Activity: Synopsis of Fractures and Dislocations

Approval Date: 3/1/2018

Termination Date: 2/29/2021

Target Audience: All local physicians working in the fields of primary care, physical medicine and rehabilitation, internal medicine, surgery, and orthopaedic surgery.

Planners/Authors
Nabil Ebraheim, MD
Author/Course Director/Planner
Professor & Chairman
Department of Orthopaedic Surgery
The University of Toledo

Johnathan Cooper
Co-Author/Planner
Department of Orthopaedics
The University of Toledo

Lauren Corba
Planner
Medical Assistant
Department of Orthopaedic Surgery
The University of Toledo

Disclosures
No Planner/Author/Co-Author has any financial interest or other relationship with any manufacturer of commercial product or service to disclose.

Activity Objectives:

- Describe orthopaedic concerns
- Review treatment options for orthopaedic injuries
- Describe physical examinations of fractures and dislocations
- Identify symptoms of various fractures and dislocations
- Diagnose fractures and dislocations
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Nabil Ebraheim, MD  nabil.ebraheim@utoledo.edu  419-383-4020
Sternoclavicular Joint Dislocations

Anterior Dislocation

- Benign Injury, cosmetic deformity only.
- A bump will be seen and felt
- Treatment: closed reduction, OFTEN UNSTABLE. Immobilization with a sling for a few days
- The result is usually good. This injury does not interfere with function.
**Posterior Dislocation** (Serious)

- **COULD BE MISSED**
  - May cause compression of the trachea, esophagus, and great vessels.
  - Could be an emergency.
  - Best evaluated by CT scan
  - Closed reduction is often successful and remains stable
  - May require open reduction
  - Make sure there is a backup cardiac surgeon for surgery
Scapula

- Scapula is surrounded by strong muscles and injury to the scapula requires a great force that can injure the chest.
- Be aware of the possibility of an **ASSOCIATED PNEUMOTHORAX**.
- Pulmonary contusion could be present. **ALWAYS ADMIT THE PATIENT AND OBSERVE FOR AT LEAST 24 HOURS**.
- Treatment:
  1. Sling and physical therapy
  2. Displaced glenoid intra-articular, especially with a dislocation or subluxation will require surgery.
- Early physical therapy is critical to obtain a good outcome.

Rule out Pneumothorax
Acromioclavicular Joint: 6 Types

Type I
Minor sprain of the fibers of the AC ligaments.
Treatment: Conservative

Type II
Rupture of AC ligaments, sprain of CC ligaments. Joint may be subluxed.
Treatment: Conservative

Type III
Rupture of AC and CC ligaments. Joint is disrupted.
Treatment: Usually Conservative. Consider surgery in a selected group of patients.

Type IV
Joint disrupted with posterior displacement of clavicle. Get axillary view.
Treatment: Surgery

Type V
Joint disrupted with very high displacement of clavicle.
Treatment: Surgery

Type VI
Inferior displacement of clavicle.
Treatment: Surgery
Shoulder

Anterior Dislocation

♦ Most common
♦ Axillary nerve is the most commonly injured structure.
♦ Often associated with greater tuberosity fracture and humeral head defect (Hill-Sachs lesion).
♦ Also associated with a Bankart lesion (avulsion of the anteroinferior labrum).
♦ High rate of recurrence in the young.
♦ High rate of cuff tear in the elderly.
♦ If the patient is unable to raise the arm after shoulder dislocation:
  o In young patient ➔ AXILLARY NERVE INJURY
  o In elderly patient ➔ ROTATOR CUFF TEAR. May need an MRI and surgery.
Posterior Dislocation

- Associated with seizures and electrical shock.
- **OFTEN MISSED** in the emergency room on radiographs.
- Axillary radiographic view is required for diagnosis.
- **LIMITED EXTERNAL ROTATIONS** at shoulder.
- May be associated with lesser tuberosity fracture and humeral head defect (reverse Hill-Sachs lesion).

