Traumatology 11

Department: OTM

Year : 2nd year

Semester : 1

Learning outcomes,

By the end of this lesson you should be able to:

- ❖Manage injuries of the upper limbs
- ❖Manage injuries of the lower limbs
- ❖Manage injuries of the head, chest and spine
- ❖Manage joint and soft tissue injuries

Definition

Definition- Traumatology is the study of diagnosis and treatment of severe, acute physical injuries e.g. from accidents, gunshot wounds sustained by individuals requiring immediate medical attention

Cont., of definition

Or Traumatology is the evaluation and treatment of psychological trauma in individuals affected by severe mental or emotional stress or physical injury

Fractures of the upper extremity

- **Shoulder girdle fractures;** Fractures and dislocations involving the shoulder girdle are common

Cause/etiology

- High energy trauma

Assessment; Follow advanced trauma life support(ATLS)guide lines to identify associated life threatening injuries

Physical examination

- Must include thorough neurovascular assessment of upper limb

Caution- Pay attention to axillary nerve/brachial plexus prone to shoulder girdle injuries

Cont.,

- Frequently traumatized region of the skeleton
- Complex structure comprised of several articulations, numerous ligaments, tendons and muscles suspending the upper extremity to the thorax
- Allows a tremendous range of motion

Fractures of the scapula (shoulder blade)

- Caused by a blunt trauma
- Include fractures of body, spine, acromion, scapula neck and coracoid process fractures
- Commonly affects ipsilateral shoulder girdle, upper extremity lung and chest wall
- Pulmonary injuries include haempneumothorax or pulmonary contusion

Cont.,

- Acromion fractures are caused by significant blunt force to shoulder directed anteriorly
- Glenoid neck fractures occur due to falls with an outstretched arm, blunt force

Associated injuries

- Humerus fractures
- Shoulder dislocation

Cause:

- Direct trauma/violence

Incidence:

- Uncommon
- Less than 1% of all fractures

Location; 50% involve body and spine

Signs/symptoms; Pain and ecchymosis

Mortality rate; 2.5% associated mortality

Associated conditions

- Rip fractures 52%
- Ipsilateral clavicle fracture 25%
- Spine fractures 29%
- Brachial plexus injuries 75%

Medical:

- Pulmonary (lung) injury
- Pneumothorax (32%)
- Pulmonary contusion (41%)
- Head injury (34%)
- Vascular injury (11%)

Investigation

- X-rays AP/LAT, scapula Y, and lateral views
- CT scan

Treatment

- Sling for 2 weeks followed by early range of motion exercises

Operative treatment- ORIF (open reduction internal fixation)

Complications

- Infection in open fractures
- Neurovascular deficit
- Loss of function of gleno humeral joint

Clavicle fractures

- **Incidence-** make up 4% of all fractures
- **Demographics-** often seen in young active patients
- **Associated injuries-** ipsilateral scapula fracture and scapula thoracic dissociation, rib fracture, pneumothorax and neurovascular injury

Mechanism of injury

- Direct blow to lateral aspect of shoulder
- Fall on an outstretched arm
- Direct trauma

Pathoanatomy

- In displaced fractures, the sternocleidomastoid muscle pulls the medial fragment posterior superiorly
- The pectoralis and weight of the arm pulls the lateral fragment inferior medially
- Open fractures button hole through the platysma

Clinical features

- Physical deformity
- Shoulder pain- worse on movement
- Swelling
- Tenderness
- Bruising
- Gritty sensation felt over broken bones

Investigation

- X rays
- CT scan

Treatment

- Arm sling immobilization with gentle range of motion exercises at 2-4 weeks and strengthening at 6-10 weeks. No attempt to reduction should be made
- Pain medications (NSAIDS)
- Surgery in cases when pieces of bone move far out of place to realign the collar bone

Complications

- Neurovascular injury
- Pneumothorax
- Mal union
- Nonunion
- Post traumatic arthritis
- Re fractures
- Scarring
- Hardware prominence

Radius fractures

- **Epidemiology-** Occur in up to 20% of all elbow injuries
- **Incidence-** Most common elbow fractures

Associated injuries

- 30% have associated soft tissue or skeletal injuries
- Distal radioulnar joint injury
- Interosseous membrane disruption
- Coronoid fractures
- Elbow dislocation
- Carpal fractures

Clinical features

- Pain /tenderness along the lateral aspect of elbow
- Limited elbow/forearm motion particularly supination/ pronation

Physical examination

- Reduced range of motion
- Instability
- **Imaging-** X-ray AP/LAT, CTscan

Treatment

- **Non-operative;** Short period of immobilization followed by early range of motion in isolated minimally displaced fractures
- **Operative-** ORIF, Radial head replacement

Complications

- Displacement of fracture
- Posterior interosseous nerve palsy
- Loss of fixation
- Loss of forearm rotation
- Elbow stiffness
- Radiocapitellar joint arthritis
- infection

Radius/Ulna shaft fractures(both bone forearm fractures)

- **Epidemiology-** More common in men than women
- ratio of open to closed fractures is higher than for any other bone except tibia

Mechanism- Direct trauma (often while protecting ones head)

- Indirect trauma- motor vehicle accidents
- Falls from heights and athletic competition

Associated conditions

- Elbow injuries
- Compartment syndrome

Signs/symptoms- gross deformity

- Pain
- Swelling
- Loss of forearm and hand function

Physical examination

- **Inspection-** in open injuries check for tense forearm compartments
- **Neurovascular** exam-assess radial/ulna nerve pulses

