

## Module 29

### ORTHOPEDIC DISORDERS

#### OBJECTIVES

Upon completion of this unit, you should be able to

- Describe some of the techniques of assessment for patients with common musculoskeletal disorders.
- Describe some of the causes, signs and symptoms, diagnostic tests, treatments, and nursing management for the following conditions: osteoporosis, cancer of the bone, osteomyelitis, osteoarthritis, rheumatoid arthritis, and selected traumatic injuries.
- Describe the arthroplastic procedures – total knee and total hip replacement – and the nursing management of patients with total knee and total hip replacement.
- Give examples of different forms of traction and some of the nursing measures associated with each.
- Describe nursing measures associated with fractures, including patients with casts, patients who have had internal fixation of fractures, and those with external fixation devices.

#### COMMENTS

**Collecting subjective data.** Assessment of the patient with suspected orthopedic problems requires careful and astute assessment skills. Of primary importance is taking a complete history. Among data collected should be information regarding the onset of symptoms and circumstances surrounding the onset. Was it sudden or gradual? Was there any history of injury? What happened when the injury occurred (for example, was it a fall? a twist?). Include evaluation of the presence of pain, its characteristics, location, and relation to activity. For example, is the pain deep and constant or is it boring and unrelieved by rest as opposed to aching with increased activity but relieved at rest? The former suggests bone erosion or a tumor while the latter suggests arthritis. On the other hand, severe throbbing pain that increases with activity suggests a fracture or perhaps an infection. Disease affecting the shoulder, hip or spine may produce referred pain. For example, a patient with lumbar spine pathology may experience pain radiating down one or both legs because of nerve root compression. Is there a history of limited mobility? If so, does this stem from joint stiffness, pain, or joint instability? Are there paresthesias present which may indicate a neurologic problem, possible pressure on nerves or a circulatory impairment? How has the problem affected the patient's activities of daily living? Does he or she use assistive devices such as a cane or walker?

**Collecting objective data.** Check body alignment, presence of deformities, abnormal posture, gait, skin color (check for cyanosis, redness, ecchymosis or scars). Check for odd positioning. Note that the body part may be aligned for comfort. Check for soft tissue swelling, muscle atrophy or contractures and the presence of nodules. Check the range of motion of the joints.

**Gentle palpation:** Gentle palpation should accompany inspection. Check the skin temperature, thickness, abnormal prominences and swelling. If an extremity is involved, check the uninvolved one first to assess what is normal for that person, then check the affected extremity. Palpate normal tissue first, moving towards the affected area, palpating the tender area last. Feel for tenderness, masses, and crepitation (an audible grating sound and sensation). Check peripheral pulses, and check joint deformity, enlargement, abnormal movement, ankylosis (joint fixation), warmth, swelling, and tenderness. Always compare one extremity with the other. Check muscle strength and tone.

Some conditions that may affect musculoskeletal function are described below.

**Osteoporosis.** Osteoporosis is characterized by reduction in bone mass where reabsorption is faster than production. It is eight times more common in women than in men. The incidence is increasing to epidemic proportions. Signs and symptoms occur after age 60 but the disease process begins much earlier. Some contributing factors of increased incidence are: white female, smoker, increasing age, inactivity, caffeine consumption, inadequate calcium intake, postophorectomy, use of corticosteroids and antacids containing aluminum.

**Signs and symptoms:** The signs and symptoms of osteoporosis include pain, unsteady gait, reduced height and humped back from vertebral fractures, and fractures of forearm, thighs and hips with no more than everyday stress. Calcium, phosphorus, and alkaline phosphatase levels remain normal.

**Prevention:** Factors recognized as important in the prevention of osteoporosis include adequate calcium intake, exercise, and estrogen therapy to maintain bone mass. Studies indicate a daily intake of 1000 mg calcium per day is desirable in pre-menopausal women. It is recommended for post-menopausal women who are not receiving supplemental estrogen to intake 1500 mg of calcium per day. Calcium can be consumed in foods such as dark green leafy vegetables or in dairy products. Over the counter or other calcium supplements should only be taken under the supervision of a physician or nurse practitioner because of the danger of hypercalcemia. A weight-bearing type of exercise program which includes such activities as walking or swimming is also an important preventive measure. A program of adequate calcium intake and exercise is most helpful in preventing continued loss of bone mass even when begun in the post-menopausal period. It is believed that alcohol and caffeine consumption as well as smoking contribute to osteoporosis. Finally, estrogen therapy for post-menopausal women is believed to be an effective treatment in the prevention of osteoporosis, but should be started no later than three to five years following menopause.

**Treatment:** The treatment of osteoporosis is the same as prevention. The disease process cannot be reversed; further deterioration can be prevented.