Patient with limited external rotation following posterior dislocation
Clavicle Fractures

A. Group I: Middle third (80%)
B. Group II: Distal Third (10-15%)
C. Group III: Medial Third (5%)

TREATMENT

- Clavicle fractures are usually treated conservatively. However, there is a high incidence of non-union in distal third fractures.
- Surgical fixation of clavicle fractures is required in cases of:
  - Non-union
  - If there is more than 2 cm displacement or overlap in acute fractures
Humerus Fractures

Proximal Humerus

♦ Neer Classification
  o Simple: non-displaced two part & three part fractures --- treated with sling.
  o Complicated: four part fractures, fracture-dislocations, head splitting fractures --- treated with surgery, usually prosthesis for four part fracture in the elderly or ORIF in young patient.

♦ Treatment for fracture dislocation-Reduce the dislocation followed by fracture fixation or replacement of the humeral head.

♦ AVASCULAR NECROSIS: could occur with a displaced anatomical neck fracture or fracture dislocation. AVN is usually treated with prosthetic replacement.

♦ Risk of AXILLARY NERVE INJURY with displaced fractures.

♦ Postoperative rehabilitation is very important.

♦ Significant residual stiffness is common in elderly, early rehab will decrease the stiffness.
Humeral Shaft Fractures

- Look for **RADIAL NERVE INJURY** and **WRIST DROP** (unable to extend the wrist and fingers and sensory loss on the dorsum of the base of the thumb).
- Treatment
  - Usually conservative --- a splint, cast or a functional brace.
  - Surgery --- for specific fracture indications, patient indications and other associated injuries.
  - Open fracture with radial nerve palsy: need surgery to debride the fracture and explore the nerve.
  - Closed fracture with radial nerve palsy: observe the radial nerve for recovery. Use EMG and Nerve Studies after three weeks.
  - Nonunion treatment includes a bone graft and plate.

Wrist Drop

Radial Nerve
Supracondylar Humerus Fractures

- Supracondylar Fractures of the humerus
  - Extra articular fractures --- usually conservative, especially in adults.
  - Intercondylar fractures --- open reduction and internal fixation. Fracture needs to be reduced anatomically and fixed.
- In children, closed reduction and percutaneous pinning fixation. Observe the circulation. Also examine the patient for anterior interosseous nerve palsy. Check the “Ok” sign.
Elbow Fractures

Dislocation of Elbow Joint

♦ Closed Reduction
  o If stable: sling for two to three days, range-of-motion exercises and physical therapy
  o If unstable: surgery to stabilize the elbow and to internally fix the fractures and to repair the ligaments.

♦ The ulnohumeral ligament is the most important ligament for stability of the elbow.
Radial Head Fractures

- Non-displaced fractures \(\rightarrow\) early range of motion and physical therapy
- Displaced fractures \(\rightarrow\) Surgery
  - Fixation for simple fracture patterns.
  - Excision for comminuted fractures.
  - Excision and replacement of the radial head if there is an associated injury to the elbow (elbow dislocation or injury to the wrist) at the distal radioulnar joint.
Olecranon Fractures

- Usually displaced due to the pull of the triceps.
- Treatment: open reduction and internal fixation with a plate or tension band construct. Excision and reattach the triceps if small and comminuted, especially in elderly patients.

Undisplaced

Avulsion

Transverse

Comminuted

Dislocation
Forearm Fractures

Monteggia Fracture-Dislocation

♦ Fractures of proximal third of the ulna with dislocation of the radial head.
♦ Treatment: open reduction and internal fixation of the ulna and closed reduction of the radial head.

Forearm Fractures

♦ Treatment: open reduction and internal fixation of the radius and the ulna. Must restore the radial bow.
♦ Malunion results in loss of forearm rotation.
Galeazzi fracture-dislocation

- Definition: Fracture of the distal third of the radius with dislocation or subluxation of the distal radio-ulnar joint (DRUJ)
- Treatment: open reduction and internal fixation of radius. **Assess the stability of DRUJ.** If unstable, pinning may be necessary or immobilize the forearm in supination.
Wrist Fractures