- Document median, radial and ulna nerve function

- **Investigation-** x rays AP/LAT views

Treatment

- **Non operative-** Functional brace with good interosseous mold in non displaced or distal two thirds ulna shaft fractures
- **Operative-** Plates/screws
- external fixators
- IMnailing

Complications

- Refracture
- Neurovascular damage
- Malunion
- Nonunion
- Compartment syndrome
- Infection
- synostosis

Fracture Humerus:

- **Incidence;** 3.5% of all fractures
- **Bimodal age of distribution;** High energy in young patients
- Low energy in elderly with osteoporotic bones
- **Symptoms;** pain and extremity weakness
- **Physical exam**; Examine overall limb alignment
- Examine and document status of radial nerve pre/post reduction

Investigation;

- X-rays AP/LAT
- MRI
- C T scan

Treatment;

Non operative- Cooptation splint followed by functional brace

Operative treatment- (indicated in)

- open fractures
- Vascular injury requiring repair
- Brachial plexus injury
- Ipsilateral forearm fracture (floating elbow)
- Compartment syndrome

Operative treatment;

- Plates/screws
- IM nails

Complications;

- Radial nerve palsy
- Malunion
- Nonunion
- Infection in open fractures

Proximal Humerus fracture;

Incidence- 4-6% of all fractures

- Third most common fracture pattern seen in elderly

Demographics- 2:1 female to male ratio

- Increasing age correlates with increasing risk of fractures in women

Mechanism- low energy falls

- Elderly with osteoporotic bones
- High energy trauma in young individuals

Associated conditions;

- Nerve injury- axillary nerve palsy most common
- Fracture dislocations most commonly associated with nerve injuries

Symptoms- Pain

- Swelling
- Decreased motion

Physical exam;

- On inspection- there is an extensive ecchymosis of chest, arm and forearm

Diagnosis- x rays AP/LAT

- Scapula Y views
- Axillary views

Treatment;

Non operative- Sling immobilization followed by progressive rehabilitation (exercises) early range of motion within 14 days, stretching program

Operative treatment-

- IM nails
- Plates/screws
- arthroplasty

Complications;

- Nerve injury
- Malunion
- Nonunion
- Post traumatic arthritis
- infection

Distal Humerus fractures

- **Incidence-** Distal intercondylar fractures are the most fracture patterns
- Common in young males and older females

Mechanism

- Low energy falls in elderly
- High energy impact in young population

Associated injuries

- Elbow dislocation
- Terrible triad injury
- Floating elbow
- Volkmann contracture (as a result of a missed forearm compartment syndrome)

Symptoms;

- Elbow pain
- swelling

Physical examination;

- Cross instability often present

Neurovascular exam

- Check function of radial, ulna and medial nerves
- Check for distal pulses
- Monitor carefully for forearm compartment syndrome

Diagnosis;

- X rays AP/LAT views
- CT scan
- MRI

Treatment- Non operative- Cast immobilization in non displaced fractures

Operative- (CRPP) closed reduction percutaneous pinning and total elbow arthroplasty

Complications

- Ulna nerve palsy
- Elbow stiffness
- Nonunion
- Malunion
- Degenerative joint disease

Fracture Carpals;

Definition- a fracture of one or more carpal bones of the wrist

- Treatment varies depending on element involved

Incidence- accounts for 18% of all hand fractures

- Over 80% of carpal fractures involve the scaphoid
- Triquetrum and others are less involved

Scaphoid fracture

- Break of scaphoid in the wrist
- General symptoms include pain at base of thumb
- Worsens on use of hand

Mechanism of injury:

- Fall on an outstretched hand

Epidemiology:

- Common in young males
- Less common in children /older adults due to weak radius and accounts for 50-80% carpal injuries

Signs/symptoms

- Focal tenderness in volar prominence at the distal wrist for distal pole fractures
- Anatomic snuff box for waist or mid body fractures

Diagnosis

- X-rays
- MRI
- Bone

DDX:

- Distal radius fracture
- Dislocation
- Wrist sprain

Prevention:

- Wrist guards during activities

Treatment: Non- operative

- If not displaced apply a thumb Spica

Cont.,

Operative:

- Percutaneous screw fixation- screwing the scaphoid bone back together

Complications:

- Avascular necrosis
- Non union

Metacarpal fractures:

Incidence:- comprise between 18-44% of all hand fractures

- Non thumb metacarpals account for around 88% of all metacarpal fractures with the 5^{th} finger most commonly involved
- Majority of metacarpal fractures are isolated injuries which are simple, closed and stable

Mechanism of injury:

- Punching when the fist is in a clenched position
- Direct trauma to the dorsum of the hand

Signs/symptoms

- Pain /tenderness
- Deformity
- Inability to move the finger
- Swelling
- bruising

Cont.,

- Shortened finger
- Scissoring of the injured finger over neighbor when making a partial fist

Diagnosis:

- X rays
- MRI
- Ultrasound
- Blood culture

Treatment:

- Antibiotics for 4-6 weeks if osteomyelitis is present
- Incision /drainage
- Primarily non-operative sedation or local anesthesia followed by closed reduction of the fracture
- Application of a forearm based splint and secure with a loose compressive wrap for 3 weeks

Complications;

- Rare but most common is mal union
- Rotational deformity
- Loss of function
- stiffness

