

Paediatric Hand Trauma:

- Burns, replants and nerve injuries



Occupational Therapy Department
The Royal Children's Hospital
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Presentation outline

- Paediatric specific considerations
- Burns
- Replants
- Nerve injuries

Paediatric specific considerations

- Healing time frames
- Impact of growth on scarring
- Inability to specify or verbalise pain
- Behaviour and occupations
- Inability to follow instructions-rehabilitation compliance difficult
- Mobility - stiffness not usually an issue
- Grafting infrequently required
- Prone to hypertrophic scarring

Burns: Incidence

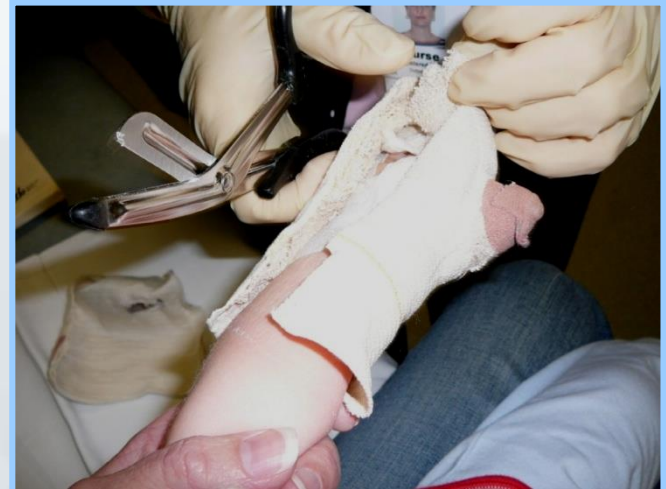
Highest incidence: 0 - 4 age group

- Burns in this age group typically occur in the home. Common causes are hot drinks, kettles, hot tap water/water on stoves, heaters irons and ovens
- Thought to be attributable to the child's impulsiveness, curiosity, lack of awareness and high activity levels
- Upper body frequently affected, associated with exploration of surroundings eg. pulling, touching, grabbing and throwing objects

Burns: therapeutic management - considerations

A thorough history is important to guide clinical decision making. The following represent considerations that may impact upon your care plan:

- Mechanism of injury
- Contact/exposure time to heat source
- Thermal level
- Age
- Tissue type
- Time to medical attention
- First aid
- Co-morbidities
- Nutritional status
- Developmental and behavioural factors
- Support network and environment



Burns: therapeutic management - considerations

Location is important as it provides information such as:

- Proximity to flexor creases or joints
- Skin type; for example glabrous or non-glabrous
- Areas of shallow subcutaneous fat deposition related to the skin-to-bone interface
- Patterns of relaxed skin tension upon problematic scar development

Depth is important as it provides information as to:

- Cutaneous structural destruction
- Possible subcutaneous structural involvement
- Adnexal structures included and their possible impact upon healing eg. injury to hair follicles may impact upon keratinocyte migration

Depth is difficult to definitively evaluate in the first 72 hours and the concept of 'Burn Wound Conversion' is crucial to consider. This concept forms the basis of Jackson's Burn Wound Model.

Jackson's Burn Wound Model

Burn wounds have the unique ability to convert from one burn wound depth to another within days of the initial injury. Jackson's Burn Wound Model is an important theoretical model that therapists use to manage injuries. This model proposes that the extent of an injury may be affected by how we primarily manage oedema and associated ischaemia.

Zone of coagulation:

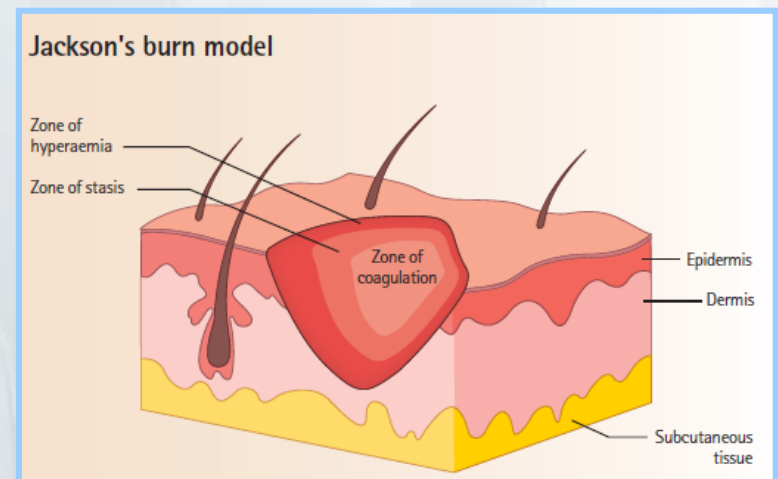
Area of closest contact with heat source. Denatured proteins and blood vessel coagulation create necrotic tissue