Fractures of the Distal Radius

- Look for MEDIAN NERVE COMPRESSION.
- Look for INJURY TO EXTENSOR POLLICIS LONGUS TENDON with an undisplaced distal radius fracture (loss of thumb extension).
- Treatment:
  - Usually closed reduction and casting
  - Surgery → Internal fixation for a displaced intra-articular fracture
Smith Fracture

♦ Definition: Extra-articular fracture of the distal end of the radius with volar displacement of the distal fragment.
♦ Treatment – Surgery – Reduction and volar plate fixation

Perilunate Dislocation

♦ Look for **MEDIAN NERVE INJURY OR COMPRESSION**
♦ Check DISI and VISI (carpal disruption usually seen on lateral x-rays of the wrist).
♦ Treatment consists of a closed reduction of the carpal bones followed by surgery to stabilize the wrist.
♦ Surgery is utilized for irreducible dislocation and to stabilize the carpal bones.
DISI

- Refers to Dorsal Intercalated Segmental Instability. It refers to loss of normal alignment between scaphoid and lunate in the wrist (Normal: 45° DISI: > 60°)
- Causes: Scaphoid fracture, non-union, scapholunate dissociation and perilunate injury.
- Treatment: Surgery

Normal Wrist
Scapholunate angle normal – 45°

DISI can occur with Scaphoid Fracture and Perilunate Dislocation
Scaphoid is volar and scapholunate angle is high > 60°
Scaphoid Fractures

- **COULD BE MISSED**
- High risk of delayed union and nonunion
- **HIGH RISK OF AVASCULAR NECROSIS** with proximal pole fractures
- Best evaluated by MRI if the fracture is not clear and the patient has significant pain
- Treatment:
  - Cast immobilization (thumb spica) --- non-displaced and stable fractures will have a good outcome if diagnosed early.
  - Surgery --- displaced fractures.
Hand

Thumb Carpometacarpal Fracture Dislocations

♦ Three Types
  o Extra-articular: treated with a splint, cast or thumb spica.
  o Partial articular: Bennett’s Fracture is treated with surgery, usually treated with reduction and K-wire.
  o Complete articular: Rolando’s Fracture can be treated with ORIF, closed reduction, percutaneous pinning or external fixation.

Metacarpal Fractures

♦ Treatment:
  o Conservative: most of the neck and shaft fractures, especially of 4th and 5th the metacarpals.
  o Surgery: multiple, comminuted or segmental fractures with bone loss
♦ Watch for malrotation of the fingers
Phalangeal Fractures

- Treatment:
  - Nondisplaced – cast
  - Displaced – surgery, usually pinning or a plate
- Watch for malrotation of the fingers
Cervical Spine Fractures

- *Jefferson Fracture (Fx 1st cervical vertebra)*
  - Bony injury will be treated by a collar of a Halo.
  - Tear of transverse ligament + bony injury with ADI > 3 mm is unstable and will be treated by a Halo or surgery (fusion of C1 & C2).

![Jefferson’s Fracture Type I](image1)
![Jefferson’s Fracture Type II](image2)

**Treatment**

- *Odontoid Fracture (Fx C2 odontoid process)*
  - Type I is managed by a cervical collar.
  - Type II & III are stabilized by a Halo.
  - Type II can lead to a nonunion of the odontoid.
- Hangman’s Fracture (Fx C2 pedicles)
  - Neurological injury is rare.
  - Stabilized by Halo, if displaced.
  - If not displaced, stabilize by a collar.
Cervical Spine Fractures

♦ Fractures of the Lower Cervical Spine
  o Stable: Conservative Treatment - Compression fracture with no posterior ligamentous injury, no nerve cord injury
  o Unstable: Surgery
    1. Burst
    2. Compression fracture + posterior ligamentous injury
    3. Facet dislocations

♦ Facet Dislocations of the Cervical Spine
  o Unilateral: displacement < 50% of the vertebral body width may need surgery, especially if associated with neurological deficit.
  o Bilateral: > 50% of the vertebral body width needs surgery.
♦ Get an MRI and check associated DISC HERNIATION in patients with cervical spine facet dislocations.