Fracture phalanges:

- Usually caused by direct trauma
- Twisting injury
- Crush injuries to the distal phalanx resulting to nail trauma and open fractures

Signs/symptoms:

- Swelling on the fracture site
- Tenderness at fracture site
- Bruising

Cont.,

- Inability to move the injured finger
- Deformity of the finger

Diagnosis:

- X rays
- Physical examination
- Patient history
- ultrasound

Treatment:

Non- operative- is the general choice of treatment for distal phalanx fractures because of its small size

- Conservative treatment with splints is used for displaced fractures

Operative treatment- surgical treatment of displaced proximal phalanx fracture after reduction is common because of instability and rotation trouble

- Use of Krishna wires by percutaneous pinning or open reduction or very small screws/plates

DDX:

- Metacarpal fracture
- Mallet finger
- Jersey finger
- Volar plate
- Avulsion injury

Complication:

- Loss of motion
- Nonunion
- Mal-union
- infection

11:Fractures of the lower extremity

Fractures of the pelvic girdle;

Incidence:

- High energy blunt trauma
- High mortality rate: 15-25% for closed fractures/50% for open fractures
- In pediatrics, reradiate cartilage is open, the iliac wing is weaker than the elastic pelvic ligaments resulting in bone failure before pelvic ring disruption

Associated injuries

- Chest injury for up to 63%
- Long bone fractures in 50%
- Sexual dysfunction up to 50%
- Head and abdominal injury in 40%
- Spine fractures in 25%

Clinical symptoms

- Pain /inability to bear weight
- Test stability by placing gentle rotational force on each iliac crest- low sensitivity for detecting instability
  - perform only once
- Look for abnormal lower extremity positioning
  - -external rotation of one or both extremities
  - -limb length discrepancy
- Rectal exam to evaluate sphincter tone/perirectal sensation

Diagnosis:

- X ray- AP pelvis, inlet view, outlet view

Tiles classification:

- **A-** Stable
- **B-** Rotationally unstable, vertically stable
- **C-** Rotationally and vertically unstable

Young barges classification:

- Anterior posterior compression
- Lateral compression

Cont.

- Vertical shear

Treatment: resuscitation

- Fluids- blood/crystalloids
- Pelvic binder/sheet
- External fixation
- Angiography/embolization

Non operative treatment

- Indicated for mechanically stable pelvic ring injuries including anterior impaction fracture of sacrum and oblique ramus fracture with less than 1cm of posterior ring displacement

Operative treatment: (ORIF) in cases like-

- Symphysis diastasis more than 25cm

Cont.,

- Sacroiliac joint displacement more than 1cm
- Sacroiliac joint displacement more than 1cm
- Displacement or rotation of hemi pelvis
- Open fracture

Diverting colostomy- indicated when there is an open pelvis fracture especially with extensive perineal injury or rectal involvement

Fracture head femur:

- **Incidence-** rare fracture pattern associated with hip dislocation
- Location /size of fracture fragment/degree of comminution depend on the position of the hip at the time of dislocation

Mechanism- impaction, avulsion or shear forces involved
-unrestrained passenger(knee against dashboard) -falls from height

-sports injury

-industrial accidents

Associated injuries

- 5-15% of posterior hip dislocations are associated with a femoral head fracture
- Anterior hip dislocations usually associated with impaction/indentation fractures of the femoral head
- Femoral neck fracture
- Acetabular fracture
- Sciatic nerve injury
- Femoral head avascular necrosis
- Ipsilateral knee ligamentous instability

Clinical presentation

- History from patient e.g. fall from a height
- Frontal impact with knee striking dashboard

Symptoms-localized hip pain, unable to bear weight

Physical exam- on inspection- shortened lower limb, posterior dislocation and anterior dislocation

Neurovascular- may have signs of sciatic nerve injury

Diagnosis

- X rays- AP pelvis, lateral hip and judet views both on pre/post reduction
- CT scan after reduction to evaluate- concentric reduction, loose bodies in joint, acetabular fracture and femoral or neck fracture

Findings; femoral head fracture, intra articular fragments, posterior pelvic ring injury, impaction and acetabular fracture

Treatment

Non operative (indications)- acute dislocation, reduce hip dislocation within 6hrs

Technique- obtain post reduction (CT continuous traction) -perform serial radiographs to document maintained reduction

Operative (ORIF) indications:

- Presence of loose bodies in the joint
- Associated neck/acetabular fracture
- Poly trauma

Cont.,

- Irreducible fracture dislocation
- Arthroplasty- significantly displaced fractures, osteoporotic and comminuted fractures

Complications:

- Heterotopic ossifications
- Avascular, decreased range of motion (ROM)
- Sciatic nerve injury
- Degenerative joint disease (DJD)

Femoral neck fractures

Epidemiology:

- Increasingly common due to aging population
- Women more than men
- Whites more than blacks
- Most expensive fracture to treat on per person basis

Mechanism:

- High energy in young patients
- Low energy falls in older patients

Pathophysiology:

Healing potential- femoral neck is intra capsular, bathed in synovial fluid, lacks periosteal layer, callus formation is limited which affects healing

Associated injuries;

- Femoral shaft fractures 6.9%

Symptoms:

- Slight pain in the groin or referred pain along the medial side of the thigh/knee in impacted/stress fractures
- Pain in the entire hip region in displaced fractures

Physical examination:

- No obvious clinical deformity
- Minor discomfort with active or passive hip range of motion, muscle spasms at extremes of motion
- Pain with percussion over greater trochanter
- In displaced fractures, the leg is in external rotation, abduction with shortening

Diagnosis

- X rays
- CT scan
- MRI
- Duplex scanning

Treatment:

Non operative- indicated in non-ambulatory patients who have minimal pain and at high risk of surgical intervention

Operative treatment:

- ORIF indicated in displaced fractures in young or physiologically young patients less than 55 yrs. of age
- Hemi arthroplasty- indicated in patients with metabolic diseases and the elderly
- Total hip arthroplasty- in controversial, in older active patients and in patients with progressively hip osteoarthritis

Complications:

- Osteonecrosis
- Nonunion
- dislocation

Femoral shaft fractures:

incidence;

- **Traumatic- (high energy)-**most common in young population as a result of high speed motor vehicle accidents
- **Low energy-** more common in the elderly often as a result of fall on standing

Associated conditions

- Ipsilateral femoral neck fractures (26% often incidence)
- Bilateral femur fractures – significant risk of pulmonary complications with increased rate of mortality as compared to unilateral fractures

Clinical presentation

- Pain in thigh
- In inspection swollen tense thigh
- Tenderness around the thigh
- Difficult examination of ipsilateral femoral neck secondary to pain on from the fracture

Diagnosis:

- X rays- AP/LAT views for entire femur and ipsilateral hip and knee
- Ct scan to rule out associated femoral neck fracture

Treatment- (non operative) long leg cast in un displaced fractures with multiple medical comorbidities

operative

- IM nails
- Plates/screws
- Exofix

Complications:

- Mal union
- Neurovascular damage (femora)
- Non union
- Infection
- Quadriceps weakness

Distal femur fractures:

Defined as fractures from articular surface 5cm above metaphyseal flare

Mechanism- in young patients high energy with significant displacement

In older patients low energy in osteoporotic bone with less displacement

Physical exam in vascular evaluation potential for injury to popliteal artery in significant displacement

- Angiography is done if there is no pulse after alignment/ reduction

Diagnosis:

- X rays AP/LAT
- CT scan to establish intra articular involvement
- Angiography indicated when there is diminished distal pulses with gross alignment restored

Treatment:

Non operative- in non displaced , non ambulatory and those with significant comorbidities

- Long leg cast
- Continuous traction
- Hinged knee brace with immediate ROM non weight bearing for 6 weeks

Operative

- Plates/screws
- Screws only
- IM nails

Complications:

- Symptomatic hardware
- Malunion
- Nonunion
- Infection
- Joint stiffness

Patella fracture

- **Incidence-** Patella fractures account for 1% of all skeletal injuries
- Male to female 2:1
- Most fractures occur in 20-50 yrs. Old

Patella sleeve fractures- seen in pediatric population(8- 10 yrs.) - high index of suspicion required

Bipartite patella- may be mistaken for patella fractures and affects 8% of population

- Characteristic superior lateral position/50% bilateral cases

Classification

- Can be described based on fracture pattern
- Non displaced
- Transverse
- Pole or sleeve (upper or lower)
- Vertical
- Marginal
- Osteo chondral
- comminuted

Physical exam

- Palpable patella defect
- Significant hem arthrosis
- Unable to perform a straight leg raise indicating failure of extensor mechanism and retinaculum disrupted

Diagnosis

- X-rays AP/LAT to check for displacement of patella especially on the lateral view/degree of retinacula disruption
- MRI- in cases of difficult leg raise

Treatment:

Non operative: knee immobilization in extension (brace or cylinder cast) and full weight bearing) indicated in

- Intact extensor mechanism (patient is able to perform straight leg raise)
- In non-displaced or minimally displaced fractures

Cont.,

- In vertical fracture patterns
- Early active ROM with hinged knee brace
- Early weight bearing in full extension
- Progress in flexion after 2-3 weeks

Operative

- TBW Tension Band Wiring
- Lag screws
- Circlage wires and patellectomy

Complications:

- Weakness and anterior knee pain
- Symptomatic hardware (most common)
- Malunion
- Nonunion
- Osteonecrosis(proximal fragment) due to excessive initial fracture displacement
- Infection
- Stiffness of the knee

Tibia fractures (proximal third)

- Defined as fractures of the proximal tibia shaft that are associated with high rates of malunion, valgus and soft tissue compromise

Incidence- 5-10% of all tibia shaft fractures

Mechanism- (low energy) occur as a result of rotational injury and a direct trauma

In high energy- occurs as a result of direct trauma

Clinical presentation:

Symptoms- pain and inability to bear weight

Physical examination- on inspection/palpation- contusions, blisters, open wounds and compartments

Diagnosis;

- X rays AP/LAT of affected tibia ipsilateral knee and ipsilateral ankle
- CT scan- indicated for intra-articular fracture extension

Treatment:

Non operative- closed reduction/cast immobilization in long leg cast for low energy fractures with acceptable alignment

Technique- place in long leg cast and convert to functional brace at 4 weeks

- cast in 10-20 degrees of flexion

Outcomes- rotational control is difficult to achieve by closed methods

- Intact fibula may lead to Varus deformity with weight bearing

Cont.,

Operative treatment:

- External fixation
- Intra medullary nailing
- Plates/screws (percutaneous locking plate)

Complication:

