Fractures

• Disruption or break in continuity of structure of bone
• Majority of fractures from traumatic injuries
• Some fractures secondary to disease process (pathologic fractures)
  – Cancer, osteoporosis

❖ Recall your knowledge: Name a disease from endocrine unit?
Case Study

- L.G., a 23-year-old man, is brought to ED following injury to his right arm during a rugby game.
- A bone in his forearm is protruding through his skin.
- The ERS immobilized the arm at the scene.
- L.G. rates his pain as a 9 on a scale of 0-10.

How would you classify this fracture? Explain.

Classification According to External Environment

Complete or Incomplete
- Complete: break is completely through bone
- Incomplete: bone is still in one piece

Classification According to Location

Based on direction of fracture line
- Linear
- Oblique
- Transverse
- Longitudinal
- Spiral

Displaced or nondisplaced
Displaced: two ends separated from one another (comminuted or oblique)
Nondisplaced: periosteum is intact and bone is aligned (transverse, spiral, or greenstick)
Case Study

For what other clinical manifestations associated with a fracture will you assess L.G.?

How long it will take for his bone to heal? Explain.

Clinical Manifestations:
• Localized pain
• Decreased function
• Inability to bear weight or use
• Swelling and bleeding from soft tissue damage
• Guard against movement
• May or may not have deformity
  Immobilize if suspect fracture!!!!

Fracture Healing

Multistage healing process (union)
1. Fracture hematoma – first 72 hours
2. Granulation tissue – 3 to 14 days
3. Callus formation – end of 2nd week
4. Ossification – 3 weeks to 6 months
5. Consolidation – up to 1 year
6. Remodeling

FRACTURE HEALING

• Factors influencing healing
  – Displacement and site of fracture
  – Blood supply to area
  – Immobilization
  – Internal fixation devices
  – Infection or poor nutrition
  – Age
  – Smoking
Complications of Fracture Healing

- Delayed union
- Nonunion
- Malunion
- Angulation
- Pseudoarthrosis
- Refracture
- Myositis ossificans

Neurovascular Assessment

- Peripheral vascular
  - Color and temperature
  - Capillary refill
  - Pulses
  - Edema

Neurovascular Assessment

- Peripheral neurologic
  - Motor function
    - Upper and lower extremities
  - Sensory function – more than “can you feel this”
  - Paresthesia
Nursing Diagnoses

- Impaired physical mobility
- Risk for peripheral neurovascular dysfunction
- Acute pain
- Readiness for enhanced health management

Nursing Planning

Overall Nursing Goals:
- Healing with no associated complications (i.e. infection, osteoporosis, fat embolism)
- Satisfactory pain relief
- Maximal rehabilitation

Interprofessional Care

- Overall Interprofessional Goals of Fracture Treatment:
  1. Anatomic realignment (reduction – closed vs. open)
  2. Immobilization
  3. Restoration of normal or near-normal function
Case Study

- An x-ray confirms a:
  - Complete transverse break of the right radius
  - Oblique fracture of the right ulnar bone.

- L.G. is scheduled for an immediate debridement and open reduction/repair of these fractures.

What is the planned treatment to L.G.? Explain.

Fracture Reduction – CLOSED

- Nonsurgical, manual realignment of bone fragments
- Traction and countertraction applied
- Under local or general anesthesia
- Immobilization afterwards

Traction

**Purpose**

- Prevent or ↓ pain and muscle spasm
- Immobilize joint or part of body
- Reduce fracture or dislocation
- Treat a pathologic joint condition

**How does it work?**

- Pulling force to attain realignment – countertraction pulls in opposite direction
- Two most common types of traction
  - Skin traction
  - Skeletal traction
Skin Traction

- Short-term (48-72 hours)
- Tape, boots, or splints applied directly to skin
- Traction weights 5 to 10 pounds
- Skin assessment and prevention of breakdown imperative

Skeletal Traction

- Long-term pull to maintain alignment
- Pin or wire inserted into bone
- Weights 5 to 45 lbs (sandbags)
- Risk for infection
- Complications of immobility

Skeletal Traction

- Maintain countertraction, typically the patient’s own body weight
  – Elevate end of bed
- Maintain continuous traction
- Keep weights off the floor
Traction

• Inspect exposed skin
• Monitor pin sites for infection
• Pin site care per policy
• Proper positioning
• Exercise as permitted
• Psychosocial needs

Fracture Reduction - OPEN

• Surgical incision
• Internal fixation
  – Risk for infection
  – Early ROM of joint to prevent adhesions
  – Facilitates early ambulation

Case Study

• What type of immobilization would you expect L.G. to return from surgery with?