Zone of hyperaemia:

Minor cell damage but significant vasodilation due to an acute inflammatory response

Zone of stasis:

Strong inflammatory response - potentially salvageable



Burns: therapeutic management – acute care considerations

Primary goals:

- Oedema management and ischaemia control
- Pain management
- Wound protection
- Protect healing structures and avoid contractures- Antideformational positioning
- Facilitate mobilisation and return to ADL's when indicated

Therapeutic modalities:

- Dressing design
- Mobilisation
- Elevation
- Splinting
- Adaptations to enable ADL participation



Burns: therapeutic management – post surgical considerations

Surgical management such as debridement, grafting, amputation or flaps/plasties may be required. Surgery assists with acute healing phase or with scar revision down the track.

A therapist may be required to provide:

- Oedema management
- Wound and primary dressing protection
- Positioning
- Splinting/Casting
- Pin site protection

Positioning, elevation, splint wearing regimes and follow-up timeframes will depend on the individual case, therefore liaison with all team members is vital.



Burns: Scar management

Scar management may be a long-term undertaking and needs to be tailored to the individual, according to the scar site and characteristics, child's age, co-morbid dermatological diagnoses (eg. eczema), nutritional status, and ability to adhere to recommendations.

Common management strategies:

- Positioning under tension eg. splinting
- Traction eg. taping
- Manual tissue manipulation eg. massage
- Emollient
- Contact media eg. silicon products
- Mobilisation eg. exercises, play, ADLs

Common scar types:

- Hypertrophic
- Keloid
- Contracted
- Widespread
- Mixed composition
- Atrophic
- Normotrophic



Replants

- Replantation attempted in most cases, unless severely damaged
- Amputations away from growth plates have potential for longitudinal growth following replantation
- Generally good outcomes achieved

Goals of therapy:

- Protect healing structures
- Return to normal hand function
- Protect from damage to insensate parts

Nerve injury: considerations

- Faster regeneration in children than in adults
- Danger of injury
- Fewer problems with stiffness and contractures
- Adaptive behaviours
- Assessment challenges
- Functional splinting to enable occupational performance participation



Case study: Lewis

Social history: Eight year old boy, Grade two student, LHD.
Likes swimming and playing mindcraft

History of presenting condition: Left supracondylar fracture
post fall on stairs

Referred to OT: 12 weeks post initial surgery (GAMP and K-wires, K-wires removed six weeks ago)

Occupational performance Issues: Difficulty picking up and using cutlery, difficulty eating and drinking with his left hand, difficulty using Ipad, unable to tie his shoes and difficulty turning pages in a book

Case study: Lewis continued



Week one - Initial assessment:

- Gathered background information
- Assessment:
 - Sensation: “Numbness” throughout thumb and index finger
 - ROM: No active thumb abduction or opposition. Full passive range digits and thumb
 - Strength: Reduced strength index finger flexor digitorum profundus (FDP) and thumb flexor pollicis longus (FPL)
 - Conclusion: Median nerve and anterior interosseous nerve palsy

Case study: Lewis continued



Week one - Initial assessment continued:

- Treatment:
 - Splint/function: Fabrication of a hand-based thermoplastic thumb splint to assist with writing and grasping small objects during function. Full passive range so no splint indicated for night use at present
 - ROM: PROM exercises to maintain joint range
 - Education: nerve regeneration and safety in regards to sensation changes

Case study: Lewis continued

Week three:

