Evaluation of the Injured Hand

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Disclosures

• Nothing relevant
Outline

• General overview of Hand Trauma
• Anatomy/Examination
• Selected Cases
History of Hand Surgery

- WWII No defined service for injured soldiers
- Sterling Bunnell—civilian surgeon developed program for the US Army
- Surgery of the Hand: 30 years
- Principles of Management still hold today
Incidence of Hand Trauma

- 2011 National Center for Health Statistics
  - 136 million visits
  - 40.3 million Injury related
    - H&N 11.7%
    - Spine 4%
    - Upper Extremity 18.3% = 7.39 million
      - Wrist/Hand/Finger 11.3% = 4.53 million
Economic Impact

- Annual expense **$740 million #1**
  - knee and lower limb fractures ($562 million)
  - hip fractures ($532 million),
  - skull-brain injury ($355 million).
- Productivity costs contributed more to the total costs of hand and wrist injuries (56%) than did direct health-care costs.
- Hand and Wrist:
  - hand and finger fractures ($278 million), largely due to high productivity costs in the age group of 20-64 ($192 million).
Hand Anatomy: Cortical Representation
Complex Anatomy

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The Lingo

Dorsal/Volar, Ulnar/Radial
Proximal/Distal

Where on the hand, which digit, what’s exposed?

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Hand Injury Assessment

• Prehospital care

• What ED personnel need to know

• What Trauma teams need to know
Hand General Appearance

- Tenodesis effect
- Can assess integrity of tendons when patient is unconscious

Tenodesis effects related to the movement of the wrist
Hand Exam

- Hand alignment
- Fingers should point to scaphoid
- Assess for malrotation
- Important for finger and metacarpal fractures
Hand Vascular Exam

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Evidence based Comprehensive Approach to Forearm Arterial Laceration
Volume 16, Issue 7, December 2015. WestJEM
Janice N. Thai, MD, et al.
Vascular Assessment

Allen Test

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Tourniquets in Emergency Setting

- Extensive experience in Military situations
  - Improves limb salvage
  - Improves functional survival
  - Morbidity is minimal

- Time for tourniquet use unclear.
  - 2 hours max intraoperative

- J Trauma. 2008;64:S28 –S37

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Nerve Anatomy
Quick assessment

Motor

I
Median nerve
Opposition:

II
Ulnar nerve
Intrinsic function
Also OK sign

III
Radial
Thumb/Wrist function

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Nerve Exam

• Median nerve
• “Eye of the Hand”
• Sensation to 3½ digits
• Motor to thumb
• Test index finger pad
Nerve Exam

- **Ulnar Nerve**
- Sensation to small and ½ ring finger
- Intrinsic muscles of hand
  - Cross fingers
  - Adduction against resistance

Ulnar Nerve Sensory Innervation
Nerve Exam

- Radial Nerve
- Sensation to dorsum of hand and thumb
- Nightstick injuries
- No motor function
- Test at 1\textsuperscript{st} webspace
Tendon injuries

- Extensor Tendon
- Drooped posture
- Inability to extend
- Don’t be fooled by intrinsic hand function
- Lay hand flat on table, then ask to lift finger up
Extensor Tendon Injuries
Tendon Injuries

• Flexor tendon
  – Extended posture
  – Unable to form fist
  – High morbidity if not repaired
  – Should be repaired within a week
  – 3 months of rehab
Tendon Injuries

• Identification
  – Extended posture
  – Pain in palm or wrist
Zone of injury
  “No Man’s Land”
Tendon Injuries
Exam Details

• ABCs of Trauma
• Life before Limb
  – “Try to save the Hand”
• Quick Hand Examination Including Sensory
  – Assess vascularity
  – Sensibility
  – Gross function
  – Skeletal stability: X-rays

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Exam Details

• Commonly associated with high speed injuries
  – Air bags
  – Rollover accidents
  – Auto-pedestrian accidents
  – Crush injuries

• High index of suspicion
Exam Details

- Evaluations:
  - X-rays Mandatory
  - Nerve Exam
  - Function
    - Tendons
    - Joint alignment
    - Dislocations
    - Skin integrity
  - Crush injury
Missed Injuries

Head injuries

- ICU Setting
- Inadequate/Incomplete exams
- Assess critical injuries first
- Secondary survey when awake/alert
Poly-Trauma
Poly-Trauma
Not So Simple injuries

3. Find x.

Here it is

SIMPPLICITY

The simplest solutions are often the cleverest
They are also usually wrong
Impalement
Hand Fractures

• Most can be handled as outpatient or in hospital follow-up
  – Close skin lacerations
• Open fractures, skin loss, mangled hands to OR ASAP
• Multi-level injury
• Bone loss treated with bone grafting
Hand Fractures: is it an open fracture?

- Depends on mechanism of injury
  - Contamination
  - Bite wounds
  - Blast/GSW injury
- Fall/impact with skin laceration
- Require close follow-up
Vascular/Replantation

- Highly specialized reconstruction
- Level 1 Trauma Centers
- Several “rules” guide replantation
- Resources, time, costs
- Outcomes fair at best

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2 digit replantation

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2 digit replantation
Soft Tissue Injuries

- Tendons
- Nerves
- Skin
- Combined Mutilating injuries
Nerve Injuries

- Start with Exam
- Know pattern of innervation
- Direct repair best if done early
- Nerve conduits
- Tendon transfers if muscle loss
Median Nerve Injury in Child

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Fingertip injuries

- Common consult
- Less than a postage stamp, can allow to granulate
- Sew on as a "biologic dressing"
- Time and healing

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Other Local flaps
Mutilating Hand Injuries

• Most dramatic
• High energy injuries
• Multi-level injuries
  – Skin
  – Tendon
  – Muscle
  – Bone
  – Nerve
Mutilating Hand Injuries

• General Principles
  – Stabilize patient
  – Stabilize Hand
    • Vascular reconstruction
  – Multiple washouts
  – Revision fixation
  – Tendon/Nerve Recon
  – Skin Coverage
Functional outcome
Summary

• Index of suspicion should be high
• Knowledge of Hand Anatomy
• Determine level of expertise required to address
• Acute injuries
  – Control Hemorrhage
  – Stabilize fractures
Thank You

What i'm about to tell you is gonna change your life forever. Are you really sure you want to know it?