Factors to Consider in the Rehabilitation Aspect of Burn Care

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The rehabilitation of an individual with burns presents a formidable challenge to physical therapists. Early physical therapy intervention and prevention of joint deformity is the key to maximal functional recovery. Throughout the period of rehabilitation, the frequent changes of a patient's condition may require a process of ongoing evaluation and appropriate adjustments in the physical therapy program. This article identifies factors that contribute to the loss of functional mobility and discusses considerations for treatment. An awareness and understanding of the problems commonly encountered during the care of a patient with burns may assist physical therapists in anticipating potential loss of function and in planning a proactive rather than a reactive treatment program.

Key Words: *Burns, Physical therapy, Rehabilitation.*

Thermal injury primarily results in the destruction of skin and secondarily involves function of the musculoskeletal system. The degree of musculoskeletal impairment is determined by the depth and extent of the burn injury.[1,2] Maintaining joint movement and maximizing functional ability in a patient with a major burn presents a formidable challenge to the physical therapist. A comprehensive team approach to burn management and early therapeutic intervention can reduce the possibility of joint dysfunction and increase the level of maximal functional return.[2] Through the process of ongoing evaluation and treatment, current as well as potential problem areas can be identified and appropriate treatment programs can be implemented to minimize loss of joint motion.

The purpose of this paper is to identify the problems contributing to loss of mobility during the acute and rehabilitative phases of burn management and to discuss possible physical therapy approaches. The problems and treatment intervention will be discussed relative to the particular phase of burn care in which they occur. Burn management is usually categorized into three phases of care: emergent, acute, and rehabilitative.[3] An active physical therapy program ideally should begin on the first postburn day and continue throughout patient follow-up.[1,4]

ACUTE PHASE

The acute phase begins after fluid resuscitation is completed and ends at the time of wound closure.[3] During this period, pain, edema, immobilization, and active tissue shortening secondary to wound healing are all contributing factors to loss of joint mobility and strength.

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In our burn facility, a physical therapy evaluation is performed on admission to identify immediate and potential problem areas and establish a treatment program. Anticipating and preventing loss of functional mobility during this phase is the key to a successful patient outcome.[1,2,4] During the acute phase, the rapid changes of the patient's condition emphasize the need for frequent reevaluation and adjustments in the treatment plan. Major problems commonly encountered by the physical therapist during this phase of care are 1) pain, 2) loss of joint mobility, and 3) decreased strength and endurance for activity. Also contributing to these problems are the frequent periods of immobilization required after skin grafting.

Pain Management

Pain is a major obstacle to implementation of the burn therapy program and deserves special consideration.[2,5] The patient with more superficial burns seems to have greater difficulty with pain because this depth of burn does not destroy free nerve endings.[3] An individual with full thickness burns initially may not complain of pain. As the eschar separates and edema decreases, however, the patient may experience a considerable amount of discomfort especially during wound care, dressing changes, and exercise.[5,6] As the patient experiences more discomfort, apprehension and anxiety tend to increase and pain behavior may become extreme. Behaviors observed are hostility, apathy, stalling techniques, avoidance, and occasionally physical and verbal abusiveness against staff and family members.[5-7]

Coping with the patient's pain behavior is difficult for the entire team, specifically for the physical therapist who is involved in a number of painful procedures, such as hydrotherapy, exercise, and functional training. Pain often interferes with the patient's willingness to participate in the treatment program. Initially, the therapist should realize that the patient does indeed have pain, allow him to express it, and then guide him to deal with it in an appropriate manner. Pain programs using methods of stress reduction may be used to

teach the patient techniques that decrease apprehension and, thereby, the perception of pain.[6,8]

Members of the burn team should communicate with each other in scheduling the patient's day to provide time for necessary medical procedures, exercise sessions, and periods of rest. Scheduling daily activity appears to reduce patient stress and promote compliance with the exercise program. In addition, we have found that planning exercise sessions in conjunction with the patient's schedule of pain medication increases tolerance to the treatment.

