, M., & Hald T., 'Pelvic floor Exercise Vs Surgery for female urinary stress incontinence', Urology International 41, 129-132, 1986.
6. Kidd, GL. 'An Analysis of the firing characterstics motor units in the facial muscles of expression', Journal of Physiology 354, 55-59, 1984.
7. Lawson, J.O.N., 'Pelvic Anatomy', Annals of the Royal College of Surgeons of England, 54, 244-252, 1974.

8. Numsat, JL., MC. Neal, D. & Walter, SR., 'Effects of neuromuscular stimulation on human muscle' Neurology, 33, 608- 617, 1976.
9. Orandi, Ahmed et al, 'Transurethral incision of the prostate', Smith's General Urology, 13th ed, a LANGE Medical Book, pp 391, 1992.
10. Scott, OM., Vbrova, C., Hyde, SA. & Dubowitz, V. Effects of chronic low frequency electrical stimulation on normal human tibialis anterior muscle', Journal of Neurology, Neurosurgery & Psychiatry, 48, 774-781, 1985.
11. Snooks, S., Swash, N., Setchell, M & Henry, N., 'Injury to innervation of pelvic floor sphincter musculature in childbirth' Lancet II, 546-550, 1984.

APPENDIX 1

MANNUAL ASSESSMENT OF PELVIC FLOOR

A. OBJECTIVE

0 No contraction of pelvic floor (nil)
1 Contraction of pelvic floor but inability to maintain for 10 seconds (flicker)
2 Contraction held for 10-15 seconds (Patient counting audibly) (weak)
3 Contraction held for 16-20 seconds (moderate)
4 Contraction held for 21-25 seconds (good)
5 Contraction held for more than 25 seconds (strong Contraction)

B. SUBJECTIVE

1 No awareness
2 Aware of pelvic floor contractions
} cannot stop mid-stream
3 Can stop mid-stream, but still continence
4 Can stop mid-stream, no incontinence

Lowest score would be 0/1
Highest score would be 5/4

APPENDIX 2

PELVIC FLOOR CONTROL

1 Tighten pelvic floor muscles
Hold for patient's audible count of five-let go and repeat five times.
Increase hold time to ten counts.
2 See how quickly you can do ten tightens.
Increase to 20 tightens.
Increase speed and number of tightens.
3 Tighten the pelvic floor; 2 lift.....10 lift;
9 let go; 8 let go.....1 let go, relax.
Repeat five times.

QUALITY NORMS FOR THE AIDS FOR DISABLED OR HANDICAPPED PERSONS

J.C. GERA

To rehabilitate disabled is the most august duty of any society. Disability is the result of war, accidents, disease or ageing. Besides, there are deformities by birth. Simple devices like splints and braces were used to relieve the suffering and pain resulting from such disability. However, now it is well appreciated that for each type of disability, a device has to be developed which could enable the disabled person to function in a normal way. The device should take care of his personal and occupational needs. The device should be of proper quality and fulfill the desired function. The components of the device should be interchangeable for easy repair and replacement. This can be possible only if there are standards for such devices which are based on our Indian experience and conditions.

STANDARDS FOR INSTRUMENTS AND EQUIPMENT FOR DISABLED

Sufferings of the disabled can be minimised if they are provided with right type of device of proper quality which will help him in performing his normal physical and occupational functions. To help in this effort, BIS took up the work of formulation of Indian Standards in the area way back in 60's by setting up Artificial limbs, Rehabilitation Appliances and Equipment for the Disabled Sectional Committee. The committee comprises of eminent rehabilitation experts, manufacturers, technical, scientific and voluntary organizations. The committee has developed over 90 standards for aids for the disabled or handicapped persons. (Details can be taken from author).

INSTRUMENTS AND EQUIPMENT FOR OVERCOMING PHYSICAL DISABILITY

A person becomes physically disabled when any limb of his body does not function in a normal way. In such case he is fitted with orthotic or prosthetic components or treated with the help of occupational therapy and rehabilitation aids.

Orthotic Components – Orthotic components are those which supplement functions impaired by disease, injury or deficiency. Over 22 Indian Standards are available for orthotic components in which the detailed requirements for various types of calipers, braces and splints are specified. Important among these relate to knee joints with lock for steel orthopaedic calipers and braces, pelvic band for steel orthopaedic calipers and braces, tuber band for orthopaedic caliper and braces, basic hand splint component, staple ankle joints, modular lower limbs orthotic components and thoraco-lumbo-sacral, flexion– extension and lateral-flexion control brace.

Prosthetic Components – Prosthetic components are those which are put inside the body for replacement of musculo-skeleton system of the bones temporarily or permanently. For prosthetic components some 33 Indian Standards are available. Important among these relate to adopter for terminal devices, artificial limbs,

Director (Medical Equipment & Hospital Planning), Bureau of Indian Standards, New Delhi – 110 002.

typing finger, typing fingers terminal device, steering appliances for artificial limbs, knife terminal device for artificial limbs, cruciform below knee joints, hip dis- articulation joint for lower limb prosthetic fitments, table spoon terminal device for artificial limb, tweezer device for artificial limbs and sach foot for lower extremity prostheses.

In all prosthetic and orthotic components mobility strength, shape and dimensions are main consideration. The upper, the lower or the both limbs of the joints should have sufficient mobility and locking arrangement to save handicapped persons from accidental jerks. The limbs should be made in a colour matching with the colour of the body.

Rehabilitation Aids – The most common equipment for physical rehabilitation are – crutches and wheel chairs for which Indian Standards have been published. Standards for metal forearm crutches has also been published. The standard for wheel chair is in three parts covering institutional model, folding type with removal armrests and swinging footrests and the junior size. All these standards specify requirements for material, important dimensions, construction, workmanship and finish, load test, tests for wheeling and hazard running and test for folding in case of folding chairs.

Other important standards for rehabilitation relate to shoulder wheels, paraffin wax bath, stationary cycle exerciser for adults, cycle fret saw and table tilting (manual). In all these standards, the main emphasis are on functional aspects.

Instruments and Equipment for Visually Handicapped – Blind or partially sighted persons form a substantial number of the handicapped persons. They have to be rehabilitated in the society so that they become independent as far as possible in carrying out their personal and occupational functions. For partially sighted persons standards like – spectacle frame and spectacle lenses and visual acuity test charts have been formulated. For the benefit of totally blind persons, a number of standards have been formulated which relate to braille slate, braille paper, cane for visually handicapped and signature guide for visually handicapped.

Equipment for Deaf and Mutes – The equipment which helps a deaf person to hear and communicate is hearing aid for which Indian Standards have already been published for general and performance requirements.