- Mal union
- Non union
- infection

Tibia plafond fractures

Incidence (pillon fractures) account for more than 10% of lower extremity injuries

- Incidence increasing as survival rates after motor vehicle accidents and falls from heights

Characteristics;

- Articular impaction/comminution
- Metaphyseal bone comminution
- Soft tissue injury associated with musculoskeletal injuries 75% have associated fibula fractures

Cont.,

- 3 fragments typical with intact ankle ligaments i.e. medial malleolar (**deltoid ligament**)
- Posterior lateral /Volkmann fragment(posterior inferior tibiofibular ligament

Symptoms

- Ankle pain
- Inability to bear weight
- deformity

Cont.,

Physical exam- examine soft tissue integrity

Inspection- swelling, abrasion, ecchymosis, blisters and open wounds

ROM/stability examine stability and ligament of the ankle joint

Neurovascular- check distal pulses and proximal tibia pulses, look for neurologic compromise and signs of compartment syndrome

Diagnosis

- X rays AP/LAT, mortise views of ankle and full length tibia/fibula and foot x rays performed for fracture extension
- CT scan – delineate articular involvement/surgical planning

Treatment- (**non operative**) immobilization with a long keg cast for 6 weeks

cont.

Indications for immobilization

- Stable fracture patterns without articular surface displacement
- Critically ill or non ambulatory patients
- Significant risk of skin problems (diabetes, vascular disease/neuropathy

Technique:

- Long cast for 6 weeks followed by fracture brace /ROM exercises
- Alternative treatment is with early range of motion

Outcomes;

- Intra articular fragments are likely to reduce with manipulation of displaced fractures
- Loss of reduction is common
- Inability to monitor soft tissue injuries is a major disadvantage

Operative treatment:

- Temporizing spanning external fixation across ankle joint
- ORIF
- Exofix :definitively
- IM nails

Complications:

- Wound slough- wound flap for post operative breakdown
- Dehiscence- wait for soft tissue edema to subside before ORIF (1-2 weeks)
- Varus mal union
- Non union
- Post traumatic arthritis- most commonly begins 1-2 years post injury

Tibia plateau fractures:

- **Incidence-** peri articular injuries of the proximal tibia frequently associated with soft tissue injuries
- **Bimodal distribution-** males in 40s (high energy)
- Females in 70s (falls)

Frequency- lateral /biconylar/medial

Mechanism-

- **Varus/valgus load-**or without axial load
- **High energy-** frequently associated with soft tissue injuries while low energy is associated with fractures

Associated conditions:

- Meniscal tears- lateral meniscal tear- most common than medial
- ACL-Anterior Cruciate Ligament injuries
- Compartment syndrome
- Vascular injury

Examination:

- **History-** high energy trauma in young patients
  - low energy falls in elderly

Physical exam-(inspection)-look for open injuries
-(palpation)-consider compartment syndrome when compartments are firm and not compressible

Varus/valgus stress testing- often difficult to perform given pain

Neurovascular exam- any difficulties in pulse exam between extremities should be further investigated

Diagnosis:

- X rays
- CT scan
- MRI

Treatment (non operative)-hinged knee brace 8-12 weeks /immediate ROM exercises

Indications- Minimally displaced split or depressed fractures

-low energy fractures stable to Varus/valgus alignment and also in non ambulatory patients

Operative treatment

- Plates/screws
- External fixators
- Screws only

Complications:

- Post traumatic arthritis
- Infections
- Compartment syndrome
- Vascular injuries

Cont.

- Knee instability

Fibula fractures:

- **Definition-** A fibula fracture is used to describe a break in the fibular bone

Mechanism:

- A forceful impact e.g. landing after a high jump/impact to the outer aspect of the leg
- Rolling /spraining of the ankle joint puts stress on the fibula which leads to fracture
- Direct injury to the leg
- Gun shot wound
- Direct blow/blunt trauma e.g. sports/motor vehicle accident

Function of fibula

- Supports the tibia bone and helps stabilize the ankle joint and the lower leg muscles
- Connects to the tibia via a interosseous membrane

Epidemiology:

- quite rare
- Occurs commonly in the young athletes

Physical examination:

Examine- skin for any laceration, abrasion/bruising and any signs of trauma e.g. range of motion

Palpation- tenderness over the fibula

Symptoms:

- Pain (acute/sharp)
- Swelling
- Inability to bear weight

Diagnosis:

- X rays

Treatment:(non operative)

- Immobilization with a long leg cast/splint for several weeks then pop walking boot with weight bearing

DDX- osteoid osteoma, Ewing sarcoma, osteosarcoma, osteomyelitis, muscle spasm, ankle sprain, tendon rupture, compartment syndrome and nerve entrapment

Cont.,

Operative treatment

- ORIF if the fracture is located on the upper half of the bone

Complications:

- Damage to superficial peroneal nerve
- Arterial damage and compartment syndrome in isolated fibula fractures
- Non union

Tarsal fractures:

- Is a break of any of the tarsal bones in the foot
- 7 in number- **calcaneus, talus, cuboid, navicular, medial, middle** and **lateral cuneiforms**

Mechanism:

- Track and field athletes
- Associated with long term morbidity
- Stress fracture

Clinical features:

- Aching pain in the dorsal mid foot which radiates along the medial arch. Pain increases with activity eg running/ jumping
- Loss of function of the foot
- Tenderness
- deformity

Treatment:

Non-operative- boot cast for 6 weeks /non weight for a fractured bone /walking boot with crutches in hairline fractures to reduce weight