Frequently, dressings cause pain by abrading the wound during attempted joint movement. In this case, exercise during hydrotherapy may be less painful and increase the patient's willingness to participate. Also, we believe that by observing the patient during hydrotherapy or dressing changes, the therapist becomes aware of the location and condition of the wounds. Handling wound areas may be excruciatingly painful to the patient, depending on the depth of the burn. Therefore, when a therapist is exercising the patient with dressings covering the wounds, careful hand placement over healed areas may minimize pain during the exercise session. In our experience, the patient's confidence and trust are increased in the therapist who takes considerate precautions to minimize pain during treatment procedures.

Another useful method of pain control is gaining patient participation in treatment, be it wound care or dressings. When the patient perceives he has more control of the treatment, his apprehension seems to decrease as does his experience of pain.[2,5,6] For example, we have observed that when a patient cleans his own wounds, he tends to be more vigorous than the therapist and has fewer complaints of pain.

Patient and family education are also important factors in pain management and compliance with treatment. A careful explanation of the steps and the rationale for all procedures helps decrease apprehension and tends to include the patient and family as active members of the burn team.[4,5] We have observed that the family is better able to give emotional support to the patient if they have a good understanding of the burn treatment program.

Joint Mobility

Wound healing is a dynamic process of tissue shortening that continues 24 hours a day, and exercise alone is not sufficient to maintain joint range of motion.[2,9,10] Exercise programs must be augmented with correct positioning and splinting to minimize tissue contracture.[2,9,10] For example, if an elbow flexion contracture is decreased from 30 to 15 degrees during an exercise session, that elbow should then be splinted to maintain the increased range of motion. If this is not done, the therapist may return the next day to find the elbow flexion contracture back to 30 degrees or even greater, and the therapist and patient may unnecessarily repeat a tedious and painful process. This kind of incident may also affect the patient's compliance with his exercise program and confidence in the physical therapist.

Exercise to increase joint motion may be active or passive and should be incorporated into functional activity. As movement may be painful and tissue shortening a problem, exercise is best accomplished if performed slowly.[2] Gaining maximum range of motion is a major goal of the physical therapy program during the acute phase of burn care. Headley reported that the use of proprioceptive neuromuscular facilitation techniques in treating the burned patient was beneficial in gaining joint motion (Fig. 1).[11] For individuals with burns, exercising is a slow and trying procedure that demands considerable persistence and patience on the part of the therapist.

All members of the burn team should be aware of the patient's exercise program and current level of self-care to ensure the therapeutic program is integrated into all aspects of patient care. Too often, the family and medical personnel feed, shave, and dress the patient when he is quite capable of performing these activities independently.

Strength and Endurance

Initially, endurance for activity is decreased because of the stress on major systems from the burn injury, rather than from the effects of deconditioning.[12] Increasing strength and endurance may be accomplished with a program of active exercises, self-care activities, bed mobility, and ambulation. Monitoring vital signs assists the therapist in determining the appropriate intensity and duration of the exercise session. Progressing the patient as rapidly as possible in self-care and functional activities appears to be important physically and psychologically. The patient's sense of well-being and self-esteem may be enhanced when he is able to perform self-care activities such as feeding and walking. The longer the patient remains dependent, the more delayed recovery seems to be.

Considerations After Skin Grafting

After skin grafting, exercise to the surgical site is discontinued for a period of time to prevent shear forces from disturbing the fragile new grafts.[2] Minimizing periods of inactivity and immobilization after surgery is important; therefore, exercise should be continued to areas not involved in the surgical procedure. Exercise to grafted areas is resumed, usually within 5 to 10 days, when grafts are adherent.[4] After grafting to the lower extremities, precautions must be taken to avoid dependent limb position for 7 to 10 days.[2,4] The patient may then be ambulated with pressure wraps applied to the lower limbs to prevent venous stasis.[1,2,4] Painful donor areas may also limit patient mobility and tolerance to exercise.[5] As the donor sites heal and become less painful, however, they should be included in an exercise program.