Buildings and Facilities for Disabled – To create facilities and conditions of work suitable for the disabled, certain basic requirements are necessary from the planning stage in the building. An Indian Standard, IS 4963 had been published for recommendations for buildings and facilities for the physically handicapped. This standard contains recommendations for doors, windows, staircase, ramps, hand-rails, signs, controls, space within building, parking lots, toilets, etc., based on anthropromatric dimensions for adults and sizes of wheel chairs and other similar equipment.

Equipment for Other Type of Disability – Work relating to formulation of standards for aids used by other type of handicapped persons such as speech impaired, mentally handicapped, mentally ill and those suffering from epilepsy, psoriasis and the disability linked to ageing is yet to be initiated.

WORK AT INTERNATIONAL LEVEL

Work relating to standardization of equipment used by the disabled is receiving attention of the International Organization for Standardization (ISO). Technical Systems and Aids for Disabled or Handicapped Persons Technical Committee (ISO/TC 173) has been set up to undertake this work. The Committee is responsible for the formulation of International Standards on items, such as walking aids, wheel-chairs, personal hoists, aids for stoma and urinary incontinence, aids for personal hygiene, aids for adapation to standard products to be used by handicapped persons, aids for training, aids for communciation and aids for re-orientation. A few standards have been

published on wheel chairs and others are in the process. Another ISO Technical Committee is on prosthetics and orthotics (ISO/TC 168) covering such aspects as performance, safety and interchangeability. The work of this committee is in progress and standards have been published on vocabulary of prosthetic and orthotics and method of describing limb deficiency present at birth. Standards published at international level on aids for disabled and handicapped persons are available.

IMPLEMENTATION OF INDIAN STANDARDS

Standards are basically voluntary in nature. To promote the availability of quality instruments in accordance with the requirements stipulated in the relevant Indian Standards, users have to creat a demand for safe and quality equipment. If the users insist on purchasing equipment manufactured in conformity with the relevant Indian Standards, sub-standard equipment being manufactured would automatically get eliminated.

BIS CERTIFICATION

The ultimate solution for quality certified medical devices is the BIS Certification Mark. The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act 1986 and rules and regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard Marked products are also continuously checked by BIS for conformity to the relevant standard as a further safeguard.

CONCLUSION

The Indian Standards for rehabilitation, prosthetic and orthotic aids have been prepared on the basis of experience of the practioners and limb fitting and rehabilitation departments. It is hoped that if these devices and equipment are manufactured as per the relevant standards, these will meet the desired functional and comfort requirements. It is for the user organizations to implement these standards so that aids of proper quality are made available to the disabled or handicapped persons.

SPINAL ORTHOSIS FOR SCOLIOSIS
"A Preliminary Study"

PROF. M.K. GOEL[1], DR. A.K. AGARWAL[2], DR. ROHIT GOEL[3]

With the increasing consciousness of spinal deformities and their early detection, a large number of patients of scoliosis come for its management at an early age. If not treated early it leads to ugly rigid deformity of the spine. In such cases spinal orthosis play a very important role. Dr. Blount and Dr. Schmidt (1948) 1,2,3 gave the medical profession "Milwaukee Brace", spinal orthosis for treatment of early cases of scoliosis.

Though Milwaukee Brace even today remains an effective method of conservative treatment of scoliosis in mild mobile curve in skeletally immature patients but it has the disadvantage of being uncomfortable and unacceptable by the patient and needs time in fabrication, yet in cervico dorsal scoliosis it is the best type of spinal orthosis. In an effort to overcome the above mentioned disadvantage with Milwaukee Brace, a number of under arm plastic spinal orthosis have been developed. An ideal orthosis should be light, have good cosmetic & acceptable to the patient. It should permit good air circulation, simple and quick fabrication and should adequately correct the deformity. Patient should easily take off and put on the orthosis.

A number of under arm orthosis are now available like Lexan Jacket from Pasadena, PVC Orthosis, Orthoplast Jacket and Boston Brace. Bunnel, Mac Ewen, Hall, Park, Watts and Yates 4,5,7,8,9,10,11,12 have discreted different types of under arm orthosis. These orthosis provide a rigid support and is efficient in treating lumbar and thoraco lumbar curves and also helps in correcting thoracic curves with apex at about T7. It stops the progression of the scoliotic curves in growing children. It extends anteriorly from the sternum to the pubic symphysis, laterally from axilla to the trochanter and posteriorly from the upper thoracic region to the gluteal folds. This under arm orthosis (T.L.S.O.) has the disadvantage that it is not suitable for the cervico thoracic curves and prolonged use may alter the thoracic cage and even may restrict pulmonary functions in a child whose pulmonary functions are already low.

LOW TEMPERATURE THERMOPLASTIC SPINAL ORTHOSIS :

Recently we are using low temperature thermoplastic for Spinal Orthosis. This is a pink coloured perforated sheet in different thickness of 2 to 5 mm. This becomes transparent, soft and elastic at 60°C when kept in a tray containing hot water. Then it is easily moulded directly on the spine in maximum correction which hardens on cooling thus maintaining the corrected position. If any modifications are needed afterwards they may be done after reheating it. It has the property of elasticity and can be stretched to a great length as desired for moulding. It has the advantage of memory therefor it returns to its original shape when heated. This has the advantage that alteration can be made in a growing child. It has also self adhesive properties and velcro and tapes sticks to it when heated. The main advantage is that it is very quick and simple to fabricate as it is directly moulded over the spine and no negative or positive moulds are

1. Emeritus Professor, Orthopaedic Surgery, K.G. Medical College, Lucknow.
2. Sr. Med. Officer Cum Reader, Department of Physical Medicine & Rehabilitation, K.G. Medical College, Lucknow.
3. Royal National Orthopaedic Hospital, Stanmore, U.K.
Correspond with Dr. M.K. Goel, B 2/2, River Bank Colony, Lucknow-226 018.

made. Another advantage is that it can be used for immobilizing the spine after surgery with internal instrumentation and bony fusion thus replacing Risser's plaster jacket.

OBSERVATIONS :

We have studied 30 cases of scoliosis in whom under arm orthosis was used. There were 16 female & 14 males in the age group of 2 to 16 years. There were 12 cases of congenital, 9 of idiopathic and 9 paralytic scoliosis. The degree of curve ranged from 18° to 95° with an average of 49°. Range of best correction was 37% to 68% while mean best correction was 52.9%. The treatment time was 2.5 years. Spinal major curve with apex between T7 and L2 gave best results. Patients should wear orthosis for about 23 hours a day. They may take out during swimming, dancing and other atheletic activities. After maturity patients may use the orthosis during sleep for some time. The weaning is gradual after skeletal maturity and carefully observed with frequent radiograph. Partial application of orthosis appeared as effective as full time wear. Orthosis has practically no significant effect on correction of rotation. A coordinated physical therapy programme is necessary to develop trunk muscles and for encouraging active correction.