**Nursing management:** Protect the patient from falls or other injuries, encourage activity and ambulation based on the individual patient's capabilities and treatment regimen.

Monitor nutritional intake and teach the patient the importance of a diet rich in calcium, protein, and vitamin D. Also teach good body mechanics and activities to avoid such as twisting and lifting. Teaching of all preventive measures should include young women as well, since the earlier the efforts towards prevention of osteoporosis are instituted, the better the outcome is likely to be.

### **Cancer of the bone**

Metastatic lesions of the bone are much more common than primary lesions. Metastatic bone cancer usually occurs after middle age and arises from primary lesions in the breast, ovary, prostate, kidney, thyroid, lungs or gastrointestinal tract. Lesions usually cause pathological fractures in the ribs, spine, or pelvis. Bone scans will usually detect the presence of a metastatic lesion and are often done after a primary lesion has been diagnosed in another part of the body.

Treatment and nursing management are usually based on the patient's symptoms and primarily focuses on keeping the person as comfortable as possible and in preventing injury that may result in further fractures.

### **Multiple myeloma**

A primary malignant tumor of bone marrow, multiple myeloma is neoplastic growth of abnormal plasma cells. Incidence is greater in males over 50.

**Diagnosis:** Often, but not always, Bence Jones Protein is found in the urine. Bone marrow biopsy reveals plasma cells have largely replaced marrow.

**Signs and symptoms:** Common signs and symptoms include: pain, bone weakness, and pathologic fractures, especially in spine, ribs, pelvis, skull, clavicles, femur, and humerus. Bleeding tendencies and increased viscosity of blood with abnormal levels of protein cause peripheral circulatory problems leading to renal failure and cardiac and visual impairments. Azotemia and elevated calcium levels may be present.

**Treatment:** Chemotherapy, steroids, pain relief, and protection from injury are central to therapy.

### **Osteomyelitis**

Osteomyelitis is an infection of bone tissue. The organism can be directly implanted in an open injury, can occur through extension of a soft tissue infection, or can be carried to bone by the blood from another part of the body such as the tonsils. The most common organism is staphylococcus aureus, although pseudomonas, E. coli, and proteus are occasionally found. Osteomyelitis may occur as an acute episode or it may evolve into a chronic condition.

**Signs and symptoms:** Signs and symptoms include fever, drainage from wound site, local heat, tenderness and swelling. Labs show elevated white blood count and sedimentation rate. Bone scans and bone biopsy are effective diagnostic tools.

**Treatment:** Aggressive antibiotic therapy is instituted, following culture. It may be necessary to extensively debride tissue. Amputation is rare and only necessary if the condition is unresponsive to treatment and bone destruction continues to extend. Sometimes a catheter is placed in the tissues and direct irrigation with antibiotic solutions may be done. Antibiotics, such as Gentamicin beads, may be placed surgically deep in the tissues for slow absorption. IV therapy with multiple antibiotics may occur with acute osteomyelitis for four to six weeks and up to three months for a chronic condition. Patients are often sent home on home IV therapy with Hickman catheters in place.

**Nursing management:** Dressing changes using sterile technique may be indicated. Wet to wet, wet to dry, or dry sterile dressings may be ordered. When exposed bone is visible, masks and sometimes gowns may be used to prevent introduction of outside organisms. Immobilization of the body part is often necessary and some patients may be on prolonged bedrest. The nurse needs to be aware of all the complications of immobility, including the development of contractures such as foot drop, pressure areas, thrombophlebitis, pneumonia, and constipation. In addition, boredom, a sense of isolation, and depression are common problems that may need to be addressed. Patients sent home on long-term IV therapy must be taught Hickman catheter care.

## **Osteoarthritis**

Osteoarthritis is defined as degenerative joint disease which develops slowly and progressively and involves non-inflammatory disease of the cartilage in primarily weight-bearing joints. Incidence in men and women over forty years of age is extremely high. Roughly, over 90 percent of the population demonstrate visible changes on x-ray and one-third are symptomatic.

**Signs and symptoms:** Signs and symptoms include asymmetrical pain, stiffness, and limited motion in affected joints, also accompanying fatigue and muscle tension. Crepitation may be present when the joint is moved. Most commonly involved joints include the fingers where nodular bony overgrowth may be observed. Other frequently involved joints are at hips, knees, the lower lumbar and cervical vertebrae. Degenerative joint disease (DJD) of the hip and vertebrae can be especially debilitating and the patient may seek surgical relief if more conservative measures fail.

**Treatment:** ASA, non-steroidal anti-inflammatory medication and direct injection of corticosteroids into the joint capsule are typical drug therapies. Application of heat and rest may also be effective. Weight reduction to reduce stress is recommended if the individual is obese. With severe degenerative joint disease, arthroplastic surgery may be indicated.