Operative- done in too unstable fractures(but not recommended)

Navicular

- most common

Symptoms:

- Poorly localized ache in the mid foot which gets worse with exercise
- Pain radiating inside the foot Arche
- Tenderness on press on top of the foot
- On and off pain upon rest

Assignment –(read more on navicular fractures)

Cuboid stress fracture

Occurrence-(rare) occurs on calcaneus compression and the $4^{th}/5^{th}$ metatarsal bones

- Diagnosis is always missed on x ray on initial stages but clear on MRI
- **Treatment-** non weight rest for 4-6 weeks followed by gradual return to full fitness

3 Cuneiform stress fractures

- Exceptionally rare tarsal fractures
- Caused by overuse

Treatment

- Non/light weight bearing rest
- Operation to fix the middle cuneiform if displaced

Calcaneus fracture

- A stress fracture of the calcaneus is a small break in the heal bone
- The calcaneus is essential for walking and provides support and stability to the foot

Signs/symptoms

- Sudden pain in the heel and inability to bear weight on that foot
- Swelling in the heel area
- Bruising of the heel and ankle

Diagnosis:

- X ray then repeat in 2 weeks
- Bone scan
- MRI

Treatment- immobilization with a cast, splint or brace is applied to hold the bones of the foot in proper position while they heal for 6-8 weeks or possibly longer

Complication of tarsal fractures:

- Chronic pain
- Limb arthritis
- Delayed union
- Non union
- deformity

Metatarsal fractures:

- Occur when one of the long bones of the mid foot is cracked or broken due to sudden injury (an acute fracture) or due to repeated stress (stress fracture)

Incidence

- Most common
- They are five in number
- Long slim which run the length of the foot to the base of the toes

5^{th} metatarsal fracture

- Most common to fractures
- Breaks at various points along its length
- Other metatarsals may break depending on mechanism
- $1^{st}/2^{nd}/5^{th}$ are commonly injured in sport/footballers
- Fractures may be acute , caused immediately by injury or may occur over a longer period of time
- Fractures may be open/closed/displaced/not displaced

Causes:

- direct injury to the foot(stepping on /kicking foot/ dropping something on foot or falling on foot
- Twisting of foot on the ankle joint can cause fractures on base of 5^{th} metatarsal
- Twisting of foot from landing from a jump(e.g. ballet dancers)

Causes of stress fractures

- Repeated stress to the bone (overuse)
- Matching /running long distances carrying heavy packs (match fractures)
- Practicing in athletes during training exercises
- Running on routine basis
- Wearing poor foot wear for running that does not suit the foot
- Abnormalities of foot structure e.g. rheumatoid arthritis/ thinning of bones (osteoporosis)
- Loss of nerve sensation in neurological patients(diabetes)

Signs/symptoms

- Pain (pin point)
- Tenderness
- Bleeding from broken bones causing bruising and swelling
- Inability to use foot

Diagnosis

- X rays
- CT scan
- MRI
- Ultrasound
- Bone scan

Treatment

- Pain killers (NSAIDS)
- Ice for 10-30 minutes immediately after injury to reduce blood flow to the area. Not done directly to the skin as it causes an ice burn (use an ice park) and press gently onto the injured part
- Rest/elevate to reduce swelling
- Stop the causative activity by resting
- Immobilize with a below knee cast
- Surgery to realign moved bones/physiotherapy care

Prevention

- Exercise slowly and gradually
- Rest/recovery time needs to be build into any training schedule
- Wear proper fitting footwear
- Be aware of stress fracture symptoms to stop worsening

Complications

- Chronic metatarsal fractures
- Fracture of 1st metatarsal can lead to later arthritis of big toe joint
- Continued pain and healing problems
- Foot deformity
- Non union

Assignment☹ read on fractures of the phallanges

111. Injuries of the head and spine:

- **Vertebral bones injuries-** injuries involve fractures/ dislocations
- Fractures include any break of the vertebrae
- A dislocation is when the vertebral bones do not line up correctly or are out of place
- A fracture /dislocation may cause damage to the spinal cord

Types of fractures /dislocations that cause spinal/head injury:

- **Compression fracture:** occurs due to hyper flexion (front to back)

-It forces part of the spinal column forward and downward

- **Burst fracture:** a serious force of compression fracture where the bone is shattered from the injury

-bone fragments may pierce the spinal cord

-occurs due to downward or upward force along the spine

Cont.

- **Subluxation:** weakening of vertebral joints by an abnormal movement of the bones

- It is a partial dislocation of vertebrae caused by injury of muscles/ligaments in the spine which may also cause a spinal cord injury

- **Dislocation:** caused by torn/badly stretched ligaments from an injury

-it causes too much movements of the vertebrae

-The vertebrae may lock over each other on one or both sides

Cont.