WHAT BRACE TO BE USED ?

In single lumbar, thoracolumbar and thoracic curve with an apex below T7 under arm orthosis is advised. For cervico thoracic pulmonary functions are also not restricted.

WHOM TO BRACE ?

Curve under 20° must be kept under observation. In curves over 20° and especially over 30° orthosis should be prescribed. Curves over 50° in adolescense usually do not respond much to orthosis.

DOES ORTHOSIS CAUSE PERMANENT CORRECTION ?

No long term results of under arm orthosis are available since they have not been used for a long period. Some retention of the curve about 30° was noted when the brace was discontinued. It was thought that Milwaukee Brace gave permanent improvement but recent study from Milwaukee indicate most of the permanent correction is lost.

In future we have to find an orthosis for scoliosis which may give permanent improvement in scoliosis and cosmetically is accept- able to the patient. Low temperature thermoplast orthosis is light, has good appearance, helps in the correction of the curve and is directly moulded on the spine. This is a great step forward in orthosis for spinal scoliosis provided they live upto their promise.

REFERENCES

1. Blount, W.P., Schmidt, A.C. Keever, E.D., and Leonard, E.T. : The Milwaukee Brace in the Operative Treatment of Scoliosis. J. Bone Joint Surg., 40A : 511-525, 1958.
2. Blount, W.P. : Scoliosis and Milwaukee Brace. Joint Dis., 19 : 152, 1958.
3. Blount, W.P. and Moe, J.H. : The Milwaukee Brace. Baltimore, Williams and Wilkins Company, 1973.
4. Bunnel, W.P. and Mac Ewen, G.D. : Use of the Orthoplast Jacket in the Non-operative Treatment of Scoliosis. Presented at the Tenth annual meeting of the Scoliosis Reasearch Society, Leuisville, KY., September 11, 1975.
5. Bunnel, W.P., Mac Ewen, G.P. and Jaya Kumar, S. : Plastic Jackets in Non-operative Treatment of Scoliosis. J. Bone Joint Surg., 62 A : 31-38, 1980.
6. Cockrell, R., and Risser, J. : Plastic Body Jacket in the Treatment of Scoliosis, Exhibit at the Annual Meeting of the American Academy of Orthopaedic Surgeons, Las Vegas, 1973.
7. Hall, J. and Miller, W. : Prefabrication of Milwaukee Brace, J. Bone Joint Surg., 56 A : 1763, 1974
8. Hall, J. and Miller, W., Shumann, W. and Stanish, W. : A Refined Concept in the Orthotic Management of Scoliosis, Orthotics Prosthetic, 29 : 9-16, 1975.

9. Park, J., Houtkin, S., Grossman, J. and Levine, D.B. : A Modified Brace (Prenyl) for Scoliosis. Clin. Orthop., 126 : 67-73, 1977.
10. Watts, H.G. : Manual for "Boston Brace System" Workshop, ed. 8 Boston, March, 1979.
11. Watts, H.G., Hall, J.E., and Stanish, W. : The Boston Brace System for the Treatment of Low Thoracic and Lumbar Scoliosis by the use of a Girdle without Super Structure. Clin. Ortho., 126 : 87-92, 1977.
12. Yates, G. : Molded Plastics in Bracing. Clin. Orthop. 102 : 46-57, 1974.

AN ANALYSIS OF PATIENTS SEEKING PHYSIATRIC SERVICE OF A RURAL MEDICAL COLLEGE HOSPITAL

* DR. NITYANANDA KAR, ** DR. KALICHARAN BANERJEE,, *** DR. AMIYA BANERJEE, **** DR SUNIL BARAN MAJUMDAR

A total of 13008 patients attending Department of Physical Medicine, Burdwan Medical College Hospital, West Bengal, during the period from January '91 to December '91 are studied. Out of these cases rheumatic diseases are maximum (73.8%) followed by orthopaedic disorders (19.8%) and paralytic disorders (5.8%). Rheumatic diseases are common (52.8%) in age group 20-40 years, maximum (58%) in females and mostly (57%) of soft tissue rheumatism followed by osteoarthrosis (36%). Orthopaedic disorders are highest (57.4%) in the age group 20-40 years, maximum (68%) in male and mainly of soft tissue injuries (31%) followed by old fractures cases (26%). Paralytic disorders are maximum (63%) in males and highest (48%) in age group below 10 years. Cerebral Palsy cases (21.6%) are more than Poliomyelitis cases (18.4%).

About 80% of total population of India reside in rural area. Rural people are naturally more prone to neuromusculoskeletal disorders as they are mainly manual workers and housewives. Physical Medicine and Rehabilitation services in rural areas are also negligible. It is aimed to study the incidence and clinical picture of patients in rural area seeking physiatric services, which will be helpful for further planning and development of needbased physiatric services in rural area.

MATERIAL & METHOD

The study is carried out in the Department of Physical Medicine and Rehabilitation, Burdwan Medical College Hospital, Burdwan, a rural Medical College in West Bengal, during the period from January, 1991 to December, 1991. All patients irrespective of age, sex and cause attending the Department during this period are included in the study. In each case history, detailed clinical examination, routine blood test, blood sugar, serum uric acid, blood for rheumatoid factor and A.S.O. titre and X-ray of the part are done to come to a diagnosis. Nerve conduction test is also done if required. The patients are advised medicines, physiotheropy, orthosis and prosthesis etc. accordingly.

RESULTS & DISCUSSION

A total of 13008 patients attend the Department during the period of one year of which 6307 (48.5%) cases are male and 6701 (51.5%) female. Maximum cases 6738 (51.8%) are in the age group 20-40 years followed by 3810 (29.3%) in the age-group of 40-60 years. There are preponderance of female in all age groups

* M.B.B.S. (CAL); D.B.M.S. (CAL); M.D. (CAL), PHYSICAL MEDICINE & REHABILITATION, LECTURER
** M.B.B.S., R.M.O. CUM CLINICAL TUTOR.
*** M.B.B.S. (CAL), MEDICAL OFFICER.
**** M.B.B.S. (CAL), MEDICAL OFFICER.
DEPARTMENT OF PHYSICAL MEDICINE, BURDWAN MEDICAL COLLEGE AND HOSPITAL, BURDWAN, WEST BENGAL.

