1 Diagnosis and Treatment of Common Fractures and Dislocations
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2 Objectives
• Well informed primary care and emergency room providers are key players in the care of the orthopaedic patient.
• In many cases, appropriate initial management can have a significant impact on outcome
  • Compartment syndrome, open fractures, vascular injuries
• Review common orthopedic conditions and provide an avenue for consultation and treatment

3 Terminology Overview
• Fractures = Broken Bones
  • Subluxation = Partial joint disruption
  • Dislocation = Complete joint disruption
• Sprain = When a ligament is torn or stretched beyond normal range
  – Huge component of traumatic injuries
  – Often have missed fractures
• Strain = Muscle is stretched beyond normal range

4 Physical Exam Terminology
• Deformity
• Tenderness
• Guarding
• Swelling
• Bruising
• Crepitus
• False Motion
• Locked Joint

5 Fractures
• What bone is broken?
5 □ Fractures
• What bone is broken?
• Open vs. closed?
• Displaced or non-displaced?
• Isolated injury or polytrauma?
• Associated conditions
  – Neurologic Injury
  – Vascular Injury
  – Compartment syndrome

6 □ Vascular Injury
• Vascular injury associated with lower extremity trauma is rare
  – <0.1% of patients with long bone fractures
  – >16% of patients with knee dislocation
• Often no obvious signs of injury
• Limb threatening injuries
• Potentially devastating consequences
• Outcomes are primarily dependent on early detection
• Delay in diagnosis is associated with amputation rates as high as 86%

7 □ Vascular Injury Diagnosis
• Begins with physical exam and radiographs
  – High in knee dislocations and medial tibial plateau fractures
• PE can be misleading
  – Normal pulses in 5-15% of patients with vascular injury
• Do PE before and after reductions
• Vascular exam
  – Documentation Palpable, Dopplerable or absent Pulses
  – Capillary refill
  – Extremity color
  – Temperature
  – Compare results to opposite side

8 □ Diagnostic Tests
• Arterial Pressure Index
• Duplex Ultrasound
• CT Angiogram
• Arteriography

9 □ Arterial Pressure Index(API)
• Quick and inexpensive
• Calculated by measuring systolic pressure of 2 extremities
Quick and inexpensive
- Calculated by measuring systolic pressure of 2 extremities
- One cuff is placed distal to injury
- Another on uninjured upper extremity
- Use doppler probe to determine systolic pressures of both extremities
- Systolic injured/uninjured = API
- API <0.90 needs further workup
- 97% accuracy rate, PPV 91%, NPV 99%
  – Lynch et al

**Vascular Injury Treatment**
- Emergent Operative Intervention

**Compartment Syndrome**
- Intramuscular pressure within an enclosed fascial space exceeds capillary blood pressure
- If untreated, damage to tissues can be irreversible

**Etiology**
- There are a multitude of causes of compartment syndrome and its etiology is probably multifactorial
  1. A decrease in size of the compartment
  2. An increase in the content of the compartment
  3. Swelling due to abnormal muscle → chronic compartment syndrome

**Diagnosis**
- Differs for alert or comatose patients, adults or children
- Alert/cooperative
  – Pain out of proportion
  – Pain on passive stretch
  – Pressure to palpation (compartment not soft)
  – Paralysis (due to pain or nerve injury)
  – Parasthesia (occurs early)
  – Pulselessness

**Diagnosis**
- Arterial Line
- Stryker Pressure Monitor
- Synthes Compartment Pressure Monitor
- Ultrasound
• Synthes Compartment Pressure Monitor
• Ultrasound
• MRI
• NIR Spectroscopy

15 **Treatment**

- First Aid to hypoxic cells
  - Keep patient normotensive
  - Remove constricting bandages
  - Elevate limb to heart height
  - O2 administration to keep fully oxygenated
- Emergent Surgery!