Unilateral facet dislocation
Bilateral facet dislocation
Thoracolumbar Spine Fractures

♦ Fractures of the Thoracolumbar Spine
  o Compression and burst fractures without neurological deficit will utilize conservative treatments.
  o Unstable fractures, fracture and neurological deficit or flexion-distraction injuries will require surgery.
♦ Fracture-dislocations are always treated with surgical stabilization.

Chance Fracture

♦ Horizontal avulsion injury of the vertebral body caused by flexion in which the entire vertebra is pulled apart by a strong tensile force
♦ Also called **SEAT BELT INJURY**
♦ **MOST COMMONLY MISSED** during initial evaluation
♦ **LOOK FOR ASSOCIATED ABDOMINAL INJURIES** such as colon injury and splenic or liver laceration, especially in children.
♦ **Types and Treatment of Chance Fractures**
  o Bony: Could heal with immobilization, casting or bracing. Surgery is rarely utilized
  o Ligamentous: Soft tissues and ligaments do not heal and require surgery.
Pelvic Fractures

✧ **LIFE THREATENING BLEEDING** is a major concern.
✧ Unstable pelvic fractures will need blood transfusion. May require 15 to 20 units of blood.
✧ Uncontrolled, life threatening bleeding—may need arterial embolization.
✧ **POSTERIOR PELVIC INJURY COULD BE MISSED**
✧ Posterior injury:
  o worse prognosis
  o unstable injury
  o needs surgery
✧ Best evaluated with a CT scan.
✧ Treatment
  o Pelvic binder in the ER or external fixation, in the operating room, to stop bleeding
  o Definitive—surgery for unstable fractures
✧ Open pelvic fractures with wounds involving the rectum and/or perineum carry a HIGH MORTALITY RATE. Colostomy decreases the mortality
Sacral Fractures

♦ May be associated with neurological deficit
♦ Three Types:
  o Type I: Fractures involving the sacral ala – 5% risk of L5 nerve root injury
  o Type II: Fractures involving sacral foramina. Up to 30% risk of neurological deficit.
  o Type III: Fractures involving the sacral spinal canal. They run the higher risk of neurological deficit and cauda equine syndrome.
♦ Treatment of Sacral Fracture:
  o Conservative: stable fractures with posterior SI ligaments intact
  o Surgery: displaced and unstable fractures
Hip Joint

Acetabular Fractures

♦ Best evaluated by CT scan and best treated with surgery for a displaced fracture
♦ Always check SCIATIC NERVE function
  Look for FOOT DROP
♦ Risk of POST-TRAUMATIC ARTHRITIC AND AVASCULAR NECROSIS

Dislocations of the Hip Joint

♦ Hip dislocation is an EMERGENCY
  o Posterior dislocation: more common-lower limb will be flexed, adducted and internally rotated
  o Anterior dislocation: rare-lower limb will be extended, abducted and externally rotated.
♦ URGENT REDUCTION IS MANDATORY TO MINIMIZE THE RISK OF AVASCULAR NECROSIS
♦ Always check SCIATIC NERVE function.
  Look for FOOT DROP
♦ Fracture-dislocations of the hip joint:
  o Closed reduction of the hip joint dislocation followed by surgery for the acetabulum
Proximal Femur Fractures

Femoral Neck Fractures

- **HIGH RISK OF AVASCULAR NECROSIS**
- **HIGH MORTALITY RATE** – 25% within one year

Treatment
- Age > 65: Replacement --- Hemiarthroplasty or Total Hip Arthroplasty.
- Age < 65: Closed or open Reduction and internal fixation.