except in the age groups below 20 years where males are more (Table – 1). Out of total 13008 cases rheumatic diseases are maximum 9600 (73.8%) followed by orthopaedic disorders 2580 (19.8%), paralytic disorders 750 (5.8%) and others like postburn contracture, Thrombophlebitis, Buerger's disease etc. 78 (0.6%) (Table – 2). Rheumatic diseases are seen maximum (58%) in female and mainly (52.8%) in the age group of 20-40 years (Table – 3). Amongst rheumatic diseases, soft tissue rheumatism cases including lumbo- sacral strain, fibrositis, periarthritis, etc. are maximum (57%) followed by osteo-arthrosis (36%), rheumatoid arthritis (5.2%) etc. (Table – 3). While the findings of Brighton (1983) on rheumatic diseases in an unsophisticated rural society of Africa reveal no cases of rheumatoid arthritis, fairly common osteo- orthrosis with one to three joints involvement and no case of multiple osteo-arthrosis with Heberden nodes. Beighton et al (1975) concluded that rheumatoid arthritis is rare and of mild nature in rural African population. The high incidence (5.2%) of rheumatoid arthritis in our study is probably due to adaption of sophisticated life style in our rural areas. Orthopaedic disorders are found mainly (68%) in male and more (57.4%) in the age group 20-40 years. Out of 2580 Orthopaedic disorders soft tissue injury cases are highest 798 (31%) followed by old fractures 672 (26%), prolapse intervertebral discs (17.5%), congenital abnormalities of limbs and spine 9.8%, chest injuries 9.1%, amputees 0.7% and others 5.9% (Table – 4).

In the present study incidence of amputee is 0.7% while Ratnesh Kumar et al (1988) observed 6.7% amputees in rural disable camp studies. This low incidence of amputees in our study is probably due to rural disable camps organised by government and non- government organisations in rural areas off and on.

Paralytic disorders are seen mainly (63%) in males and highest (48%) in the age group below 10 years. Among paralytic disorders peripheral nerve lesions are commonest (29.6%) followed by cerebral palsy cases (21.6%), poliomyelitis (18.5%), hemiplegia (14.4%), etc. (Table – 5). Peripheral nerve lesions include nerve injuries, leprosy & G.B. syndrome etc. In the present study among childhood disability cerebral palsy cases (144) are found commonest (21.6%) followed by poliomyelitis cases (18.4%), while Ratnesh Kumar et al (1988) observed maximum number (69.2%) of poliomyelitis followed by cerebral palsy (5.6%) in childhood disability.

TABLE – 1

Showing age and sex distributions of study cases

Sex	Age in years					Total
	0-10	10-20	20-40	40-60	60 +	(%)
Male	456	686	3209	1732	224	6307
	7.2%	10.9%	50.9%	27.5%	3.5%	48.5%
Female	243	601	3529	2078	250	6701
	3.6%	9%	52.7%	31%	3.7%	51.5%
Total	699	1287	6738	3810	474	13008
	5.4%	9.9%	51.8%	29.3%	3.6%	100%

TABLE – 2

Showing distribution of cases according to etiology

Diseases	Male	Female	Total
Rheumatic Diseases	4040 42%	5560 58%	9600 73.8%
Orthopaedic Disorders	1759 68%	821 32%	2580 19.8%
Paralytic Disorders	474 63.2%	276 36.8%	750 5.8%
Miscellaneous	34 43.6%	44 56.4%	78 0.6%
Total	6307 48.5%	6701 51.5%	13008 100%

TABLE – 3

Showing Distribution of Rheumatic diseases in relation to age and sex

Rheumatic Diseases	Age in years and Sex							Total
	0-10	10-20	20-40	40-60	60 +	Male	Female	(%)
Rheumatic Arthritis	18 42.9%	24 57.1%	x x	x x	x x	30 71.5%	12 28.5%	42 0.4%
Rheumatoid Arthritis	6 1.2%	90 18.3%	252 51.2%	120 24.4%	24 4.9%	132 26.8%	360 73.2%	492 5.2%
Ankylosing Spondylitis	x x	x x	60 100%	x x	x x	58 96.7%	2 3.3%	60 0.6%
Gouty Arthritis	x x	x x	12 100%	x x	x x	10 83.3%	2 16.7%	12 0.1%
Osteo Chondrosis	42 63.6%	24 36.4%	x x	x x	x x	54 81.8%	12 18.2%	66 0.7%
Osteo Arthrosis	x x	12 0.3%	1314 38%	1866 53.9%	270 7.8%	1482 42.8%	1980 57.2%	3462 36%
Soft Tissue Rheumatism	36 0.7%	558 10.2%	3432 62.8%	1314 24%	126 2.3%	2274 41.6%	3192 58.4%	5466 57%
Total	102 1.0%	708 7.4%	5070 52.8%	3300 34.4%	420 4.4%	4040 42%	5560 58%	9600 100%

TABLE – 4

Showing Distribution of Orthopaedic Disorders in relation to age and sex.

Orthopaedic Disorders	Age in years and sex							Total
	0-10	10-20	20-40	40-60	60 +	Male	Female	(%)
Cong. limb	36	24	12	x	x	32	40	72
Deformities	50%	33.3%	16.7%			44.5%	55.5%	2.8%
Cong. Spinal	6	12	156	6	x	120	60	180
Abnormalities	3.3%	6.7%	86.7%	3.3%		66.6%	33.4%	7%
Spinal	x	24	x	x	x	9	15	24
Deformities		100%				37.5%	62.5%	0.9%
Soft Tissue	36	210	450	90	12	560	238	798
Injuries	4.5%	26.4%	56.3%	11.3%	1.5%	70%	30%	31%
Chest	x	6	138	66	24	167	67	234
Injury		2.5%	59%	28.5%	10%	71.4%	28.6%	9.1%
Prolapse	x	30	360	60	x	338	112	450
I.V.Disc.		6.7%	80%	13.3%		75%	25%	17.5%
Spondylo	x	x	48	36	x	26	58	84
Lysthesis			57%	43%		31%	69%	3.2%
Recurrent	6	24	18	x	x	24	24	48
Dislocations	12.5%	50%	37.5%			50%	50%	1.8%
Old Fractures	132	90	294	138	18	468	204	672
	19.4%	13.4%	44%	20.6%	2.6%	70%	30%	26%
Amputees	x	12	6	x	x	15	3	18
		66.7%	33.3%			83.3%	16.7%	0.7%
Total	216	432	1482	396	54	1759	821	2580
	8.4%	16.9%	57.4%	15.3%	2.1%	68%	32%	100%

TABLE – 5

Showing Distribution of Paralytic Disorders in relation to age and sex.

