ACUTE HAND INJURIES

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The hand is a uniquely mobile unit that can sense, communicate, and physically alter the world around us.

One third of all acute injuries seen in emergency rooms involve the upper extremity.

Two thirds of these injuries occur to individuals in their working years.

The way in which a hand wound heals impacts on the patient’s functional outcome.

Acute hand injuries often involve multiple tissues such as tendons and nerves that require special consideration.
OUTPATIENT CARE FOR ACUTE HAND INJURIES: IMPLICATIONS FOR FUNCTION

- Wound Healing and Scar Formation
- Positioning and Contracture
- Post-surgical Conditions - Precautions & Contraindications
Phases of wound healing

- **Inflammatory phase** (1-5 days)
  - Blood vessel contraction + clot formation → haemostasis
  - Blood vessel dilation for transport → exudate
  - Clinical signs: erythema, heat, oedema, pain

- **Fibroplastic/Proliferative phase** (5-42 days)
  - Fibroblasts lay down bed of collagen (random orientation)
  - Angiogenesis
    → Granulation tissue → epithelialisation

- **Maturation and remodelling** (up to 2 years)
  - Occurs once wound is closed
  - New collagen formed
  - Fibroblasts help to remodel and realign collagen fibres
  - Regains up to 80% normal tensile strength
DIGITAL CRUSH INJURY TREATED WITH SILICONE OIL
WOUND HEALING AND SCAR FORMATION

Factors that may delay wound healing:

– Age (>mid 30s)
– Mechanism of injury (e.g. puncture wound, crush injury)
– Stress
– Medications (corticosteroids, NSAIDs, transplant suppressors, DMARDs, TNF-α receptor antagonists)

– Medical conditions
  – Circulatory disorders
  – Respiratory disorders
  – Malabsorption disorders
  – Disorders of mobility and sensation
  – Immune deficiency disorders
  – Anxiety, depression
  – Allergy to wound dressing products
– Smoker
WOUND HEALING AND SCAR FORMATION

Abnormal scar
- **Hypertrophic scar**
  - Overgrowth of dermal tissue that remains within the wound boundaries
- **Keloid scar**
  - Extends beyond the boundary of the wounds

Factors influencing abnormal scar development
- **Depth** – extends into dermis
- **Time** – >3 weeks to closure; prolonged inflammatory phase
- **Skin graft** – borders, seams of graft
- **Age** – more vigorous in healthy younger people
- **Genetics** – family or personal history of hypertrophic or keloid scarring
- **Wound shape** – U or V shape wounds are more likely to raise
- **Wound location & direction** – crossing joint at right angle or extending beyond relaxed skin tension lines
Goal
To optimise wound healing while maintaining soft tissue length and preventing excessive or adherent scar formation.

- **TIME**
  - Tissue management, inflammation/infection control, moisture balance, epithelial (edge) advancement
- Non-restrictive dressings
- Reduce oedema
- Early scar management
TIPS & HINTS FOR WOUND DRESSINGS

Principles

1. Non-restrictive
2. Enable light function where appropriate
3. Minimise pain*
4. Meet wound care goals
   i. Debride
   ii. Hydrate
   iii. Protect
   iv. Absorb exudate
   v. Reduce bacterial load
5. Dress fingers individually!
6. Gentle pressure through web-spaces
TIPS & HINTS FOR WOUND DRESSINGS

Primary dressing
- Should make full contact with the wound – no ‘non-contact’ areas
- Allow easy movement of exudate away from the wound
- Should minimize friction on the wound

Secondary dressing
- Should not be too occlusive
- Functions to keep moisture away from the wound
- Maintains suitable wound healing climate

Amputation healing by 2° intention
Extensor tendon in base of wound
Skill saw vs hand
TIPS & HINTS FOR WOUND DRESSINGS

Avoid circumferential dressings
  ▪ Only cover one side of the digit whenever possible

Add slits to the edges of the dressing to allow motion
TIPS & HINTS FOR WOUND DRESSINGS

- Lightly secure with e.g. micropore tape
- Apply finger sock using dressing applicator
TIPS & HINTS FOR WOUND DRESSINGS

Split dressings over joints to allow motion
TIPS & HINTS FOR WOUND DRESSINGS

Web spaces
TIPS & HINTS FOR WOUND DRESSINGS

Tip or stump dressing
TIPS & HINTS FOR WOUND DRESSINGS

Use skin protection preparations to:
- Enhance adherence of adhesive to skin
- Ease securing of dressings
- Protect fragile skin
TIPS & HINTS FOR OEDEMA MANAGEMENT

Elevation
- Elbow extended

Active movement = muscle pump
- Intrinsics

Light oedema massage
(Stroke distal → proximal)
“Clear the pipes” proximally first

Compression
- Many options available
  - Bulky dressings – softban & crepe
  - Easy fix wrap
  - Tubular bandage/digi-sleeve
  - Isotoner glove
  - Coban