**Rheumatoid arthritis**

Rheumatoid arthritis is a chronic systemic disease involving synovial linings of symmetrical joints and may involve other areas of the body causing rheumatoid nodules, pericarditis, neuropathies, lymphadenopathy, and osteoporosis.

**Incidence:** Women are three times more likely to have the disease than men. Although it can occur at any age, typically the onset is between the age of 25 and 40. The disease often involves joints of the fingers, hips, wrists, hands, feet, elbows, shoulders and knees. When deformity exists, subluxation may occur.

**Signs and symptoms:** Signs and symptoms include pain, stiffness, limited mobility, inflammation with attendant symptoms of tenderness, heat and swelling. Morning stiffness is common, as is weight loss and anorexia. Anemia may also be present.

**Diagnosis:** Typical diagnostic findings include increased sedimentation rate and rheumatoid factor, sometimes with LE and ANA, synovial fluid specimens contain increased white blood counts. Physical findings include joint x-rays, narrowing of the joint, subluxation, and deformity.

**Treatment:** Drug therapies include anti-inflammatory, steroids, and gold salts. Other treatments include rest and protection of joints (including splints), activity to tolerance, heat and cold application, psychological support, and reconstructive surgery. The objective is to give pain relief, preserve joint function for as long as possible, and decrease inflammation.

**Self-Test 1**

Match the condition of Column A with the appropriate description in Column B.

<u>Column A</u>	<u>Column B</u>
1. osteoporosis	a. Bence-Jones Protein in urine
2. cancer of the bone	b. involves Synovial linings of symmetrical joints
3. multiple myeloma	c. morning stiffness and weight loss
4. osteomyelitis	d. prevent with exercise, calcium intake
5. osteoarthritis	e. infected bone tissue
6. rheumatoid arthritis	f. pathological fractures occur
	g. incidence epidemic in elderly women
	h. non-inflammatory disease of the cartilage
	i. commonly involves distal interphalangeal joints
	j. cannot reverse condition, but can prevent exacerbation

## **Surgical reconstruction arthroplasty**

In arthroplasty, diseased articulating surfaces of a joint are replaced with a prosthetic device often composed of both metal and plastic parts. These procedures may be done for patients with osteo or rheumatoid arthritis or any patient with a painful, poorly functioning joint. Although arthroplasties of fingers, toes, ankles, wrists, elbows, and shoulders are performed, the most common procedures are knee and hip replacements.

**Total knee replacement** involves placement of either a hinged or condylar device. The hinged type is entirely metal and has both a spiked femoral shaft and a spike tibial shaft portion that are fitted into these two bones, cemented into place with methyl methacrylate and joined together with a hinge. The condylar type, on the other hand, has a metal femoral attachment and a plastic tibial attachment. These surfaces are concave and convex so that they may fit together smoothly. The **total hip replacement** prosthesis usually has a ball shaped metal head that fits into the femoral shaft. The acetabular surface is replaced with a cup shaped plastic or metal segment. The metal portion of these devices is usually made of stainless steel or vitalium, and bone cement. Methyl methacrylate may be used to secure the prosthetic parts to the bone surfaces. Most recently developed are prosthetic devices which allow new bone to actually attach or “graft” to the prosthesis. It is believed that these new devices will not loosen as cemented devices often do over time, and therefore will never need replacement. Special precautions are taken in the operating room to prevent wound contamination. Double gloving, special air filtration, and barrier drapes are commonly used for the procedures.

**Nursing management:** Preoperatively, patients are asked to shower or bathe using antimicrobial soap. The operative area is clipped and then scrubbed with antimicrobial soap several times the day before and the morning of surgery. Besides the usual preop preparations and teaching, patients should be taught how to use a trapeze fitted to the bed frame, any restrictions in movement that will be necessary postoperatively, and exercises that will be performed for muscle strengthening. Patients are typed and cross matched for blood, and fitted for nylon antiembolism stockings. Electrically operated pneumatic compression hose may also be ordered. An IV is often placed the night before surgery and antibiotics may be given prophylactically before and after surgery. The patient undergoing total hip replacement goes to the operating room in a hospital bed and later is transferred directly from the operating table to the bed in order to limit unnecessary movement of the hip.

In total hip replacement, balanced traction on the affected leg, an abduction pillow, brace, or regular pillows between the legs may be used to maintain proper alignment. Hip flexion and rotation are not allowed. The affected leg should remain abducted and in a neutral position. Elevation of the head of the bed is no more than 45 degrees. Bedrest is maintained for 2-5 days and turning may be restricted. Orders should be specific and detailed about movement restrictions.