Paralytic Disorders	Age in years and sex							Total
	0-10	10-20	20-40	40-60	60 +	Male	Female	(%)
Cerebral Palsy	144 88.9%	18 11.1%	x	x	x	86 53%	76 47%	162 21.6%
Hemiplegia	x	6 5.5%	30 27.8%	72 66.7%	x	71 65.7%	37 30.3%	108 14.4%
Paraplegia	x	12 66.7%	6	x	x	17 94.5%	1 5.5%	18 2.4%
Post-Encephalitis	42 100%	x	x	x	x	30 71.4%	12 28.6%	42 5.6%
Post meningitis	12 100%	x	x	x	x	6 50%	6 50%	12 1.6%
Paralytic Polio	126 91.3%	12 8.7%	x	x	x	78 56.5%	60 43.5%	138 18.4%
Motor Neuron Diseases	x	x	24 100%	x	x	18 75%	6 25%	24 3.2%
Peripheral Nerve lesions	24 10.8%	60 27%	96 43.2%	42 19%	x	150 67.5%	72 32.5%	222 29.6%
Myopathies	12 50%	12 50%	x	x	x	18 75%	6 25%	24 3.2%
Total	360 48%	120 16%	156 20.8%	114 15.2%	x	474 63.2%	276 36.8%	750 100%

REFERENCES

1. Brighton, S., "Third World Rheumatology", Recent Advances in Rheumatology, 3, 111-112, 1983.
2. Beighton, P., Solomon, L., & Valkenburg, H.A., "Rheumatoid arthritis in a rural South African Negro Population", Annals of Rheumatic Diseases, 34, 136, 1975.
3. Kumar, R., Bajpayee, A.K. & Agarwal, A.K., "A Clinical Study of 588 rural based locomotor Disabled : Camp Study", Indian Journal of Physical Medicine and Rehabilitation, 2, 29-32, 1989.

THE USE OF MUSCLE BASED FLAPS IN THE TREATMENT OF PRESSURE SORES.

A. JAYASWAL[1], S. RASTOGI[2], P.K. DAVE[3],

This study of 62 pressure sores which had developed in 54 patients treated in Orthopaedic Department, of All India Institute of Medical Sciences, New Delhi, between 1985 and 1990 is being presented to highlight the role of local muscle based flaps in the treatment of pressure sores. Majority of these pressure sores were encountered in traumatic quadri and paraplegics. 28% of our 210 spinal injury patients developed bed sores of varying degrees. Out of these 62 sores, 31 were treated by local muscle based flaps. All of these 31 sores were of gr. III or gr. IV. Marginal necrosis occurred in 4 of these cases — 3 of which healed well with debridement and secondary closure. Deep infection was encountered in one case but as the flap was viable, control of infection followed by secondary suturing helped in good uptake. Primary healing and uptake occurred in the remaining cases. Rather than allowing these sores to take a course of debility, the authors feel that, aggressive, timely surgical intervention help in lessening the morbidity and increasing the overall moral of such patients.

The key word in the treatment of pressure sores is without doubt, Prevention. Prevent the sores from occuring. But, inspite of best efforts these sores do occur. Superficial, small sores – grade I and II (Shea '75' Table 1) can be managed by good nursing care, keeping the pressure off the prone areas; repeated dressings and split thickness skin grafting, which may be sometimes necessary. The larger, deeper – the gr. III & IV sores cause greater problems, are not emenable to conventional treatment and require an aggressive surgical approach.

MATERIAL AND METHODS

This is a study of 62 pressure sores in 54 patients treated in the Orthopaedic Department of the All India Institute of Medical Sciences, New Delhi, between 1985 and 1990. Majority of these pressure sores (57) were encountered in traumatic guadri- paraplegics. Infact, 28% of our spinal injury patients developed bed sores of varying degrees. Two tuberculous paraplegics, two elderly patients with fracture neck of femur and one patient of ankylosing spondylitis who had a dislocated total hip also developed pressure sores and are included in this series. 48 out of 62 sores were sacral or sacro gluteal in distribution 8 were trochanteric, 4 were ischeal and 2 over the heal. 8 patients had more then 2 sores. All the sores were graded according to Shea, 1975 (Table 1). Majority of them were gr. III & II (Table 2). 8 males and 14 females with an average age of 42 years (range 16 years to 75 years) had these sores.

Gr. I superficial sores were all treated with repeated sterile dressings and postural care. The use of a water bed and sealing with dermafilm or biofilm helped. Larger gr. II sores required, besides this, debridement and sometimes split thickness skin grafting. Gr. III & IV sores required, besides aggressive debridement and

1. Associate Professor
2. Additional Professor
3. Professor
Department of Orthopaedics, All India Institute of Medical Sciences, Ansari Nagar, New Delhi – 110 029.

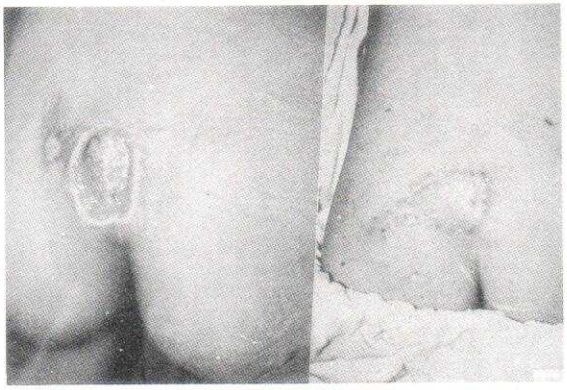

Fig. 1. : (a) Fig. 1 : (b)

Fig. 2 : (a) Fig. 2 : (b)

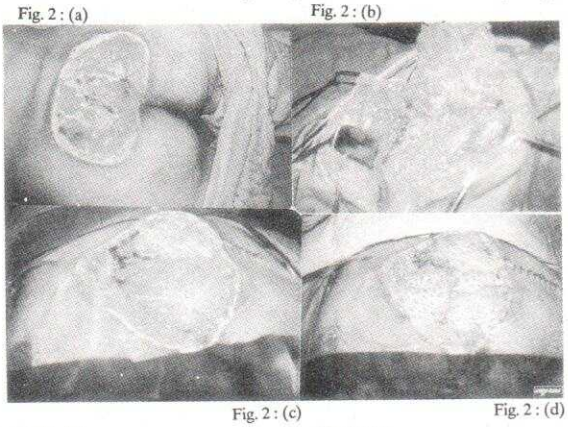

Fig. 2 : (c) Fig. 2 : (d)

Fig. 3 : (a) Fig. 3 : (b)

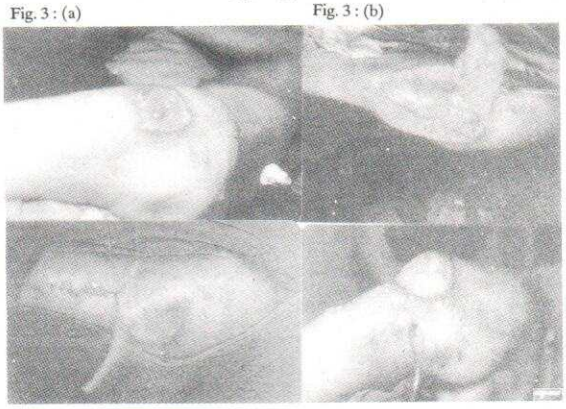

Fig. 4 : (a)