- Assessment:
 - Sensation: Hypersensitivity and tingling throughout median nerve distribution
 - ROM/Strength: Now has active radial and palmar abduction and weak opposition (able to hold against gravity once placed in opposition). Full passive range digits and thumb
 - Function: Lewis reporting improved functional capacity with splint in situ – nil limitations reported at this stage. Tends to exclude index finger from tasks requiring pinching
 - Conclusion: Improvement in nerve innervation/regeneration

Case study: Lewis continued

Week three continued:

- Treatment:
 - Splint/function: Begin to wean splint. Encouragement to incorporate left hand into function as much as possible – particularly with fine motor tasks
 - ROM: AROM exercises incorporating newly innervated muscles. Buddy strap index and middle finger to decrease exclusion of index finger
 - Sensation: Desensitisation

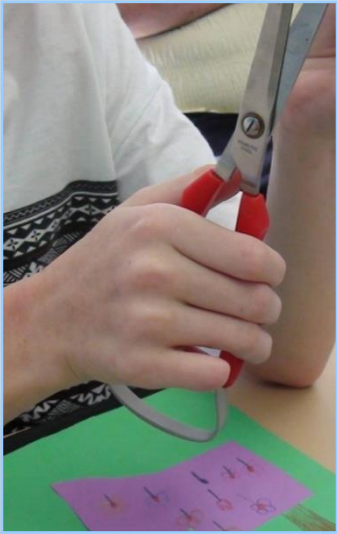
Case study: Lewis continued

Week six:

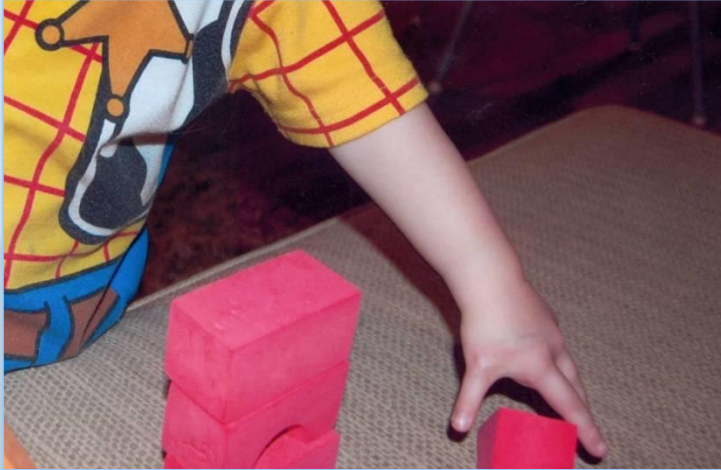
- Assessment:
 - Function: Nil occupational performance issues identified with splint in situ. Some reduced speed and quality of tasks with splint off however improved since initial assessment
 - Strength: Increased opposition strength
 - Sensation: Tingling throughout median nerve distribution diminished
- Treatment:
 - Continue AROM and strengthening
- Plan:
 - Monthly reviews to monitor progress and treatment plan.

General therapeutic games and activity ideas for burns, replants and nerve injuries

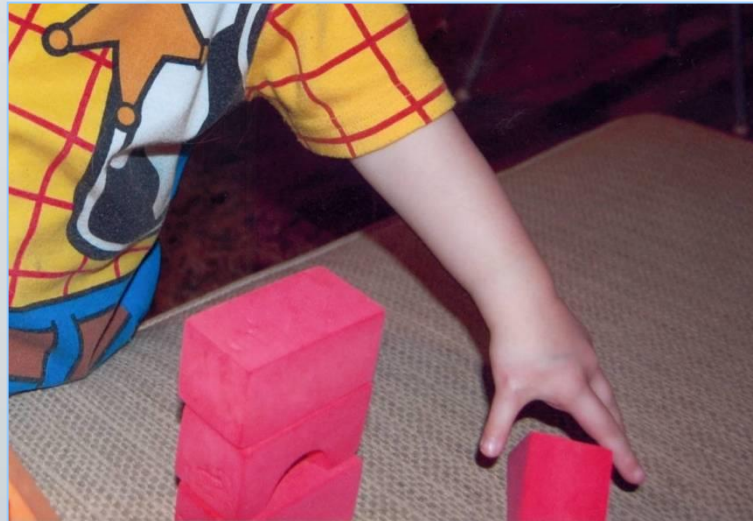
Flexion



Extension



Thumb





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