-Traction or surgery reduction is needed for reduction

-use of a brace/halovest /surgery is used to fuse the vertebrae for alignment/line up

- **Fracture dislocation:** occurs when there is a fracture/a dislocation of the vertebrae

-It causes injury to the soft tissues/ligament injury

-It may also cause injury to the spinal cord

Dislocation of the inter -vertebral bones

- Joints in the back part of vertebrae are weakened by an abnormal movement
- Dislocation of vertebrae occurs due to injury to the muscles/ligaments in the spine causing injury to he spinal cord

Causes;

- Car accidents
- Sports collisions/injuries
- falls

Treatment

- **Reduction-** trying gentle maneuvers to help put bones back to position
- **Immobilization-** with a spinal splint /sling after reduction for several weeks
- **Surgery**
- **rehabilitation**

Complications

- Dural tears
- Misdirected instrumentation
- Excessive bleeding necessitating transfusions/fluids replacement

Raptures of vertebral discs

- Occurs when the spinal column tear and the discs protrude outward, press or pinch the nearby spinal nerves
- A ruptured disc is also called herniated or slipped disc
- Ruptured discs causes severe low back pain and sometimes a shooting pain down the back of the legs known as (**sciatica)**

Cause

- Inflammation of the spinal nerves
- Every day activities/work
- Strains/sprains of muscles/tendons/ligaments
- Aging
- Sports
- Car accidents
- falls

Symptoms

- Severe low back pain/leg (usually 1 leg)
- Tingling in part of the leg or foot
- Weakness in the leg

Diagnosis

- On symptoms (sciatica)
- CT scan
- MRI
- Patient history

Treatment of ruptured discs

- Heat and cold- apply cold packs to the painful area to numb the nerves that cause pain
- Heating pads/hot paths later reduce tightness/spasms in the muscles of the lower back for free movement
- Pain relievers- NSAIDS (ibuprofen/advil/motrin/aspirin/ acetaminophen/naproxen
- Stay active- do a normal daily activity- extended bed rest is harmful

cont.

- Gentle stretches/exercises helps one return to normal activity
- Complementary care- spinal manipulation, massage and acupuncture help relieve pain and discomfort while healing

- It should be done by a professional person with license

Surgical treatment

- Considered if pain/sciatica persists for 3 months or more
- Discectomy- removal of a ruptured disk parts to relief compression of the spinal nerve roots

(Assignment- discuss the complications)

Ligamentous tears

- **A ligament-** is a tough band of fibrous tissue that connects bone to bone or bone to cartilage
- they can stretch and tear resulting to sprains
- Ligament tear occur due to extreme force to a joint such as a fall/high impact event

Commonly affected areas-Ankle/knee/wrist/thumb/neck or back ligaments

Symptoms

- Pain/tenderness on touch
- Swelling
- Bruising
- Inability to move the affected joint
- Muscle spasms
- Feeling of a tear sound at time of injury

Function of ligaments

- Support/strengthen joints
- Keeps the skeletal bones in alignment
- Prevents an abnormal movement of joints

Causes of ligament tears

- Falls forcing a joint out of its position
- Sudden twisting
- Blow to the body
- Athletic activities

Diagnosis

- Physical examination and medical history by palpating and moving the joint
- X ray
- MRI

Grading of sprains

- **Grade1-** a mild sprain damaging the ligament but does not cause significant tearing
- **Grade2-** moderate sprain that includes a partial tear of the ligament. This may show an abnormal looseness
- **Grade3-** This is a severe sprain with a complete tear of the ligament resulting to joint instability and loss of function

Treatment

- (RICE- ACRONYM) Rest/Ice/Compress/Elevate
- **R-** rest the joint by stopping further activity that stress the joint
- **I-** ice/cold contact provides short term pain relief/limits swelling
- **C-** compress(wrap) the injured area with an elastic bandage to reduce pain/swelling
- **E-** elevate to control blood flow to the area to reduce swelling (elevate above the level of the heart)

Complications

- Fractures
- Infections
- Vascular/neurologic complications following injury/ surgery
- Compartment syndrome
- Complex regional pain syndrome
- Deep venous thrombosis
- Loss of motion /persistent laxity issues

Injuries to the spinal cord (SCI)

- Involves damage to the spinal cord that causes temporary/permanent changes in its function
- Affects people between 16-30 yrs. of age
- Most commonly caused by an external trauma
- Affects men more than women

Causes

- Tumors
- Blood loss

Cont.

- Stenosis

Types of spinal cord injuries:

- **A complete spinal cord injury-** causes a permanent damage to the area of the spinal cord that is affected
- Paraplegia(lower part of the body) occurs
- **An incomplete spinal cord injury-** is a partial damage to the spinal cord

Levels of spinal cord injuries

- Cervical
- Thoracic
- Lumbar
- sacral

Signs/symptoms

- Muscle weakness
- Reduced sensation to touch or pin/needles
- Leaking of urine/retention
- Abnormal and painful sensation
- Leaking of stool
- Shortness of breath

Diagnosis

- X ray
- CT scan
- MRI

Treatment

- 1st aid immobilization to align the spine
- Traction to realign the vertebrae
- Surgery- in patients with neurological deterioration to prevent future pain/deformity
- Follow-up to monitor for secondary complications such as pneumonia, pressure, ulcers and deep vein thrombosis

Complications

- Autonomic dysreflexia- lesions at T6 or higher which can cause stroke/seizures due to increased blood pressure
- Deep vein thrombosis- slow blood flow inside a vein
- Syringomyelia- formation of fluid filled cavity on the spinal cord causing pressure on surrounding areas

Cont.

