Hand Emergencies

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Disclosure

• I have no conflict of interest related to this program/presentation

Topics to Cover

• Hand infections
• Bite wounds
• Traumatic wounds
• Compartment syndrome
• Pressure injection injuries
• Exposure injuries
Is it really an emergency?

- Wide variety of hand emergencies
- Loss of life or limb
- Time-dependent

Hand Infections

- Closed compartments in which abscess form
- felon: 15-20 fibrous septae between periosteum and skin at distal tip
- Paronychia: Disruption of seal between nail plate and nail fold

Hand Infections

- Multiple areas of communication for abscess to spread
  - Thumb → radial bursa
  - SF → ulnar bursa
  - Bursae communicate in 50-80%
  - IF and 2nd webspace drain to thenar space
  - LF, RF, and 3rd webspace drain to midpalmar space
  - SF drains to hypothenar space
  - Deep subfascial space (dorsal subcutaneous, dorsal subaponeurotic, and interdigital web spaces)
Sources of Infection

- Most common organisms are Staph and Strep species (50-80% reported hand infection)
- Abscesses requiring surgical debridement include those in deep spaces, flexor sheaths, and those with involvement of joints


Flexor tenosynovitis

- Kanavel’s Four Cardinal Signs
  - Flexion posture
  - Fusiform swelling
  - Tenderness along flexor sheath
  - Pain on passive extension
- Treat early (24-48h) infection w/abx, elevation, and splinting for comfort
- Treat late infection w/open drainage/irrigation or closed catheter irrigation


Necrotizing Fasciitis

- True medical emergency requiring rapid, aggressive treatment
- At risk: IV drug users, alcoholics, diabetics, and PVD
- Presents as low-grade cellulitis and progresses rapidly w/severe pain, edema, bullae, crepitus, and skin necrosis w/“dishwater pus”
- Also have systemic symptoms and hemodynamic instability
- May be polymicrobial, but most often Strep. pyogenes (GAS)
- Tx w/resuscitation, IV antibiotics
  - Clindamycin is synergistic w/PCN, preventing protein toxin synthesis and suppressing growth of PCN-binding proteins produced by S. pyogenes and S. aureus
- Rapid debridement and empiric abx therapy increases survival rate to 90% in UE necrotizing fasciitis
Septic Arthritis

- Infection of joint space, as result of direct joint penetration, contiguous spread, or hematogenous spread
- Present with swollen, painful, erythematous joint held in partial flexion
- Cartilage destruction due to bacterial toxins and proteolytic enzymes
- Staph, Strep, and Gonococcus
- Diagnose w/aspiration (WBC >50,000, PMNs >75%, Gluc <40mg/nml fasting level)
- Treat w/incision and drainage and IV antibiotics

Bite Wounds

- Account for 1% of all visits to ER
- Clenched fist injuries: “fight bite” may violate skin, joint space, subtendinous space, and dorsal subcutaneous space
  - S. pyogenes, S. aureus, Eikenella corrodens
- Cats/Dogs: cat bites (piercing injury w/inoculation) have 50% infection rate vs 4% in dog bites (crush/tear able and able to drain)

Trauma

- Replantation Indications:
  - Thumb, Multiple digits, Partial hand, Wrist, Forearm, Single digit distal to FDS insertion, Any digit in a child
- Contraindications:
  - Severely crushed or mangled digit, Multiple level amputation, Comorbidities, Prolonged warm ischemia time (6h proximal to carpus, 12h for digits)
- Goal:
  - Anticipated function should be equal to or better than that achieved w/revision amputation or prosthesis
Ring Avulsion Injuries

Urbaniak Classification:

Class I: circulation adequate, standard bone/soft tissue treatment is sufficient

Class II: circulation inadequate, vessel repair preserves viability

Class III: complete degloving or amputation

Replantation

- Sequence:
  - Locate/tag vessels and nerves
  - Debride
  - Shorten and fixate bone
  - Repair extensor and then flexor tendons
  - Anastomose arteries
  - Repair nerves
  - Anastomose veins
  - Obtain skin coverage

- No standardized regimen for perioperative anticoagulation protocols

- Average TAM 129 degrees, static 2-pt discrimination 8mm in clean cut and 15mm in crush/avulsion

Crush/Blast Injuries

- Debride non-viable tissue
- Stabilize bony fractures with external fixator or K-wires
- Minimal excision of tendons
- Do not excise nerve tissue but may release carpal tunnel
- Splint hand in the safe position (wrist extended 20 degrees, MCPs flexed to 70-90 degrees,PIP/DIPs extended to 0 degrees)
- Tag nerve and tendon ends for later return to OR
- Consider VAC therapy until definitive soft tissue coverage
Compartment Syndrome

- Tissue pressure rises, collapsing veins, local blood flow is reduced, and metabolic needs of muscles and nerves are not met—myocyte lysis, capillary leak, and increased intracompartmental pressure
- Structures at highest risk for injury are nerves and muscle (metabolically active)
- Damage is irreversible after 6-8hrs
- Pain w/passive stretch, paresthesias/paralysis, pallor, pulselessness, pressure (tense)

Compartment Syndrome of Forearm

- Delta pressure (diff between compartment pressure and diastolic pressure) <20-30mmHg
- Release via sinusoidal volar and dorsal linear incisions
  - Superficial and deep volar compartments
  - Dorsal compartment
  - Mobile wad compartment
- Failure to treat leads to Volkmann contracture

Pressure Gun Injuries

- Pressure required to penetrate human skin is 100 psi
- Painting guns produce between 10,000-12,000psi
- Injury is mechanical and chemical, usually involving non-dominant IF
  - Most toxic agents are organic solvents (paint thinner, gasoline, jet fuel, oil)
- Spread preferentially occurs in subcutaneous tissue planes and along neurovascular bundles
Pressure Gun Injuries

- Often present late due to failed diagnosis by patient and urgent care clinics
- Treat with extensive debridement and antibiotic therapy
- Use of steroids is controversial
- Amputation rates range from 22-50%

Exposures

- Burns
  - First degree (superficial)
  - Second degree (partial thickness)
  - Third degree (full thickness)
  - First and superficial second degree burns heal within 2 weeks
  - Deep second degree or third degree require tangential excision and grafting (FTSG preferable)
  - Escharotomies follow compartment release incisions
  - Biobrane (biosynthetic semipermeable membrane with nylon mesh and porcine collagen) worn as glove in superficial second degree burns
  - Early splinting and OT to decrease joint stiffness and contracture

Exposures

- Frostbite—extensive soft tissue damage associated with exposure to temperatures below freezing point
- Ice crystals form and damage capillaries leading to progressive ischemia and infarction
- Oxygen free radicals, prostaglandins, and thromboxane A2, and proteolytic enzymes lead to inflammation and tissue damage
- Superficial lesions present as clear blisters and deep lesions as hemorrhagic blisters

3. Wieder, A et al. Long-term followup of high-pressure injection injuries to the hand.
Exposures

- Appropriate warming is use of whirlpool bath or tub at 37-39°C.
- Administer anti-inflammatories/analgesics for pain
- Thawing takes 20-40min
- Debride clear blisters and leave hemorrhagic blisters intact to decrease risk of infection
- May require angiography to eval blood flow

Wrap Up

- Consider the principles of what makes a true emergency:
  - Is it potentially life or limb threatening?
  - Could prolonging treatment lead to negative form and function?
- Communicate with your team—including the ER staff, the OR staff, and the nurses on the floor