Intertrochanteric Fractures

- **Treatment**: Closed reduction and internal fixation
Reverse Oblique Hip Fracture
- Treatment with a rod, plate or blade plate.
- Do not use a compression hip screw

Subtrochanteric Fractures
- **HIGH MECHANICAL STRESS** at the fracture site, slow healing
- **HIGH INCIDENCE OF IMPLANT FAILURE AND NONUNION**
- Treatment: internal fixation, usually with a rod
Femur Fractures

Femoral Shaft Fractures

♦ Look for associated FEMORAL NECK FRACTURES and HIP DISLOCATION

♦ Treatment: Closed reduction and internal fixation with interlocking nail. **Rodding within 24 hours decreases the mortality and complications.** A reamed rod statistically is the treatment of choice.
Fractures of the Distal Femur

- **Treatment:**
  - Supracondylar Fracture: above the knee joint and will require surgery.
  - Intercondylar Fracture: involves the knee joint. Treatment consists of an open reduction and internal fixation.
- Complications include knee stiffness and post-traumatic arthritis, especially in the elderly.
- Periprosthetic fracture in the elderly is a common fracture type for this age group.
Knee Joint

Dislocations of the Knee Joint

- Is an **EMERGENCY**
- There is **HIGH RISK OF NEUROVASCULAR INJURY**
- Always **CHECK DISTAL PULSE** to rule out popliteal artery injury
- Usually will need ankle brachial index or **ARTERIOGRAM** study
- Needs **URGENT REDUCTION**, reassess the circulation.
Fractures of the Patella

- Results in the disruption of the extensor mechanism of the knee. The patient is unable to extend the knee.
- Treatment
  - Open reduction and internal fixation for displaced fractures.
  - Patellectomy (partial or total) for highly comminuted fractures.
  - Cast for non-displaced fractures, if the patient is able to extend the knee.
Tibia

Fractures of the Proximal Tibia

Tibial plateau fracture

♦ Best evaluated by CT scan
♦ Look for signs of COMPARTMENT SYNDROME
♦ Could be associated with other injuries such as meniscal tear, ACL or collateral ligament tears. Major depression or separation of the joints may be associated with meniscal tears.
♦ Often requires surgery --- closed or open reduction and internal fixation depending on the amount of depression and displacement of the fracture
♦ Medial plateau fracture could resemble a knee dislocation – need ABI

Fractures of the Tibial Shaft

♦ Look for signs of COMPARTMENT SYNDROME
♦ HIGH INCIDENCE OF OPEN FRACTURES, INFECTION AND NONUNION
♦ Treatment: Usually closed reduction and internal fixation with interlocking nail
Fractures of the Tibial Plafond (Pilon Fracture)

- High risk of soft tissue complications
- **SOFT TISSUE CONDITION SHOULD BE CAREFULLY ASSESSED.** Delay surgery until the soft tissue condition improves and the wrinkle sign is present.
- Treatment
  - External fixation initially
  - Definitive: internal fixation once the condition of the soft tissue improves (staged procedure).
  - Minimally invasive is better than extensive surgery

Ankle
Fractures of the Ankle Joint

- Ankle Fracture
  - Fracture of the fibula alone
  - Fracture of the medial malleolus alone
  - Bimalleolar fracture
  - Trimalleolar fracture

- Look for **SYNDESMOTIC INJURY**. Syndesmotic injuries require surgical stabilization.

- **MAISONNEUVE FRACTURE**: fracture fibula and ankle injury may be missed. Always get full leg x-ray including the knee and ankle.

- Fracture of the proximal fibula could be missed.

- Treatment: Surgery

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Fractures of the Talus

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♦ Talar neck or body fracture.
♦ Best evaluated by CT scan.
♦ **HIGH RSK OF AVASCULAR NECROSIS and SUBTALAR ARTHRITIS**
♦ Treatment: Surgery --- for displaced talar neck and body fractures.

**Fractures of the Calcaneus**
♦ Look for lumbar spine fractures or other fractures of the lower extremities which could be missed
♦ Check for compartment syndrome
♦ Wait for the wrinkle sign before surgery to minimize a soft tissue complication
♦ Treatment
  o Short period of immobilization, physical therapy and range-of-motion exercises for non-displaced extra and intra-articular fractures.
  o Internal fixation may be used cautiously in open fractures.
  o Surgery for displaced and intra-articular fractures. Surgery may cause soft tissue complications, such as infection.
Foot

Injuries to Midfoot:

♦ Navicular, Cuboid and Cuneiform fractures
  o Displaced fractures will require surgical treatment
  o Non-displaced fractures will utilized conservative treatment methods.