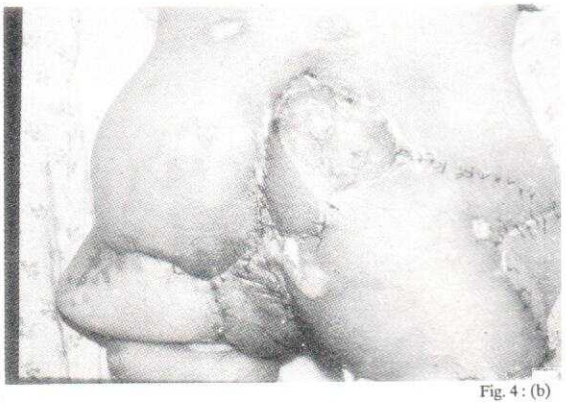

Fig. 4 : (b)

LEGENDS

Fig. 1. : a) Gr. III sacral sore.
b) The sore covered by a gluteus maximus island myocutaneous flap-2 years post-operative photograph.

Fig. 2. : a) A large Gr. IV sacral sore.
b) Peroperative photograph of the whole gluteus maximus being raised like the leaf of a book and
c) Turned over (turnover plasty) to cover the sore.
d) Split thickness mesh graft applied over muscle flap.

Fig. 3. : a) Trochanteric sore.
b) Raising of TFL myocutaneous flap.
c) TFL flap rotated to cover the sore.
d) Suction drain under the flap.

Fig. 4. : a) Multiple extensive Chronic sores.
b) Covered by multiple flaps/skin grafts, in different stages of heating.

meticulous repeated dressings, an early muscle based flap to cover the wound.

Surgical Principle :– The flap consists of a part or the whole of a nearby muscle mobilised with its intact main vascular supply. In case of sacral sores the upper two thirds of the gluteus maximus muscle is mobilized by detaching its iliac attachment two inches proximal to the trochanter, and freed distally by splitting in the direction of the muscle fibres at the junction of upper two-thirds and lower thirds (as is done in the posterior approach to the hip). The vascular pedicle of this portion of the gluteus maximus comes from superior gluteal artery which enters the muscle belly immediately after exit from the sciatic notch and hence to prevent its damage, the detachment of the sacral insertion of the gluteal fibres, if required for mobilisation of the muscle has to be done carefully. The mobile muscle flap can then be moved forwards to cover the sacral defect and secured in place with sutures to the surrounding healthy tissue. Skin cover is provided by split thickness graft either primarily or as a secondary procedure over the muscle flap. Alternatively, and better still, the flap with the superior glut. maximus muscle is mobilised with its overlying 'island' of the skin which gets its vascularity from the perforating vessels, which are branches of the main muscular vessels. This 'myocutaneous flap' thus contains vascularised skin, subcutaneous tissue and underlying vascular muscle. It is important to leave two drains, post operatively for 36-48 hrs., one in the dead space left by the mobilised muscle and another under the flap. The skin defect left after mobilisation of the 'island' of skin can be either closed by a "V-Y" technique or, if the defect is large, by split thickness skin graft.

31 local muscle based flaps were done and majority of them for sacral sores (Table 4). The flaps that needs to be chosen depends on the situation of the sore (Table 3). One patient, a young executive, with traumatic guadriplegia came two years after the injury with a big sore involving the sacrum, left gluteal region, the left ischeum with gross undermining and with a dislocated left hip and a right trochanteric sore. After excising the head of femur, flaps of the gluteus maximus and tensor fascia lata (TFL) were mobilised to cover the entire defect on the left side. Subsequently right gluteus maximus and TFL myocutaneous flaps were used to treat the sores on the right [fig. 4(b)].

Post operative care includes constant surveillance of the flap for necrosis, keeping pressure off the flap and preventing frictional pulls on the suture lines of the flap for 2-3 weeks, appropriate antibiotics for 10 days and patient-family education and counselling to prevent recurrences.

RESULTS & OBSERVATIONS

These flaps are viable flaps and the "muscle base" provide the necessary vascularity for survival, early uptake and form a cushioning over the underlying pressure points – the bony prominences like the sacrum, the ischeum and the greater trochanter. If careful peroperative care is taken in mapping and mobilising the flap according to its vascular supply, and proper post-operative measures are taken to prevent quashing and blanching of the flap then complications are minimized. We had no problem of flap death in our series. However 4 flaps had marginal necrosis, 3 of which healed well with debridement and secondary closure. In one flap a defect of 1 cm after debridement of the necrosed margin, split thickness grafting was done once the defect granulated. Deep infection, underneath the flap, a known complication occured in one case but the flap was viable and control of infection with debridement, antibiotics followed by secondary suturing helped in good uptake.

One patient who developed hypoproteinaemia, anaemia (Hb 6 grams%) and septicaemia had dehiscence of the flap all around and deep infection. This patient finally succumbed.

Primary healing and uptake occured in the remaining cases (81%).

DISCUSSION

Prolonged recumbency due to chronic illnesses are known to cause pressure sores, particularly in elderly patients. These pressure sores however, are usually superficial and respond well to postural care, dressings/ debridement and split thickness skin grafting. Patients with neurological deficits and particularly those with sensory loss develop the larger, excavating sores with undermined edges and exposed bone. These sores do not heal easily.

These sores when they occur can be treated by aggressive timely surgical intervention. But it is not enough to just cover the sores with fancy flaps and altering the local cutaneous geography. The early post operative care of keeping pressure off the flap and suture line, the counselling and, patient-family education in care of the "flapped" area as well as other prone areas for prevention of recurrences, the vocational guidance, the need for follow up home visits are some of the aspects that can never by overemphasised. Thus a team approach, a human approach, an involved approach has to be adjuncted with skilled surgical approach to deal with these difficult sores.

Table 1

PRESSURE SORES : CLASSIFICATION (SHEA '75)

GR. I	Superficial ulceration exposing dermis.
GR. II	Full thickness of skin involved – extension into Subcutaneous tissue.
GR. III	Subcut. tissue (whole) upto deep fascia extensive undermining.
GR. IV	Thro' deep fascia involving bones/joints.