• Most likely a bivalved [split] cast wrapped in an Ace bandage.
• This type of cast allows visualization of the surgical incision and expansion for any potential postoperative swelling.
Fracture Immobilization

• Cast
  – Temporary
  – Allows patient to perform many normal activities of daily living
  – Made of various materials
  – Typically incorporates joints above and below fracture

Upper Extremity Immobilization

• Types of casts
  – Sugar-tong splint
  – Posterior splint
  – Short arm cast
  – Long arm cast
• Sling to elevate and support arm
  – Contraindicated with proximal humerus fracture

• Sling
  – To support and elevate arm
  – Ensures axillary area is well padded
  – No undue pressure on posterior neck
  – Encourage movement of fingers and nonimmobilized joints

Vertebral Immobilization

• Body jacket brace
  – Immobilization and support for stable spine injuries
  – Monitor for superior mesenteric artery syndrome (cast syndrome)
    • Assess bowel sounds
    • Treat with gastric decompression
Lower Extremity Immobilization

- Long leg cast
- Short leg cast
- Cylinder cast
- Robert Jones dressing

- Elevate extremity above heart
- Do not place in a dependent position
- Observe for signs of compartment syndrome and increased pressure

External Fixation

- Metal pins and rods
- Applies traction
- Compresses fracture fragments
- Immobilizes and holds fracture fragments in place
• Assess for pin loosening and infection
• Patient teaching
• Pin site care – per hospital protocol

EXTERNAL FIXATION

Stabilization of Knee Injury

Case Study

What classifications of medication would you expect the health care provider to order for L.G. postoperatively? Explain.

What vaccination should he have received in the ED if he were not up-to-date?
Drug Therapy

- Central and peripheral muscle relaxants
  - Carisoprodol (Soma)
  - Cyclobenzaprine (Flexeril)
  - Methocarbamol (Robaxin)
- Tetanus and diphtheria toxoid
- Bone-penetrating antibiotics

Case Study

What will you teach L.G. about his nutritional needs related to bone healing?
❖ Explain rationale for each.

L.G. returns to the orthopedic unit following an open reduction and fixation of his arm fractures.
- His right arm has a splint cast on it that is secured with an Ace wrap.
- It is elevated above the level of his heart.
- The surgeon has written an order for hourly neurovascular checks.
❖ What will you assess when performing these checks? Explain.
Case Study

What nursing diagnoses would be appropriate for L.G.?

- Acute Pain
- Risk for Alteration in Peripheral Tissue Perfusion
- Impaired Physical Mobility
- Risk for Peripheral Neurovascular Dysfunction

Nursing Implementation

- Health Promotion
  - Teach safety precautions
  - Advocate to decrease injuries
  - Encourage moderate exercise
  - Safe environment to reduce falls
  - Calcium and vitamin D intake

Nursing Implementation

- Acute Care
  - Patients with fractures can be treated in the emergency department or a physician’s office
  - Patients are released home, or they may require hospitalization
Preoperative Care

- Patient Teaching
  - Immobilization
  - Assistive devices
  - Expected activity limitations
  - Assure that needs will be met
  - Pain medication

Postoperative Care

- Monitor vitals
- General principles of post-operative nursing care
- Frequent neurovascular assessments
- Minimize pain and discomfort
- Monitor for bleeding or drainage
  - Aseptic technique
  - Blood salvage and reinfusion

Other Measures

- Prevent complications of immobility
  - Constipation
  - Renal calculi
  - Cardiopulmonary deconditioning
  - DVT/pulmonary emboli
Case Study

- L.G. recuperates well and is scheduled for discharge the following day.
- What will you teach L.G. regarding care of his cast?

Ambulatory Care
Cast Care

- Do
  - Frequent neurovascular assessments
  - Apply ice for first 24 hours
  - Elevate above heart for first 48 hours
  - Exercise joints above and below
  - Use hair dryer on cool setting for itching
  - Check with health care provider before getting wet

- Do
  - Dry thoroughly after getting wet
  - Report increasing pain despite elevation, ice, and analgesia
  - Report swelling associated with pain and discoloration OR movement
  - Report burning or tingling under cast
  - Report sores or foul odor under cast
Ambulatory Care
Cast Care

- Do not
  - Elevate if compartment syndrome
  - Get plaster cast wet
  - Remove padding
  - Insert objects inside cast
  - Bear weight for 48 hours
  - Cover cast with plastic for prolonged period

Ambulatory Care
Cast Care

- Validate understanding of cast care instructions
- Follow-up phone call
- Teach cast removal and possible alterations in appearance of extremity

Ambulatory Care

- Psychosocial problems
  - Dependence in performing ADLs
  - Family separation
  - Finances
  - Inability to work
  - Potential disability
Ambulatory Care

- Ambulation
  - Reinforce physical therapist's instructions
  - Mobility training
  - Instruction in use of assistive aids
  - Pain management

Ambulation

- Degrees of weight-bearing
  - Non-weight-bearing (NWB)
  - Touch-down/toe-touch weight-bearing (TDWB)
  - Partial-weight-bearing
  - Weight bearing as tolerated (WBAT)
  - Full-weight-bearing ambulation (Ad lib)