16 **Open Fractures**

- Often scarier than they really are
- Ok to push exposed bone back in if compromised skin
- Usually reduce with gentle longitudinal traction
- Put sterile compression dressings on and splint
- Still at risk for compartment syndrome
- Need urgent surgery

17 **Dislocations**

18 **Hip Dislocations**

- Traumatic posterior hip dislocations are high energy injuries
- Associated injuries are common
- Outcome is highly dependant on time to reduction, associated injuries and post-reduction management
- Unsatisfactory results can be expected in up to 50% of patients
- Treatment is directed to the avoidance of complications

19 **Diagnosis**

- Physical exam
  - Flexion, adduction and internal rotation
  - Careful knee exam
  - Neuro exam for sciatic nerve palsy
- Xrays
  - Head is smaller
  - Not concentric

20 **Treatment**

- Urgent reduction

- Traction should be applied in a steady manner

- Patient should be paralyzed if possible to avoid further cartilage damage with
• Patient should be paralyzed if possible to avoid further cartilage damage with manipulation

• Femoral neck fractures reported
  • Polesky, JBJS, 1972

• 2-15% are irreducible

22 Diagnosis

• Physical Exam
  – Limited ROM
  – Deformity not reliable

• Radiographic
  – AP/Scapular Y views
  – AXILLARY LATERAL

23 Treatment

• Multiple reduction maneuvers described
• Generally sling or shoulder immobilizer
  – Duration depends on age
    • Elderly → 1-2 weeks
    • Young male → 4 weeks

• If associated fractures or persistent instability exist, orthopedic follow-up is indicated

25 Elbow Dislocations

• Occur from fall on outstretched hand
• Majority are posterior
• Reduce with gentle traction, flexion and dorsal pressure
• Relaxation/sedation key
• Long posterior splint
• Refer to orthopedics

26 Fractures

27 Diagnosis/Work Up

• Physical Exam
  – Skin – tenting v. open fracture
  – Neurovascular exam
    • Radial v. hand intrinsics
    • Foot drop – careful if foot against bed
• Radial v. hand intrinsics
• Foot drop – careful if foot against bed
• Radiographs
  – Joint above and below
  – Orthogonal views (AP/lateral)
  – CT – often for articular fractures

28 Fracture Referral
• Urgent
  – Widely displaced (needing reduction)
  – Long bone fractures
  – Open fractures
• Emergent – neurovascular compromise
• Within 1 week
  – Distal radius, proximal humerus, distal humerus, olecranon, patella, ankle, clavicle

29 Clavicle Fractures
• Commonly fractured bone in sports
• Diagnosis – Upright x-rays preferable
• Management – Sling (initial)
• Used to treat all without surgery
• Now surgery done for many patients

30 Proximal Humerus Fractures
• Very different injuries depending on age
  – Young → high energy
  – Elderly → GLF
• Reduction maneuvers usually unsuccessful
• Shoulder immobilizer initially
• Associated dislocations require urgent transfer
• Treatment
  – Young → ORIF
  – Elderly
    • Often non-operative
    • Joint replacement v. ORIF if surgical

31 Humeral Shaft Fractures
• Bimodal distribution
  – Young – high energy
  – Elderly – low energy
• Majority amenable to non-operative treatment
  – Coaptation splint acutely
  – Transition to functional bracing
• Operative indications controversial
• Radial nerve palsy NOT a contraindication to non-op

32 Distal Humerus Fractures
- Higher incidence neurologic injury
- Most require surgery
- Posterior splint OK for transfer
- Can be seen in office the following day if NVI
- CT scan is helpful
- Virtually all require surgery

33 Forearm Fractures
- Most common in kids
- Symptoms
  - Pain, swelling & deformity
- Splinting
  - Sugar tong
  - Volar splint not appropriate
- Treatment
  - Children – reduction, occasional surgery
  - Adults - Surgery

34 Wrist Fractures
- Due to fall on outstretched hand
- Splint for transport
  - Sugar tong most appropriate
- Many require reduction and casting v. surgery
- Don’t miss acute carpal tunnel

35 Hip Fractures
- Wide spectrum of injury
  - Intertrochanteric fractures
  - Femoral neck fractures
  - High v. low energy (young v. old)
- Nearly all require hospitalization and surgical treatment
- Work up
  - Hip and femur radiographs
  - CT pelvis appropriate if high energy
  - Labs (CBC, BMP, coags, UA for elderly, Lactate for polytrauma)