Table 2

PRESSURE SORES : GRADES (SHEA '75)

Gr. I	8	12.9%
Gr. II	13	20.9%
Gr. III	37	59.6%
Gr. IV	4	6.6%
	62	

Table 3

TYPES OF MUSCLE BASED FLAPS FOR PRESSURE SORES USED

SITE	MUSCLE	VASCULAR PEDICLE	SKIN COVER
* SACRAL	GL. MAXIMUS	SUP. GL. ART.	i)SPLIT THICKNESS ii)ISLAND MYOCUT.
* ISCHIAL	GL. MAXIMUS	INF. GL. ART.	ISLAND MYOCUT.
* TROCHAN-TERIC	TENSOR FASC. LATA	LAT. CIR. ART.	MYO-CUT. FLAP.

Table 4

MUSCLE BASED FLAPS

Gl. maximus advancement and spit. thickness	—	4
Gl. max. Myocut island	—	14
Gl. max. Turnoplasty + grafting	—	3
Bil. Gl. max. Myocut	—	4
Ten. Fascia lata Myocutaneous	—	6
		31

REFRENCES

1. Chacko, V., Joseph, B., Mohanti, S.P., Jacob, T. : Management of spinal cord injury in a general hospital in Surat, India, Paraplegia 24 : 330-335. 1986.
2. Mathes, F., Nahai, S.J. : Clinical application for Muscles and Myocutaneous flaps, C.V. Mosby Co. 1982, 426-509, 1982.
3. Shea, J.D. : Pressure Sores : Classification and management. Cl. Orthop. 112 : 89-100, 1975.
4. Shanmugasundram, T.K. : Pl 480 Paraplegia project Madras Project Report, 1984.

PENETRATING SPINAL INJURIES – A FOLLOW UP STUDY

* DR. V.P. SHARMA, ** DR. A.K. AGARWAL, *** PROF. U.K. JAIN

6 cases of post gunshot Spinal Cord Injury is being presented. No appreciable neurological recovery was observed on follow up. No complication as a result of retained bullet/pallet in side the body was observed.

Penetrating Spinal Injuries leading to neurological deficit is in itself very uncommon. It has world wide varied incidence eq. in USA, Africa, Europe and other Asian countries. The gunshot injury is relatively common out of all types of penetrating Spinal Injuries. In India gunshot injury leading to Spinal Cord Injury is relatively very uncommon. Only 2 or 3 cases per year of such injuries attended our hospital. Such injuries are mostly prevalent in few criminal infested districts of U.P. These gunshot injuries are also associated with injuries to chest wall, abdomen and other areas of body.

Missile injuries are generally of two types low velocity and high velocity (the bullet or fragment moving at 1000 m/sec or more).

Because of contrasting modes of Injury, low velocity missile can produce injury by direct contact leading to contusion, crushing, laceration, haemorrage & paralysis, while high velocity missile can produce massive necrosis leading to paralysis merely by the dissipation of enormous energy throughout the soft tissue and without any naked eye evidence of viscous or cord Injury (Morgan et al 1971, Myers, 1973). Bullets and fragments which tumble rather than spin, produce greater tissue destruction.

The iatrogenic impalement of the spinal dura has been reported following sublamilar wiring of fracture of spine (Dunn, 1987).

METHOD AND MATERIAL

Present retrospective study comprises of six cases of Spinal Cord Injury following gunshot who were admitted to this hospital for rehabilitation. All the effected persons were male. Age ranged from 25 years to 65 years with a average of 35 years. Out of six cases, 4 cases were in third decade. Duration of injury ranged from one month to three & half years with a average of ten & half months (Table No. 1).

Neurological status

On admission, 5 cases were having complete lesion while in one case it was incomplete lesion. In followup of 2 cases, the course remained stationary while in 3 cases, there was some sensory improvement in the level. Only in one case there was complete return of bladder and bowel as well as motor recovery in one lower limb with partial recovery in other lower limb (Table No. 2).

Complications

Two cases having dorsal lesion developed sacral sores and in one case sore at greater trochanter developed which later required flap

* M.S. (Ortho.), D.N.B. (PMR), FICS FACS (USA), FIMSA, MNAMS. P.G. SPINE (AUSTRALIA), Lecturer.
** M.S. (Ortho.), FICS, FIMSA, MNAMS, FKIR(NJ), Sr. Med. Officer cum Reader.
*** M.S. (Ortho.), FICS, Director-Professor.
Department of Physical Medicine & Rehabilitation, K.G. Medical College, Lucknow.

rotation for healing. In one case having cauda equina lesion developed chronic osteomyelitis of distal phalanx of 3rd toe due to initial sepsis. In none of the case, lead poisioning from retained bullet, migration of bullet, Arterio-venous fistula or spinal/para spinal infection was observed.

DISCUSSION

Taylor (1941) said 'when... we remember how narrow a bottle neck is the cord in the pathways from the relatively enormous brain to the vast-periphery, we have the explanation of two salient facts : first that injuries of the cord must commonly cause permanent paralysis. Second that a small volume of trauma has disastrously extensive consequences.'

However, there is hope for some recovery, of unpredictable degree, in partial or incomplete injuries of the cord but here a distinction must be drawn between gunshot and stabbing. In the partial gunshot injuries little or no recovery occurs (Taylor 1941, Morgan et al 1971, Heiden et al 1975, Waters 1984), but in the incomplete or Brown Sequard deficit of stabbing, considerable recovery can be expected (Rosenberg, 1957).

There is little disagreement that deteriorating neurological function in the early post injury period constitutes a surgical emergency, possibly the result of intraspinal bleeding. Even so, the result of surgical intervention are disappointing. Surgery or no surgery makes no difference in the out come of results. Hence low velocity penetrating Spinal Injury requires proper wound toilet, antibiotics and follow up to avoid any complication. In high velocity penetrating injuries with other associated injuries require surgical exploration and repair.

These Spinal Cord Injuries cases are being managed like any other spinal cord injury except keeping in mind the long term complication.

