Rehabilitation after burn injury

Zsuzsanna Vekerdy MD, PhD
Edgar D, Bereton M: Rehabilitation after burn injury
BMJ 2004;329:343-5.

„Rehabilitation starts on the day of injury”

http://bmj.com/cgi/content/full/329/7461/343
BURN Rehabilitation Team

- Pain Management specialist
- PRM specialist
- Anaesthetists
- Intensivists
- Nursing practitioners
- PT Physical Therapists
- OT Occupational therapist
- Social worker
- Reconstructive Surgeon
- Oral Health specialist
- Dietitians Nutritionists
- Psychologist
- Orthotists prosthettist
- Patient and FAMILY
Pain control

- Analgetic drugs – baseline pain control
  - Paracetamol / non-steroid anti-inflammatory drugs, tramadol, slow-release narcotics
- TENS (transcutaneous electric nerve stimulation)
- Distraction
- Aromatherapy
- Relaxation techniques
- Reinforcement and coping strategies
- Virtual reality therapy
Inhalation injury

Early onset therapy on suspicion of an inhalational injury

Aims:
• Removing lung secretion
• Normalisation of breathing mechanics—such as using a positive expiratory pressure pressure device, intermittent positive pressure breathing, sitting out of bed, positioning
• Improving the depth of breathing and collateral alveolar ventilation—such as by ambulation or, when that is not possible, a tilt table, facilitation techniques, inspiratory holds

FEV1, FVC, FEF 25-75, Respiratory Rate
Movement and ADL

- Movement has to be encouraged from the beginning
- Activities of daily living must be practiced
- Splints might be necessary

Sensation (W.E.S.T., Hot-cold discrimination, vibration)
Strength / ROM (pinch strength, grip strength – dynamometer-, goniometer)
Exercise tolerance / endurance (2 minute walk test, get up and go test)
A comparison between two burn rehabilitation protocols. BURN 2007. Jun

Intensive burn rehabilitation treatment protocol (BRT) vs. routine rehabilitation treatment

Outcome measures: (1) post burn contractures, (2) thrombosis, (3) duration of staying in hospital

Result: post burn contracture 6% in BRT and 73% in routine group (p<.01)
Occupational therapy

• Health and safety guidelines
• Specific issues:
  – Use of hot water
  – Instruments for splinting
  – Lifting /transferring patients and objects

Goal setting (Goal Attainment Scale, SF-36)
Performance components (Developmental assessment, Psychosocial assessment, Work performance assessment)
Oedema management

Oedema removal: The only body system that can actively remove excess fluid and debris from the interstitium is the **lymphatic system**. The principles of reduction of oedema should be adhered to in totality and not just in part:

- **Compression**—such as Coban, oedema gloves
- **Movement**—rhythmic, pumping
- **Elevation or positioning of limbs for gravity assisted flow of oedema from them**
- **Maximisation of lymphatic function**
- **Splinting does not control oedema except to channel fluid to an immobile area!**
Immobilisation

Stopping movement, function, and ambulation has its place:

- It should be enforced only when there is concomitant injury to tendon or bone or when tissues have been repaired (including skin reconstruction).

- If a body part must be immobilised—to allow skin graft adherence, for example—then the part should be splinted or positioned in an anti-deformity position for the minimum time possible.
# Time of immobilisation

<table>
<thead>
<tr>
<th>Reconstruction method</th>
<th>Depth of burns</th>
<th>Length of immobilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biological dressing</td>
<td>Any (preferable not full thickness)</td>
<td>&lt;24 hours</td>
</tr>
<tr>
<td>Cultured epithelial autograft (suspension)</td>
<td>Superficial to intermediate</td>
<td>24-48 hours</td>
</tr>
<tr>
<td>Split skin graft</td>
<td>Intermediate to deep partial thickness</td>
<td>3-5 days</td>
</tr>
<tr>
<td>Dermal substitutes (such as Alloderm, Integra)</td>
<td>Deep partial to full thickness</td>
<td>5-7 days</td>
</tr>
<tr>
<td>Faciocutaneous or myocutaneous flaps</td>
<td>Full thickness</td>
<td>7-14 days</td>
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</table>
Positioning

Early - aim:
- Surgery
- Skin-care

Late – aim:
- Preventing contractures (proper lying and sitting positions, splints)
- Avoiding pain
- Helping ventilation (prevention of pneumonia)
- Preventing pressure sores