PRECAUTIONS
- Neurovascular compromise (e.g. crush injury, replantation, skin graft)
- Poor cognition
TIPS & HINTS FOR OEDEMA MANAGEMENT

- Bulky bandage
  - Twist in the palm to leave thumb free

- Coban/Coflex
  - Place, don’t pull
  - ‘Gentle hug’
  - Educate to monitor colour and sensation
  - Somewhat occlusive
TIPS & HINTS FOR OEDEMA MANAGEMENT

Coban/Coflex glove

Isotoner glove & Tubigrip
TIPS & HINTS FOR SCAR MANAGEMENT

Transition of wound to scar
- Begins as soon as wound healing begins
- Most active for first 4-6 months
- Scar maturation in children: 12-24 months
- Scar maturation in adults: 6-24 months

Scar properties
- Vascularity
- Pliability
- Height
- Hypertrophy
TIPS & HINTS FOR SCAR MANAGEMENT

Contact media
Polyacrylate tape (Hypafix, micropore)
- Used for
  - Burns dressing
  - Graft fixation
  - Retention dressing
  - Scar management
- Benefits
  - Remains in place 4-6 days
  - Well-tolerated
  - Allows normal activity
  - Can be used in combination with silicone gel products

Remove with regular cooking oil
TIPS & HINTS FOR SCAR MANAGEMENT

Customise – cut to match wound/scar and location
TIPS & HINTS FOR SCAR MANAGEMENT

Allow motion
- Try to limit tape to one side of a finger (avoid circumferential tape if possible)
- Cut slits to allow motion
- Consider using multiple pieces of Hypafix to allow motion over joints
TIPS & HINTS FOR SCAR MANAGEMENT

Silicone Products

- Mechanism not clear
  - Retention of moisture in scar
  - Mimics effects of stratum corneum
  - Absorption of silicone molecules into scar
  - Maintains even tension of surrounding skin
  - Compression

Silicone gel

- Retained in position with retention garments or tubular bandages
- Worn up to 23 hours a day
- Should not be worn over open wound
TIPS & HINTS FOR SCAR MANAGEMENT

- Silicone tape
- Silicone lined tubular sleeves
- Elastomer mold
  - Silicone compound for areas with difficult to fit contours
TIPS & HINTS FOR SCAR MANAGEMENT

Pressure Garments

- Deliver $>15\text{mmHg}$
- Accelerate scar maturation
- Greatest change in first month of wearing
- Garments applied 1-2 weeks after re-epithelialisation

Van den Kerckhove 2005
TIPS & HINTS FOR SCAR MANAGEMENT

Moisturise/Massage
Massage or soft tissue mobilisation
May help to
• Break down constricting fibrous bands
• Increase circulation
• Relieve dryness
• Desensitise
POSITIONING AND CONTRACTURE

Position of safe immobilisation ‘POSI’
- Wrist extended
- MCP joints (knuckles) flexed
- IP (finger) joints straight
- Thumb “around a vase”

Maintain soft tissues in elongated state
**POSITIONING AND CONTRACTURE**

**Splinting**

- Prevent contracture
- Counteract pull of scar tissue as it matures
- Mobilize joint(s) – allow tissue to grow and/or remodel
POST-SURGICAL CONDITIONS — PRECAUTIONS & CONTRAINDICATIONS

- Flexor tendon repair
  - Avoid full finger extension
  - Avoid wrist extension
  - If out of splint support flexed wrist with rolled towel behind metacarpals
  - Avoid bulky dressing that will limit passive flexion
  - Zone I – leave button in situ for 6 weeks
POST-SURGICAL CONDITIONS — PRECAUTIONS & CONTRAINDICATIONS

- Extensor tendon repair
- Terminal tendon repair (mallet finger)
  - Do not allow any flexion at DIP joint
POST-SURGICAL CONDITIONS — PRECAUTIONS & CONTRAINDICATIONS

- Extensor tendon repair
  - Central slip repair (boutonniere)
    - Avoid finger dropping into flexion
    - Maintain extension
    - No active flexion
POST-SURGICAL CONDITIONS — PRECAUTIONS & CONTRAINDICATIONS

- Extensor tendon repair
- Hand, wrist & forearm
  - Zone III — avoid flexion at MCP joint
POST-SURGICAL CONDITIONS — PRECAUTIONS & CONTRAINDICATIONS

- Skin graft / Burns
  - POSI
  - Avoid movement that may stretch or move the graft
  - Leave bolster in situ for 10-14 days
SUMMARY

Wound closure not always synonymous with successful outcome

Acute hand injuries can have significant functional, emotional, and social impact

Deformity and loss of function can be minimised by

- Early movement in non restrictive dressings
- Early reduction of oedema
- Early intervention for scar management
- Early attention to positioning and contracture
- Consideration of other involved tissues
- Team approach

We can land men on the moon, but, for all our mechanical and electronic wizardry, we cannot reproduce an artificial fore-finger that can feel as well as beckon.

John Napier