Lisfranc Joint Injuries:

♦ Tarso-metatarsal joint complex is referred to as Lisfranc joint complex
♦ The 2nd metatarsal is usually displaced due to the tear of the Lisfranc ligament
♦ It could be occult – may need a stress views and/or weight bearing films or a CT scan
♦ Treatment
  o Unstable injures (usual presentation) will require surgery. Fixation for a bony injury and a fusion for ligamentous injuries.
  o Surgery will also be used for the fixation of a fracture dislocation or fusion of the joint.
  o Splint – if there is no instability on stress x-rays (usually rare). Follow the patient with x-rays.
Injuries of the Forefoot

♦ Metatarsal Fractures
  o Splint – undisplaced and isolated lesser metatarsal fracture
  o Surgery is done for displaced first metatarsal fracture, multiple metatarsal fractures and fifth metatarsal fractures involving tarsometatarsal joint (Jones Fracture).

♦ Phalangeal fractures are treated non-operatively with buddy taping and stiff-soled shoes with protected weight bearing
Fractures of the proximal fifth metatarsal

- **Avulsion fracture**, a zone I injury usually occurs along the insertion of the lateral band of the plantar aponeurosis or avulsion of the peroneus brevis. Treatment is by closed means, usually with short-leg cast or stiff-soled shoe. Weight bearing as tolerated.

- **Jones’ fracture**, a zone II injury usually results from tensile stress along the lateral border of the proximal fifth metatarsal. Treatment involved either a non-weight-bearing short-leg cast or surgery with intramedullary screws.

- **Proximal diaphyseal stress fracture**, zone III injury is relatively rare and is seen mainly in high-level athletes. It results from repetitive cyclic loading, this leads to a stress fractures and it **has a tendency for nonunion**. Treatment involves surgical fixation with or without bone grafting.
Reference Sheet


1. In a sternoclavicular joint dislocation, which dislocation (posterior or anterior) is more serious?
   a. Anterior  
   b. Posterior  
   c. Superior  
   d. Inferior  

2. Fracture of the scapula could be associated with
   a. Anterior dislocation  
   b. Pneumothorax  
   c. Clavicle Fracture  
   d. None of the above  

3. A type II Acromioclavicular joint fracture involves which of the following:
   a. Minor sprain of the fibers of the AC ligaments  
   b. Rupture of AC ligaments, sprain of CC ligaments  
   c. Rupture of AC and CC ligaments  
   d. Joint disrupted with posterior displacement of clavicle  

4. A type IV Acromioclavicular joint fracture involves which of the following:
   a. Minor sprain of the fibers of the AC ligaments  
   b. Rupture of the AC ligaments, sprain of the CC ligaments  
   c. Rupture of the AC and CC ligaments  
   d. Joint disrupted with posterior displacement of the clavicle  

5. In an elderly patient with an anterior shoulder dislocation, is usually associated with:
   a. DVT  
   b. Rotator cuff injury  
   c. Biceps Rupture  
   d. Clavicle Fracture  

6. Posterior shoulder dislocation is most commonly associated with:
   a. Seizures  
   b. Electrical shock  
   c. lack of external rotation  
   d. all of the above  

7. In proximal humerus fractures, simple non-displaced two part and three part fractures are treated with:
   a. Closed reduction  
   b. Open reduction  
   c. Sling  

Synopsis of Fractures Post-Test
8. What should physicians look for when treating humeral shaft fractures with radial nerve palsy?
a. Loss of finger flexion  
b. Claw fingers  
c. Wrist Drop  
d. Loss of finger abduction

9. After a closed reduction following the dislocation of the elbow joint, unstable fractures should be treated with:  
a. Sling for 2-3 days, ROM exercises, and PT  
b. Surgery and internal fixation

10. Non-displaced radial head fractures should be treated with:  
a. Early ROM exercises and PT  
b. Fixation  
c. Excision  
d. Excision and replacement of radial head

11. Displaced comminuted radial head fractures, with elbow dislocation, should be treated with:  
a. Early ROM exercises and PT  
b. Fixation  
c. Excision  
d. Replacement