Fluidisation bed

The „Burnwalter” - portabile
Positioning in bed to prevent contractures

<table>
<thead>
<tr>
<th>Position</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ventral part of the neck</td>
<td>Slight extension</td>
</tr>
<tr>
<td>Shoulder</td>
<td>90° abduction, 15-20° adduction, neutral rotation</td>
</tr>
<tr>
<td>Arm</td>
<td>Elbow extended, arm in supination</td>
</tr>
<tr>
<td>Hand, dorsal part</td>
<td>Wrist in 15-20° extension, az MCP joints in 60-90° flexion, IP joints in total extension</td>
</tr>
<tr>
<td>Hand – extensor tendons</td>
<td>Like above, but MCP joints in 30-40° extension</td>
</tr>
<tr>
<td>Palm</td>
<td>Wrist in 15-20° extension, fingers and MCP joints in total extension, thumb in board oalmar abduction</td>
</tr>
<tr>
<td>Ventral part of chest, shoulder</td>
<td>90° abduction and slight outward rotation (draw attention on the danger of ventral luxation of the shoulder)</td>
</tr>
<tr>
<td>Hips</td>
<td>Hips in abduction (10-15°), in total extension and neutrally rotated</td>
</tr>
<tr>
<td>Foot</td>
<td>Knee extension, ankle in 90° dorsalflexion</td>
</tr>
</tbody>
</table>
Skin reconstruction

- Skin reconstruction is tailored to the depth of burn found at the time of surgery.
- The application and time frames of reconstruction techniques utilised will be dependent on attending surgeon's preference.
- Other factors influencing choice of management include availability and cost of biotechnological products.

GOAL: functional reconstruction
Scar management

Scar management relates to the physical and aesthetic components as well as the emotional and psychosocial implications of scarring.

– *Hypertrophic scarring* results from the build up of excess collagen fibres during wound healing and the reorientation of those fibres in non-uniform patterns.

– *Keloid scarring* differs from hypertrophic scarring in that it extends beyond the boundary of the initial injury. It is more common in people with pigmented skin than in white people.
Scarring is influenced by many factors:

- Extraneous factors
  - First aid,
  - adequacy of fluid resuscitation,
  - positioning in hospital,
  - surgical intervention,
  - wound and dressing management

- Patient related factors
  - degree of compliance with rehabilitation programme,
  - degree of motivation,
  - age,
  - pregnancy,
  - skin pigmentation.
Management

Techniques

Pressure garments are the primary intervention in scar management.

Applying pressure to a burn is thought to reduce scarring by hastening scar maturation and encouraging reorientation of collagen fibres into uniform, parallel patterns as opposed to the whorled pattern seen in untreated scars.
If people have moderate to severe burns around the neck or face, an acrylic face mask must be considered. This provides conforming pressure over the face and neck. Material masks can also be made for patients to wear at night.
Silicon gel sheeting for preventing and teaching hypertrophic and keloid scars
L O’Brien, A Pandit
Cochrane Database of Systemic Reviews 2008

30 Trials / 559 people (age range: 2-81 years)
Comparison: adhesive silicon gel sheeting with:
• non-silicon-gel plates with added Vitamin E
• Laser therapy
• Triamcinolone acetonide injection
• Non-adhesive silicon gel sheeting
• No treatment option

Conclusion: trials are of poor quality and highly susceptible to bias
Weak evidence of benefit
Team education of scar management

- Garments need to be tailored to patients' requirements and are often influenced by the type of surgery completed.
- Patients should generally be measured for garments at five to seven days after grafting surgery, and these should be fitted as soon as they are available.
  - A pressure garment lasts for about three months; after that time it is helpful to re-measure patients frequently to accommodate the changing dimensions of the scar.
- For areas of persistent scarring that have not responded well to pressure garments, further scar management techniques must be considered:
  - Use of massage, moisturising creams, and contact media.
  - Moisturising is important as it prevents the skin from drying out and then splitting and cracking, which may lead to secondary infection and breakdown of the skin.
Outpatient follow-up – Community Based Rehabilitation (CBR)

- A burns unit team should offer outpatients regular and comprehensive follow up reviews.
- The type of follow up required obviously depends on the severity of the burn, but in terms of movement and function, patients require regular monitoring and updating of their prescribed exercise regimen and home activity programme.
- Therapists who do not regularly treat burns patients require experienced support to achieve the expected outcomes. This should include written, verbal, and visual communications as well as monitoring of management plans.

Functional outcome measures (Vineland Adaptive Behavioral Scale, FIM, Wee-FIM, GMFM, PEDI)
Outcome Measures (Revised Burn Specific Health Care, ABA, General Health Questionnaire, Sickness Impact Profile, School Function Assessment)
# Functional Independence Measure (FIM) items

## SELF CARE
- A. Eating
- B. Grooming
- C. Bathing
- D. Dressing – upper body
- E. Dressing – lower body
- F. Toileting
  - Sphincter control
- G. Bladder management
- H. Bowel management

## MOBILITY
### Transfer
- I. Bed, chair, wheelchair
- J. Toilet
- K. Tub, shower

### Locomotion
- L. Walk/wheel Chair
- M. Stairs
## Functional Independence Measure (FIM)

**COMMUNICATION**

<table>
<thead>
<tr>
<th>N. Comprehension</th>
<th>A</th>
<th>V</th>
<th>V</th>
<th>N</th>
</tr>
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<tbody>
<tr>
<td>O. Expression</td>
<td></td>
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**SOCIAL COGNITION**

| P. Social interaction |   |   |   |
| Q. Problem solving    |   |   |   |
| R. Memory             |   |   |   |