Assistive Devices

- Devices for ambulation range from a cane to a walker or crutches
- Technique for use varies
- Use transfer belt for stability when teaching how to use
- Discourage from reaching for support
- Upper arm strength required
Evaluation

• Report satisfactory pain management
• Appropriate care of cast or immobilizer
• No peripheral neurovascular dysfunction
• Uncomplicated bone healing

Complications of Fractures

• Majority heal without complication
• Death is usually the result of
  • Damage to underlying organs and vascular structures
  • Complications of fracture or immobility
• May be direct (i.e. infection) or indirect (i.e. compartment syndrome, VTE, FES)

• Infection
• Compartment Syndrome
• Fasciotomy for Compartment Syndrome
• Venous Thromboembolism
• Fat Embolism (FES)
• Rhabdomyolysis
• Hypovolemic Shock

INFECTION

Treatment:
• Aggressive surgical debridement
• Wound may or may not be closed
• Closed suction drainage
• Skin grafting
• Antibiotics – irrigation, impregnated-beads, and IV

• High incidence in open fractures and soft tissue injuries
• Devitalized and contaminated tissue an ideal medium for pathogens
• Prevention key
• Can lead to chronic osteomyelitis
COMPARTMENT SYNDROME

- Two basic types of compartment syndrome
  - ↓ Compartment size
  - ↑ Compartment contents
- Arterial flow compromised
  → ischemia → cell death → loss of function

Compartment Syndrome—Clinical Manifestations

- Six Ps
  - Pain
  - Pressure
  - Paresthesia
  - Pallor
  - Paralysis
  - Pulselessness

Compartment Syndrome—Interprofessional Care

- Prompt, accurate diagnosis via regular neurovascular assessments, performed by RN
  - Notify of pain unrelieved by drugs and out of proportion to injury
  - Paresthesia is also an early sign
- Assess urine output and kidney function – Rhabdomyolysis
Compartment Syndrome
Interprofessional Care
• NO elevation above heart
• NO ice
• Surgical decompression (fasciotomy)

VENOUS THROMBOEMBOLISM
• High susceptibility aggravated by inactivity of muscles
• Prophylactic anticoagulant drugs
• Antiembolism stockings
• Sequential compression devices
• ROM exercises

Fat Embolism (FES)
**Mechanical theory:**
Fat released from marrow and enters circulation where it can obstruct
**Biochemical theory:**
Hormonal changes caused by trauma stimulate release of fatty acids to form fat emboli
• Presence of systemic fat globules from fracture that are distributed into tissues and organs after a traumatic skeletal injury
• Most common with fracture of long bones, ribs, tibia, and pelvis
• Contributory factor in many deaths associated with fracture
Fat Embolism (FES) Clinical Manifestations

- Early recognition is crucial – rapid & acute; comatose
- Symptoms 24 to 48 hours after injury – "impending disaster"
- Fat emboli in the lungs cause a hemorrhagic interstitial pneumonitis.
- Respiratory (pallor to cyanosis) and neurologic symptoms
- Petechiae – neck, chest wall, axilla, buccal membrane, conjunctiva

Fat Embolism (FES) Clinical Manifestations

- Fat cells in blood, urine, or sputum
- ↓ PaO2 < 60 mm Hg
- ST segment and T-wave changes
- ↓ Platelet count, hematocrit levels
- Elevated ESR
- Chest x-ray → bilateral pulmonary infiltrates

Fat Embolism (FES) Interprofessional Care

- Treatment is directed at prevention
- Careful immobilization and handling of a long bone fracture probably the most important factor in prevention
- Management is supportive and related to symptom management
Fat Embolism (FES)
Interprofessional Care

- Coughing and deep breathing
- Administer $O_2$
- Intubation/intermittent positive pressure ventilation
- May develop pulmonary edema, ARDS, or both, leading to increased mortality rate

Audience Response Question

A plaster splint is applied with an elastic bandage to the leg of a patient with a fractured tibia in preparation for open reduction and internal fixation. The patient complains of increasing pain in the affected leg and foot that is not relieved by loosening of the elastic bandage. The most appropriate action by the nurse is to
a. elevate the leg on two pillows.
b. apply ice over the fracture site.
c. notify the health care provider.
d. perform neurovascular assessment of the foot.

Audience Response Question

A patient has a severely sprained ankle from a sports injury. What should the nurse teach the patient prior to discharge from the urgent care center?
a. Alternate cold and heat for 30 minutes each until symptoms are relieved.
b. Apply cold for 20 to 30 minutes with breaks of 10 to 15 minutes during the first 2 days.
c. Use continuous cold for the first 24 hours and then continuous heat until the symptoms are relieved.
d. Apply continuous heat to the ankle for the first 24 hours and then continuous cold until the symptoms are relieved.