36 Geriatric Hip Fractures
- Life changing injuries
  - 20-30% mortality rate within 1 year***
  - 1 year mortality decreases with surgery within 48 hours
  - Many do not return to same level of independence or functional status
- Post-op care
- Many do not return to same level of independence or functional status

• Post-op care
  - WBAT post-op
  - Chemical DVT prophylaxis warranted

37 Geriatric Hip Fracture – Post-Op

• VTE prophylaxis – ROC routine
  – Lovenox 40 mg SQ daily in hospital
  – ASA 325 mg BID upon hospital d/c
  – Total of 6 weeks

• Post-Acute care
  – No benefit of rehab v. SNF in isolated injuries
  – Home health – limited application
  – Consider long term placement in many cases

• PCP follow-up within 2 weeks

38 Femoral Neck Stress Fractures

• Young patient
• Recent activity increase
• Military recruits
• Diagnosis
  – New groin pain, worse with activity
  – Xray, MRI
• Operative v. NWB

39 Pelvic Ring Injury

• Bimodal distribution
  – Young → high energy
  – Geriatric → Ground level fall
• High energy injuries often have associated injuries
  – Urogenital
  – Closed head
  – Visceral

40 Pelvic Ring Injury

• Work-up: High energy
  – ABC’s, secondary, trauma AP pelvis, CT CAP
  – Pelvic binder or sheet - center on trochanters

• Work-up: Ground level fall
  – Evaluate for other sources of pain (spine)
  – Radiographs – AP/inlet/outlet views of pelvis
  – Often admit to medicine for pain control/social
  – No binder
Femoral Shaft Fractures
- High energy
- Large blood loss into thigh
- Temporary immobilization
- Plain x-rays (no CT)
- Weightbearing status varies post-op
- DVT prophylaxis indicated

Distal Femoral Fracture
- X-rays + CT scan
- Immobilization
- Almost all TTWB post-op
- DVT prophylaxis indicated

Patella Fractures
- Usually due to direct blow or forced flexion of knee
- Unable to extend knee
- Initial Management – immobilizer
- WBAT in full extension with immobilizer OK acutely
- Treatment
  - Nondisplaced – immobilizer
  - Displaced - Surgical

Tibial Plateau Fractures
- Very Common fracture
- Be aware of compartment syndrome
- Medial fractures can have arterial injuries
- High rate of meniscal/soft tissue injury
- Initial management
  - Splint or knee immobilizer
  - ABI’s for medial or bicondylar

CT scan
- Almost always needed, but...
  - Not very useful if done on widely displaced fracture (ex-fix first)
  - Call ortho
- Management
  - Often staged in widely displaced/bicondylar
  - TTWB for 10-12 weeks post-op
  - DVT prophylaxis controversial
Tibia Fractures

• 1-10% have compartment syndrome
• Initial management
  – Realign (protect skin)
  – Splint
  – Radiographs of entire bone
  – CT scan for distal 1/3 spiral fractures
• Surgical treatment
• Post-op
  – Weightbearing varies
  – DVT prophylaxis controversial

Ankle Fractures

• Wide range of severity
• Initial management
  – Reduce all dislocations
  – Usual maneuver – pull great toe toward opposite shoulder
  – Splint – posterior + stirrups, use plaster
• High spiral fibula fracture – get ankle x-rays!
• Treatment
  – Operative for most (distal fibula exception)
  – DVT prophylaxis not required
  – Weightbearing varies

Transfer Issues

• Most injuries can be splinted and transferred
• Make sure not to miss compartment syndrome, vascular injuries or open fractures
• Straighten out with longitudinal traction while splinting
• Food
  – No one ever died from missing a few meals
  – NPO for injured patients
  – If patients self transferring – stress NPO
• Life threatening injuries go to trauma centers

Transfer Issues

• Orthopedist available by phone 24/7 for advice or consultation
• Telemedicine units in many rural locations – coming soon
• ROCX – great resource for ambulatory patients
• Always willing to accept patients for transfer to any Reno area hospital for more serious injuries
injuries

Thank You