- Spasticity- involuntary increase in muscle tone- very stiff muscles with no movement
- Heterotopic ossification- small areas of bone crop up in non-bony areas
- Pressure sores- sitting/lying too long in one position
- Pain- around the joints

Joint and soft tissue injuries

- **Dislocation-**injury to a joint in which the bone ends are forced to move from their normal positions or a displacement of one or more bones at a joint

Treatment

- Rest the dislocated joint /don't repeat the action that caused the injury /try to avoid painful movements
- Apply ice and heat to reduce swelling
- Maintain range of motion
- NSAIDS drugs (ibuprofen)

Causes of dislocation

- Trauma
- Car accidents
- Falls
- Sports (foot ball)
- Regular activities when the muscles and tendons surrounding the joint are weak

Prevention of dislocations

- Being cautious on stairs to help avoid falls
- Wearing protective gear during contact sports
- Staying physically active to keep muscles /tendons around the joint strong
- Maintaining a healthy weight to avoid increased pressure on the bones

Complications

- Tearing of muscles/ligaments/tendons that reinforce the injured joint
- Nerve or blood vessel damage in /around the joint
- Susceptibility to re injury in severe dislocation or repeated dislocation

Strains

- An act of straining or the condition of being strained/ an excessive extension/effort of muscles or ligaments

Causes

- Sporting injuries
- Falls/sudden movement
- Attempt to lift heavy objects
- Repeated coughing strains the ribcage muscles

Treatment

- (Pain relievers, ice, splinting)
- Rest the affected muscle and apply ice and heat
- NSAIDS to reduce pain and swelling
- Compression with an elastic bandage to provide support and decrease swelling
- Elevate to reduce swelling

Complications

- Joint dislocation
- Pain
- Recurring swelling
- Ruptured muscle
- Cartilage injuries

Sprains

- Stretching or tearing of ligaments and fibrous tissue that connects bones to joints

Causes

- Stretched /torn ligaments (fibers connecting bone to bone)
- Injury e.g. twisting of joints

Treatment

- Pain relievers, ice or splinting with an elastic bandage to support and reduce swelling
- Rest the strained muscle
- Apply ice
- NSAIDS (acetaminophen (Tylenol)
- Heat the muscle with a warm bath after pain decreases
- Stretching and light exercises to bring blood to the injured area

Complication of sprain

- Joint dislocation
- Pain
- Recurring swelling
- Ruptured muscle
- Cartilage injuries

Subluxation

- An incomplete or partial dislocation or abnormal spacing of vertebrae or intervertebral units or organ

Causes

- Accidents
- Bad posture
- Sitting for long hours
- Alcohol or drug use
- Improper lifting and emotional stress

Signs/symptoms

- Dizziness or balance problems
- Reduced range of motion or spinal mobility
- Spinal muscle tightness/weakness or spasms
- Pain/numbness or tingling sensation in extremities
- Joint pain/soreness or tenderness

Treatment

- Closed reduction by maneuvers to relocate joint to position
- Surgery when there is a recurrent dislocation
- Use of braces/splints
- Medications (NSAIDS)
- Rehabilitation

Complication

- Damage to blood vessels and nerves
- Ligament /muscle tears
- Loss of movement/flexibility

Ligament/tendon injuries

- These are injuries to the soft tissues that connect muscles/joints

Symptoms

- Pain
- Feeling of pop sound when tissue is torn

Treatment

- Brace/splint
- NSAIDS/or surgery in severe cases

Causes

- Twisting of a joint –traumatic injury
- Overuse activities

Neurovascular injuries

- Is the damage to the major blood vessels supplying the brain, brainstem and upper spinal cord including the vertebral, basilar and carotid arteries
- These vessels are located both extra and intra cranially and injuries can occur in either or both of these locations

Causes

- Minor/severe blunt or penetrating trauma to the head and neck

Clinical features

- Decreased sensation
- Loss of sensation
- Dysesthesia
- Numbness
- Tingling or pins and needles

Diagnosis

- Assessment of distal pulses, capillary refill, skin color and temperature
- CT scan for skull base fractures

Complications

- Ilia inguinal nerve compression
- Meralgia paresthesia
- Obturator nerve compression
- Sciatica and also piriformis syndrome

Contusions

- A contusion is a bruise caused by a direct blow or an impact such as a fall
- Are common in sport injuries
- Happens when blood vessels get torn and leak under the skin or the surrounding area
- Is any collection of blood outside a blood vessel

Cause

- Trauma e.g. cut or blow to an area of the body

Signs/symptoms

- Stiffness/swelling in bone contusions
- Tenderness
- Trouble bending
- Pain

Diagnosis

- MRI in bone contusions

Complications

- Damage to the internal organs
- Fractures
- Dislocations
- Torn muscles
- sprains

Lacerations

- A wound produced by tearing of soft body tissue
- A laceration wound is often contaminated with bacteria and debris from the object caused by a cut

Cause

- Cut by sharp objects

Symptoms

- Bruising
- Bleeding

Cont.

- Swelling
- Skin discoloration
- pain

Treatment

- Application of antibiotic ointment and cover wound with a sterile bandage
- Daily cleaning of wound with soap/water

Complication

- Infection
- bleeding

Muscle tears

- A muscle tear is stretching and tearing of muscle fibres

Cause

- Fatigue
- Overuse

Commonly affected muscles

- Lower back muscles
- Neck muscles
- Shoulder muscles
- hamstring

Signs of muscle tear

- Pain
- Swelling
- Muscle spasms
- Limited range of motion
- Redness
- bruising

Diagnosis

- Physical examination and ask patient patients history
- X rays

Treatment

- Pain relievers
- Ice
- splinting

Complication

- Compartment syndrome
- Swelling
- Rupture of muscle in long immobilization

END

THANK YOU