REHABILITATION PHASE

During the rehabilitation phase, the primary medical goal is to restore function. This phase is defined as the period from wound closure to community readjustment.[3] An aggressive physical therapy program during the acute phase of burn care will minimize potential movement dysfunction as the wounds heal. No matter how diligent the team effort during the acute phase, the patient with a major burn, however, experiences some degree of functional loss. The following section will address the prevention and treatment of problems frequently encountered during the rehabilitation phase. The major problems considered are 1) fragile new skin, 2) consequences of burn scar formation, 3) decreased strength and endurance, and 4) need for psychosocial adjustment.

Skin Care

Skin care is an important component of burn scar management and recovery of function. The new skin formed over

burn wounds, especially over areas of deep, partial thickness wounds, is fragile, less elastic, and has a decreased number of sebaceous and sweat glands.[10, 13] We recommend careful inspection of the patient's skin before physical therapy to assess skin condition and response to treatment procedures.

Blisters are a common problem in newly healed skin because the epidermal layer does not firmly attach to the underlying dermis for several months.[2] Any shear force applied to the skin tends to break the fragile fibers that hold the epidermis to the dermal layer. Hands and arms are common sites for blister formation because they are more prone to shear forces. Wearing well-fitted gloves or pressure garments protects skin from shear forces and allows the patient increased hand function without fear of additional tissue damage. When blisters do form, they should be punctured, the fluid within them carefully expressed, and the blistered skin left intact.[2] A light pressure dressing may be applied for a few days for protection while the skin heals. Preventing blister formation should be an important goal for the patient and the therapist. If blisters do occur, every attempt should be made to preserve the epidermal tissue because any loss of skin results in a new wound area.

Maintaining adequate natural skin lubrication is difficult because the number of sebaceous glands is decreased. Subsequently, healed burn skin often appears dry and flaky, tends to crack easily, and itches.[2, 13] Intense itching can be a serious problem for some patients and causes severe discomfort. Additionally, rubbing or scratching the skin may result in new open areas. Skin problems are often compounded by the drying effects of hydrotherapy.[2] Therefore, whirlpool should be discontinued as soon as it is not essential to wound care and is not recommended as a treatment to soften skin before exercise. External lubrication is necessary to maintain soft and supple skin.[2] A lubricant should be applied to all healed areas routinely and before exercise. Any lanolin-based skin lotion may be used as a lubricant, but perfumed creams are not recommended because of the drying effect of their alcohol base.

Friction massage is often cited as a treatment to decrease scar tissue formation secondary to soft tissue injury.[14] For the patient with immature scar tissue secondary to burn injury, however, massage may be contraindicated. The friction from massage could result in a shear between the fragile epidermal tissue and the dermal bed. Too often, patients are seen in the clinic with blistered areas caused by vigorously massaging lotion into newly healed skin.

Spontaneously healed skin and grafted areas are photosensitive, and patients are advised to avoid exposure to direct sunlight for approximately one year.[2, 13] Wearing protective clothing, especially during the summer, may be uncomfortable but is necessary for skin protection.

Because of the fear of injury, the patient may become overprotective of his skin and have a difficult time adjusting to increased physical activity. Educating the patient in skin care and encouraging his participation in functional activity throughout hospitalization tends to decrease apprehension and facilitate adjustment to increased activity at home.

Burn Scar Management

Active scar tissue formation tightens skin across joints, decreases joint range of motion, and creates disfigurement.[9, 10, 13] Burn scar formation is a prolonged inflammatory response to trauma that begins within 48 hours of the injury and continues for one to two years.[15–17] Active scar tissue appears red and raised, is sensitive, and usually itches. As the scar tissue matures, it flattens, lightens in color, and blends in with healthy tissue.[9, 10] Managing the consequences of scar tissue formation should include a program of pressure application, splinting, and exercise.