Table No. 1 Age, Sex & Duration

Name	Age	Sex	Duration
AKM	30	M	One month
KNS	30	M	3,1/2 years
SS	30	M	3 months
SKG	25	M	4 months
SM	65	M	10 months
RKM	30	M	3 months

Table No. 2 Neurological status

	On Admission	Followup
1.	Complete below T6	Same
2.	Partial Bladder & Bowel with incomplete below L5	Bladder & Bowel & LT. LL. recovered, partial RT.LL.
3.	Complete below T7	Hypoasth. between T7-T12 Motor same
4.	Complete below T10	Below L1 complete
5.	Complete below L1	Hypoasthesia below L3 Anaesthesia below L5
6.	Complete below T6	Same

Table No. 3 Complications

1.	Bed sores	Three cases.
2.	Chronic O.M. III distal phalanx.	One case.

REFERENCES

1. Dunn, V., Smoker, W.R.K. & Menezes, A.H. : Transdural herniation of the cervical spinal cord as a complication of a broken fracture fixation wire. AJNR, 8, 724-726, 1987.
2. Heiden, J.S., Weiss, M.H., Rosenberg, A.W., Kurze, T. & Apuzzo, M.J.L. : Penetrating gunshot wounds of the cervical spine in civilians. J. Neurosurg. 42, 575-579, 1975.
3. Morgan, T.H., Wharton, G. & Stuart, F. : Spinal Cord injuries secondary to gunshot wounds. Proc. Veterans Admin. Spinal Cord Injury Conf. 18, 220-223, 1971.
4. Myers, P. : Open injuries of the spine and spinal cord : Missile wounds and shell fragments. Proc. Veterans Admin. Spinal Cord Inj. Conf. 19, 157-160, 1973.
5. Rosenberg, A.W. : Stab wounds of spinal cord. Reports of three cases. Bull. Los Angeles. Soc., 22, 79-84, 1957.
6. Taylor, J. : Discussion on war injuries of the spine. Proc. R. Soc. Med. 34, 447-454, 1941.
7. Waters, R.L : Gunshot wounds to the spine : The effects of Bullet fragments in the spinal cord. J. AM. Praplegia Soc., 7, 30-33, 1984.

THERAPEUTIC USES OF L.A.S.E.R. A CASE REPORT

DR. SM. RAMESH CHELLAPPAN

L.A.S.E.R. is the acronym for Light Amplification by Stimulated Emission of Radiation. The LASER which we possess is soft L.A.S.E.R. 632 whose wave length is 6328° Au. It is Athermic, with very minimal side effects.

The L.A.S.E.R. beam is produced on electrically stimulating the gaseous mixture of 85% helium and 15% neon gas, which reverberate producing energy. The beam can be applied either through the scan or by the probe method.

The beam differs from normal white light, by its monochromaticity, coherence and non divergence. The physiological effects include wound healing, penetration capacities, analgesic effect, anti-inflammatory and anti-spasmodic properties.

Soft L.A.S.E.R. finds its therapeutic applications in Orthopaedics, Rheumatology, Dermatology, Dental, Veterinary Medicine and Sports injuries.

CASE HISTORY :

In our Department of Physical Medicine and Rehabilitation, Annamalai University, we conducted a therapeutic trial on a case of rheumatoid arthritis hand.

Thirty six years old Poovanam, a case of Rheumatoid Arthritis with symmetrical hand involvement was taken up for the experimental trial. She had symmetrical involvement of the hand, with restriction of movements. Difficulty in doing her activities of daily living, finger to palm distance was 2.5 cms both sides and at the beginning of the treatment she was able to inflate only upto 30 mm Hg with the sphygmomanometer cuff.

To the left hand the conventional wax bath and mobilisation exercises were given for a duration of 10 days and to the right hand L.A.S.E.R. was applied by the scanner method for a duration of fifteen minutes for the same period combined with mobilisation exercises. The prognosis in both hands were noted at the fifth and tenth day.

The patient had speedy recovery in the right hand compared with the left. Her finger to palm distance was reduced from 2.5 cm to 1.5 cm on the fifth day and to .5 cm on the tenth day of treatment. She was able to inflate upto 36 mm Hg with right hand on the 5th day and upto 40 mm Hg at the end of treatment and was able to perform her activities of daily living more independently with this hand. She also had marked improvement in her joint range of motion.

In the left hand the finger to palm distance was reduced only upto 1.8 cm from 2.5 cm. Her joint range of motion was comparatively less than right hand, giving us the impression that soft LASER treatment produced speedy recovery compared to the conventional modality of treatment.

This is just the beginning of our experimental trial and we are continuing our comparative study with more rheumatoid arthritis patients.

Here I would like to add that this soft LASER is contraindicated in patients with

M.B.B.S. D. Phys. Med. Lecturer, Physical Medicine & Rehabilitation, RMMCH, Annamalai University, Annamalainagar, T.N.

cardiovascular disorders, ep leptics, and in pregnancy. Eyes should be pr tected by special pair of goggles to be worn both by the patient and the doctor. As direct penetration of L.A.S.E.R. beam into the eye may cause degenerative changes and ultimately end in blindness.

Finally, I would like to conclude in the words of Sir Issac Newton – "I may be like a boy playing on the sea shore looking for a febble or a prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me".

REFERENCES

1. Goldman et al. Laser therapy of Rheumatoid Arthritis. Lasers in Surgery and Medicine 1 : 93-101, 1980.
2. Mester, E., Mester, A.F., Mester, A. The biomedical effects of Laser application. Laser in Surgery and Medicine 5 : 31-39, 1985.
3. Palmieri, B. A double-blind stratified crossover study of amateur tennis players suffering from 'tennis elbow' using infrared Laser therapy. Medical Laser Report, (pp 3-14), May, 1984
4. Valls Cabrero, M., Galvez Failde, J.M., Miranda Mayordoma, M., Camara Aguita, R., Ulloa Ochoa, J. Laser therapy as a regenerator and healing wound tissues. Proceedings of the International Congress on Laser in Medicine & Surgery. Bologna, (pp 187-194), 26, 27 and 28 June, 1986.

OFFICE BEARERS OF INDIAN ASSOCIATION OF PHYSICAL MEDICINE & REHABILITATION
(1992-93)

President
Dr. K. Janardhanam, Annamalaingar

President Elect
Dr. MHR Rizvi, Patna.

Vice President
Dr. R.K. Srivastava, New Delhi.

Secretary
Dr. S. Hariharan, Trivandrum.

Joint Secretary
Dr. U. Singh, New Delhi.

Treasurer
Dr. S. Wadhwa, New Delhi.

Member of Executive Committee

Dr. B.D Athani, Bombay
Dr. M. Feroz Khan, Madras
Dr. M.K. Mathur, Jaipur
Dr. Sanjai Rastogi, Kanpur
Dr. M.K. Chakravarty, Tripura
Dr. P.H. Rao, Secunderabad
Dr. C.R. Gupta, Darjeeling
Dr. Rakesh Jhalani, Bairoi

Editor, I.J.P.M.R.
Dr. A.K. Agarwal, Lucknow

News letter Editor
Dr. S. Bhattacharjee, Vellore

INDIAN JOURNAL OF PHYSICAL MEDICINE & REHABILITATION

(An official Publication of Indian Association of Physical Medicine & Rehabilitation)

Address for Correspondence
Dr. A.K. Agarwal
M.S. (Ortho.), FICS, FIMSA, MNAMS, FKIR (N.J.)
Editor, Indian Journal of Physical Medicine & Rehabilitation,
2, Quinton Road, Lalbagh, Lucknow – 226 001.
INDIA.