Fractures

Chapter 62

Copyright © 2017, Elsevier Inc. All Rights Reserved.

Fractures

- Disruption or break in continuity of structure of bone
- Majority of fractures from traumatic injuries
- Some fractures secondary to disease process
  - Cancer or osteoporosis

Copyright © 2017, Elsevier Inc. All Rights Reserved.

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.
Case Study

- The ERS immobilized the arm at the scene.
- L.G. rates his pain as a 9 on a scale of 0-10.

Case Study

- How would you classify this fracture? Explain.

Classification According to External Environment

- Open fracture
- Closed fracture
Classification

• Complete or incomplete
  – Complete: break is completely through bone
  – Incomplete: bone is still in one piece

Classification

• Based on direction of fracture line
  – Linear
  – Oblique
  – Transverse
  – Longitudinal
  – Spiral

Classification According to Location
Classification

• Displaced or nondisplaced
  – Displaced: two ends separated from one another
    • Often comminuted or oblique
  – Nondisplaced: periosteum is intact and bone is aligned.
    • Usually transverse, spiral, or greenstick

Case Study

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

Clinical Manifestations

• Localized pain
• Decreased function
• Inability to bear weight or use
• Guard against movement
• May or may not have deformity
  Immobilize if suspect fracture!!!!
Case Study

• L.G. asks you how long it will take for his bone to heal.
• You quickly review fracture healing so that you can answer his question better.
• Describe the six stages of bone healing.

Fracture Healing

• Multistage healing process (union)
  1. Fracture hematoma
  2. Granulation tissue
  3. Callus formation
  4. Ossification
  5. Consolidation
  6. Remodeling

Bone Healing Stages
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

Interprofessional Care

- Overall goals of fracture treatment
  - Anatomic realignment (reduction)
  - Immobilization
  - Restoration of normal or near-normal function
Fracture Reduction

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

Case Study

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

Case Study

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

  - How will you explain the planned treatment to L.G.?
Fracture Reduction

- Open reduction
  - Surgical incision
  - Internal fixation
  - Risk for infection
  - Early ROM of joint to prevent adhesions
  - Facilitates early ambulation

Traction

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

Traction

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

Buck’s Traction

Traction

- Skeletal traction
  - Long-term pull to maintain alignment
  - Pin or wire inserted into bone
  - Weights 5 to 45 lbs
  - Risk for infection
  - Complications of immobility
Balanced Suspension Traction

Skeletal Traction

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

Case Study

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

Fracture Immobilization

• Cast
  – Cover affected part with stockinette and padding
  – Immerse plaster of paris material in warm water, wrap and mold it
    • Sets in 15 minutes
    • 24-72 hours before weight bearing
    • Do not cover – risk for burn
    • No direct pressure; petal edges

Fracture Immobilization

• Cast
  – Synthetic casting materials
    • Lightweight, stronger, waterproof
    • Early weight bearing
    • Activated by submersion in cool or tepid water, then molded
**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

**Upper Extremity Immobilization**

- Sling
  - To support and elevate arm
  - Contraindicated with proximal humerus fracture
  - 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

Knee Immobilizer
Lower Extremity Immobilization

- Hip spica cast
  - Single spica
  - Double spica
- Assess patient for same problems as body jacket brace

Common Types of Casts

- Short arm cast
- Long arm cast
- Long leg cast
- Short leg cast

External Fixation

- Metal pins and rods
- Applies traction
- Compresses fracture fragments
- Immobilizes and holds fracture fragments in place
External Fixation

• Assess for pin loosening and infection
• Patient teaching
• Pin site care

Internal Fixation
Stabilization of Knee Injury

Electric Bone Growth Stimulation

- Used to facilitate healing process
  - Increase calcium uptake
  - Activate intracellular calcium stores
  - Increase bone growth factor production
- Non-invasive, semi-invasive, and invasive methods

Case Study

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

Nutritional Therapy

- ↑ Protein (1 g/kg of body weight)
- ↑ Vitamins (B, C, D)
- ↑ Calcium, phosphorus, and magnesium
- ↑ Fluid (2000-3000 mL/day)
- ↑ Fiber
- Body jacket and hip spica cast patients: six small meals a day
Nursing Assessment