12. Olecranon fractures are usually displaced due to the pull of the:  
a. Biceps  
b. Triceps  
c. Lats  
d. Deltoids

13. Monteggia fracture-dislocations should be treated with:  
a. Open reduction and internal fixation of the ulna and closed reduction of the radial head  
b. Closed reduction of the ulna and radial head  
c. Open reduction of the ulna and closed reduction of the radial head

14. Galeazzi fracture-dislocations should be treated with:  
a. Open reduction and internal fixation of the radius  
b. Closed reduction of the radius

15. When treating fractures of the distal radius, the physician should look for:  
a. Medial nerve compression  
b. Injury to extensor pollicis longus tendon  
c. Both a and b  
d. None of the above

16. A Smith fracture can be defined as  
a. Intra-articular fracture of the distal end of the radius with volar displacement of the distal fragment  
b. Extra-articular fracture of the distal end of the radius with volar displacement of the distal fragment
17. With perilunate wrist dislocations, you should look for:
   a. Median nerve injury
   b. Radial Nerve Injury
   c. Ulnar nerve injury

18. Scaphoid wrist fractures come with a high risk of:
   a. Carpal tunnel syndrome
   b. Delayed union and nonunion, AVN
   c. Infection

19. In neck and shaft metacarpal fractures the most important findings for a physician to look for is:
   a. Finger swelling
   b. Finger malrotation
   c. Wrist swelling
   d. Hand hematoma

20. Non-displaced phalangeal fractures of the foot should be treated with:
   a. A cell
   b. Surgery with plates
   c. Surgery by K-wires
   d. Early range of motion by buddy tape

21. Jefferson fractures can be described as:
   a. Bony injury
   b. Burst fracture of C1
   c. May be associated with a tear of transverse ligament
   d. All of the above

22. For a fracture of the lower cervical spine, that is dislocated or subluxed, what type of treatment is recommended?
   a. Conservative
   b. Open reduction and internal fixation
   c. Halo
   d. None of the above

23. Hangman’s Fracture is described as:
   a. Fracture of C1
   b. Fracture of C2
   c. Fracture of C7
   d. Burst fracture of C6

24. Chance fractures, Horizontal avulsion injury of the vertebral body caused by flexion in which the entire vertebra is pulled apart by a strong tensile force, can be _______.
   a. Bony
   b. Ligamentous
   c. All of the above
   d. None of the above
25. Chance fractures may also be referred to as _____ fractures
   a. Jefferson
   b. Odontoid
   c. Hangman’s
   d. Seat belt

26. Chance fractures may be associated with what type of injuries
   a. Colon injury
   b. Splenic/liver laceration
   c. All of the above
   d. None of the above

27. Which dislocation causes a cosmetic deformity only?
   a. Posterior sternoclavicular joint dislocation
   b. Anterior sternoclavicular joint dislocation
   c. All of the above
   d. None of the above

28. In type I, II, and III acromioclavicular joint fractures, treatment is _______
   a. Conservative
   b. Surgery

29. In type IV, V, and VI acromioclavicular joint fractures, treatment is _______
   a. Conservative
   b. Surgery

30. Humeral head defects are often associated with anterior dislocations of the shoulder. They are commonly known as _______
   a. Hill-sachs lesion
   b. Bankart lesion
   c. SLAP lesion
   d. None of the above

31. An unstable pelvic fracture is usually associated with
   a. bleeding
   b. a need for an open reduction internal fixation
   c. a need for a blood transfusion
   d. All of the above

32. What is a complication associated with intraarticular fractures of the distal femur?
   a. knee stiffness
   b. post-traumatic arthritis
   c. none of the above
   d. both a and b
33. What is a maisonneuve fracture?
   a. proximal fracture of the fibula and ankle injury
   b. fibular fracture
   c. ankle injury
   d. none of the above

34. What is the treatment of choice for a displaced intraarticular fracture of the calcaneus?
   a. short period of immobilization
   b. open reduction internal fixation
   c. external fixation
   d. closed reduction alone

35. What is a Jones’ fracture?
   a. zone I injury
   b. zone II injury
   c. zone III injury
   d. none of the above