**Total FIM**

- **ADMIT**
- **DISCHG**
- **FOL-UP**

**minimum score: 18**

**maximum score: 126**
Functional Independence Measure (FIM) scoring

Levels: NO HELPER:

- 7 complete independence (timely, safely)
- 6 Modified independence (device)

Modified dependence

HELPER:

- 5 Supervision
- 4 Minimal assist (Subject=75%+)
- 3 Modified moderate assist (Subject=50%+)

Complete dependence

- 2 Maximal assist (Subject=25%+)
- 1 Total assist (Subject=0%+)
Special issues
Children

Development: mental / physical / bone mass / power and lean body mass

The factor age and the recovery of severely burned children

EBM

BURNS 2008 Feb
Conclusion:
Patterns of recovery in pediatric burn patients are determined by age.
Weight loss

Addressing severe muscle catabolism and wasting

• Improving lean body mass
• Improving strength

Growth hormone
Oxandrolone (combined with exercise)
Increased protein intake
Yenidunya classification of burn contractures

(1) Dynamic stage contractures
   (a) Acute contractures
   (b) Simple contractures

(2) Static stage contractures
   (a) Neglected contractures
   (b) complex burn contractures
   (c) complicated burn contractures
Classification of contractures

1. Mild hypertrophic scar formation involves very mild plantar flection contractures of some toes
2. Moderate where less than three toes were significantly involved in plantar flexion contractures
3. Severe where three to five toes were involved with significant plantar contractures
4. Mutilated where all toes were involved in plantar flexion contractures with significant deformities
Complications

- Pruritus / postburn itching
- Pain
- Psychological symptoms
- Anxiety
- Suicide / parasuicide

Self-concept (PH Childrens’ Self Concept Scale, Rosenberg Self Esteem Scale)
Family functioning (Impact of Events Scale, Beck Depression Inventory,
State Trait Anxiety Inventory, Social Support Questionnaire, Ways of Coping Q)
Long-term therapies for complications

- Massage
  - *The Cochrane Central Register of Controlled Trials*
    - Roh YS et al. 2007

- Music relaxation
  - *Ferguson SL, Voll KV. J Burn Care Rehabil* 2004

- Virtual reality (distraction analgesia)
  - *Sharar SR et al.*
    - *Arch Phys Med Rehabil* 2007 dec
Prevention

• Home safety education

  80 studies. Conclusion: safe hot tap water temperatures, functional smoke alarms, storing medicines and cleaning products, out-of-reach syrup ipecac, poison control centre numbers accessible...

• Community-based intervention for prevention of burns and scalds in children

  39 studies. Conclusion: significant decrease in paediatric burn and scald injury in the intervention compared to the control communities

Pschosocial services for families following paediatric burn injury: Less anxiety, stress and depression among parents
Importance of prevention and family care

- **Intentional burns, assaults**
  
  Modjarrad K et al. Descriptive epidemiology of intentional burns in the US
  
  BURNS 2006.

  1601 / 54219 = 3% (49% self-inflicted – 51% assault-related)

  Older age, more man, more black people, higher mortality, higher mean TBSA, inhalation injury, longer hospital stay, more need for rehabilitation and nursing care facility

- **Lack of family support**
  
  Park S et al. The risk factors of psychosocial problems for burn patients
  
  BURNS 2007.

  Problems with treatment, follow-up, rehabilitation, welfare information

- **Child abuse**
  
  Thomas NJ et al
  

  Decreased non-accidental trauma during child abuse prevention month.
Socioeconomic circumstances

Burn Injury Rehabilitation Model
Systems’ database (J Burn Care Res 2006 Sept)

Reasons of loss for follow-up:
– Individuals who were younger
– not employed at time of burn
– with less than highschool level education
– a history of drug abuse
– circumstances of injury suspected assault
– having no insurance for care

RISK FACTORS
Factors influence outcome, QoL

• Young adults:
  – Physical outcomes: strength, grip and pinch, mobility levels, self-care (ADL)

PROBLEM AREAS: PERIPHERIAL STRENGTH (GRIP AND WRIST – THESE DEFICITS AFFECTED HOME ADL AND CORRELATED WITH TBSA

  – Psychological outcomes: behavioral problems, personality disorder, psychiatric illness

PROBLEM AREAS: 50% HAD PSYCHIATRIC PROBLEMS, MAINLY ANXIETY DISORDERS

Return to work after burn injuries

• By year 1, 79.7% of patients returned to work

• Early barriers: physical and wound issues

• By 1 year:
  – physical abilities, working conditions (temperature, humidity, safety)
  – Psychological factors (nightmares, flashbacks, appearance concerns)
Readings


• White Book On Physical and Rehabilitation Medicine in Europe. 2006 www.euro-prm.org


• Occupational Therapy and Physiotherapy: Principles and Guidelines for Burns Patient Management. Australian and New Zeland Burn Assotiation (ANZBA) 2002