• Subjective Data
  – Past medical history
    • Trauma
    • Bone or systemic diseases
    • Immobility
    • Osteopenia
    • Osteoporosis
  – Medications
  – Surgery or other treatments

• Objective Data
  – Apprehension
  – Guarding
  – Skin lacerations, color changes
  – Hematoma, edema
  – ↓ or absent pulse, ↓ skin temperature
  – Delayed capillary refill
Nursing Assessment

• Objective Data
  – Paresthesias
  – Absent, ↓ or ↑ sensation
  – Restricted or lost function
  – Deformities, abnormal angulation
  – Shortening, rotation, or crepititation
  – Muscle weakness
  – Imaging findings

Case Study

• L.G. returns to the orthopedic unit following an open reduction and fixation of his arm fractures.

• His right arm has a split cast on it that is secured with an Ace wrap.

Case Study

• It is elevated above the level of his heart.
• The surgeon has written an order for hourly neurovascular checks.
Case Study

• What will you assess when performing these checks?

Neurovascular Assessment

• Peripheral vascular
  – Color and temperature
  – Capillary refill
  – Pulses
  – Edema

Neurovascular Assessment

• Peripheral neurologic
  – Motor function
    • Upper and lower extremities
  – Sensory function
  – Paresthesia
Case Study

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

Copyright © 2017, Elsevier Inc. All Rights Reserved.

Nursing Diagnoses

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

Copyright © 2017, Elsevier Inc. All Rights Reserved.

Nursing Planning

• Overall Goals
  – Healing with no associated complications
  – Satisfactory pain relief
  – Maximal rehabilitation

Copyright © 2017, Elsevier Inc. All Rights Reserved.
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 nursing care
• Frequent neurovascular assessments
• Minimize pain and discomfort
  – Aseptic technique
  – Blood salvage and reinfusion

Other Measures

• Prevent complications of immobility
  – Constipation
  – Renal calculi
  – Cardiopulmonary deconditioning
  – DVT/pulmonary emboli

Traction

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

• L.G. recovers 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
  - Touch-down/toe-touch weight-bearing
  - Partial-weight-bearing
  - Weight bearing as tolerated
  - Full-weight-bearing ambulation

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 or indirect

Infection

- 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
Infection

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

Compartment Syndrome

- Swelling and increased pressure within a confined space
- Compromises neurovascular function of tissues within that space
- Usually involves the leg but can occur in any muscle group

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
• Early recognition and treatment essential
• May occur initially or may be delayed several days
• Ischemia can occur within 4 to 8 hours after onset

Compartment Syndrome
Clinical Manifestations
• Six Ps
  – Pain
  – Pressure
  – Paresthesia
  – Pallor
  – Paralysis
  – Pulselessness

Compartment Syndrome
Interprofessional Care
• Prompt, accurate diagnosis via regular neurovascular assessments
  – Notify of pain unrelieved by drugs and out of proportion to injury
  – Paresthesia is also an early sign
• Assess urine output and kidney function
Compartment Syndrome Interprofessional Care

- NO elevation above heart
- NO ice
- Surgical decompression (fasciotomy)

Fasciotomy for Compartment Syndrome

![Image of fasciotomy]

Venous Thromboembolism

- High susceptibility aggravated by inactivity of muscles
- Prophylactic anticoagulant drugs
- Antiembolism stockings
- Sequential compression devices
- ROM exercises
Fat Embolism (FES)

- Presence of systemic fat globules from fracture that are distributed into tissues and organs after a traumatic skeletal injury
- Contributory factor in many deaths associated with fracture
- Most common with fracture of long bones, ribs, tibia, and pelvis

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

Fat Embolism (FES)

Clinical Manifestations

- Early recognition of FES is crucial
- Symptoms 24 to 48 hours after injury
- Fat emboli in the lungs cause a hemorrhagic interstitial pneumonitis.
- Respiratory and neurologic symptoms
- Petechiae – neck, chest wall, axilla, buccal membrane, conjunctiva
Fat Embolism (FES) Clinical Manifestations

- Clinical course of fat embolus may be rapid and acute
- Patient frequently expresses a feeling of impending disaster
- In a short time skin color changes from pallor to cyanosis
- Patient may become comatose

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 O₂
• Intubation/ intermittent positive pressure ventilation

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.