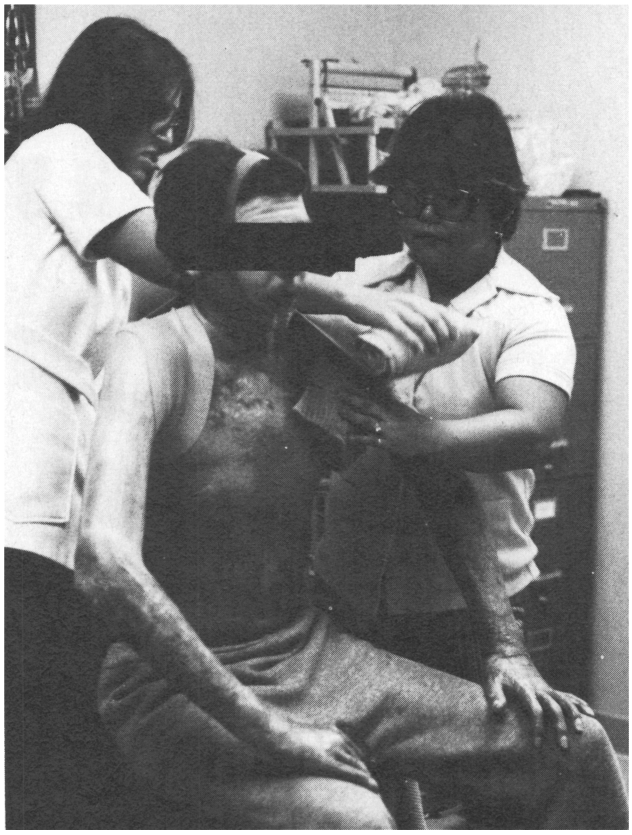

Fig. 1. Proprioceptive neuromuscular facilitation patterns used as part of an exercise program.

Larson et al[9, 10] and Baur et al[17] documented the effects of pressure (25 mm Hg) as an effective treatment in reducing scar tissue response. Pressure may be applied to the burn scar by a variety of methods; the number is limited only by the imagination of the physical therapist. Methods commonly used to apply pressure are elastic wraps and custom-fit pressure garments.[9] These methods may be augmented with splints or open-cell foam placed over the scar tissue to enhance pressure in selected areas. To affect early scar formation while wounds are still open, bias cut stockinette, pressure wraps, splints, or foam may be applied over the burn dressing.[4]

The combination of foam and pressure dressing is an excellent method for applying pressure to areas where hard splints may shear new skin or where conformity to an irregular surface is difficult. For example, burns of the axilla are difficult to manage and usually result in loss of shoulder range of motion. Splints do not conform well to this area, and patients frequently complain of discomfort wearing traditional "airplane" splints. Large pieces of 4-in (about 10 cm) foam cut in a crescent shape and held into the axilla with a figure-eight elastic wrap are very effective in gaining shoulder range of motion (Fig. 2).[9] This technique provides pressure into the axilla, maintains some degree of shoulder abduction, and allows the patient upper-limb mobility.

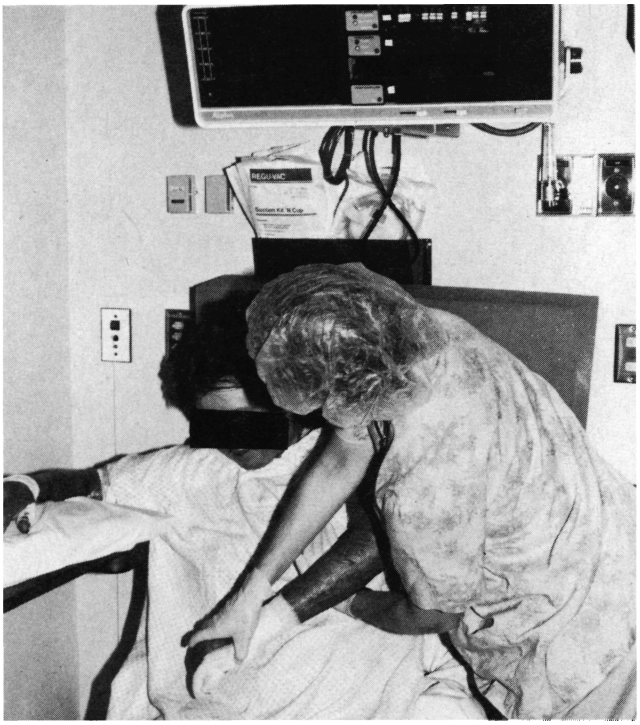

Fig. 2. Securing crescent-shaped foam with elastic bandages to provide pressure into the axillary scar tissue.

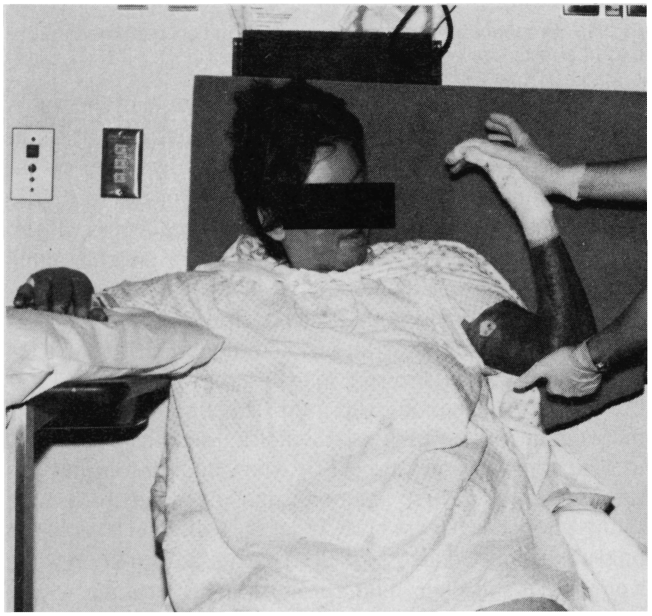

Fig. 3. Slow prolonged stretch to gain increased elbow flexion. Note careful hand placement to avoid a painful fifth finger amputation and shearing of the skin.

In addition to treating scar tissue with pressure, an aggressive program of exercise is recommended with precautions to avoid trauma to healed skin. Lubricating all healed areas before exercise provides the therapist with a close inspection of skin condition. It also softens dry skin and decreases the possibility of tearing tissue during exercise. Observing the skin during stretching allows the therapist to adjust the force applied to gain maximum range of motion without fear of tissue injury. As the skin is stretched over a joint, it will blanch when it reaches a critical length before rupturing.[2] Slow and prolonged stretching techniques are quite useful to increase range of motion in burn patients when augmented with skin lubrication and adjustment of force based on observation of tissue response (Fig. 3).[2]

Strength and Endurance

During the rehabilitation phase, a progressive program of strengthening and cardiopulmonary fitness is essential for patients to regain their previous level of functional activity.[2,4] A combination of weight training and aerobic exercise may be used to increase strength and endurance. As reduction of sweat glands decreases the body's ability to dissipate body heat, however, we recommend monitoring vital signs during endurance activity. Overheating may be manifested by a rapid heart rate and increased blood pressure.

Psychosocial Adjustment

After burn injury, patients experience varying degrees of social-psychological adjustment. Complaints of insomnia, loss of appetite, restlessness, and depression are common.[5,6] By establishing a relationship of trust with the patient and encouraging early self-care activity, the physical therapist may help the patient through this adjustment period. Because of the close relationship between physical ability and self-concept, encouraging independence in self-care and allowing the patient control over his environment may promote a sense of self-worth.[6,18,19]

Family support is reported by the patients in our facility as the most important element to their recovery and subsequent adjustment. Dependence of the patient on his family for support and acceptance creates stress on family members. As they are an important dimension to the burn patient's recovery, we have established a support group that provides the family an opportunity to share feelings. Participation of family, former patients, and burn staff is encouraged.

SUMMARY

Rehabilitation of the individual with burns is a dynamic and multidimensional process that presents a formidable challenge to the physical therapist. Early intervention at the time of admission to establish patient rapport and to develop a preventative treatment program is the key to successful physical therapy. The therapist must constantly reassess the rapidly changing condition of the patient with burns and alter treatment as appropriate. A conscientious, cooperative effort by the burn team will provide the patient with the best possible opportunity for recovery. Physical therapy involves more than providing exercise and correct positioning for a patient. A comprehensive program encompasses attention to factors of pain, components of self-concept, and dimensions of psychosocial dynamics that may affect patient compliance with treatment and eventual adjustment to family and community.

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