Nurses will perform vital signs, neurovascular checks, inspect and decompress Jackson-Pratt and hemovac drains, check the dressing and IV sites, and monitor the patient's

progress several times a shift. These patients will probably receive IV antibiotics for at least 48 hours or until drains are removed. A Foley catheter will likely be in place for several days and the patient will use a flat fracture bedpan when necessary. Because of the patient's immobility, the nurse must pay special attention to complications that may develop, including stasis pneumonia, skin breakdown, phlebitis, constipation and urinary retention. Patients may receive prophylactic anticoagulants and can anticipate post-operative Doppler studies and, perhaps, scans to rule out the possibility of blood clots. The patient is taught to sit and ambulate with minimal flexion of the affected hip. An elevated toilet seat and a special high chair with arms for sitting may be used to reduce hip flexion. The patient is taught to keep legs one to one and a half feet apart when sitting and to place a pillow between the legs when turning. An assistive device may be used for reaching down, since the patient is not allowed to bend way over.

With a knee replacement, the post-operative course varies in regard to restrictions and positioning. The affected leg is kept in full extension for several days. A knee immobilizer may be used. However, the head of the bed may be elevated as desired. Practice of straight leg raising and quadriceps setting exercises are often instituted soon after surgery. A continuous passive motion (CPM) machine may be used. The machine flexes and extends the knee joint to tolerance. The degree of flexion is gradually increased until 90 degrees is tolerated.

Of course, the patient with hip or knee replacement surgery receives extensive physical therapy (PT), learning to walk, sit, stand, and manage stairs. The nurse needs to be aware of the patient's progress in PT and reinforce learning.

Prior to discharge, the patient should be taught to observe and report signs and symptoms of infection, loosening of the prosthesis, and, particularly in the case of hip replacement, dislocation.

### **Traumatic injuries**

Strains are acute or chronic over-stretching of muscles or tendons. Signs or symptoms include pain, stiffness, and swelling. Treatment involves cold application for soft tissue swelling for 24 to 48 hours; later, heat may be used for comfort.

**Sprains** are forcible wrenching with hyperextension of the joint. Injury to the ligaments and possibly to the Synovial lining with bleeding into the joint capsule occurs. Signs and symptoms include swelling, pain, discoloration, and decreased motion. Sometimes symptoms are delayed in onset for several hours. Treatment involves immobilization of the joint to prevent further damage, ice application, ace wrap, and elevation. Sometimes torn ligaments require surgical repair.

**Subluxations/dislocations** are most common in shoulder, finger, elbow and hip joints. Subluxation is an incomplete separation of the joint. It remains in partial opposition. Dislocation is a complete separation of the joint, often with associated damage such as torn ligaments, ruptured muscle attachments and blood vessels. Signs and symptoms

include pain, deformity, decreased motion, and muscle spasm. Treatment involves manipulation and joint realignment. Patients may require anesthetic for larger joints to relax the muscles to enable manipulation and joint realignment. Immobilizing the joint for three to four weeks allows time to heal.

**Fractures** are broken bones. The cause may be a direct blow or an indirect stress, twisting, or violent muscle contraction as occurs during a seizure. Pathological fractures occur when diseased bone breaks under normal turning and moving. Emergency care includes placement of sterile dressings over open fractures and immobilization of the part. For long bones, the joint above and the joint below the injury are immobilized. Care is taken not to impair circulation. Padding is placed over bone prominences. In emergency care, if in doubt about the presence of a fracture, splinting is always done. The nurse should assess for pain or paralysis, and check the pulses distal to the injury and for skin pallor or the presence of paresthesia. Vital signs are checked every 15 minutes for several hours for continued bleeding or swelling which may cause further soft tissue damage. Hidden hemorrhage and signs of shock, especially with hip and pelvic fractures, may occur. Several units of blood may be lost and concealed in the soft tissues. Fat emboli may occur with long bones and pelvis fractures as well.

**Compartment syndrome:** With a leg or forearm fracture, edema may lead to swelling of muscle groups surrounded by fascia. Swollen muscles compressed by fascia and unable to expand will experience circulatory compromise and tissue death will follow. Also, a limb that has been fractured and is enclosed in a cast may continue to swell and the cast becomes too tight. This may lead to vascular compromise. Compartment syndrome is an emergency requiring immediate relief by either cutting of the cast to relieve pressure, or, if the problem is caused by increased internal pressure, surgery to cut fascia and release muscle before necrosis (death of tissues) occurs.

Fracture reduction methods include the following:

**Closed reduction** is manipulation to realign bones without surgery, usually followed by casting or splinting. Nursing management includes elevating the cast, neurovascular checks several times per shift, checking for skin breakdown around the cast edges every two hours, and checking for possible pressure areas within the cast (for example over the heel or knee areas). Patients with cast pressure points may complain of being in severe pain. If a wound is under the cast, blood will drain through fiberglass casting material, but will be absorbed by plaster cast material. Observe and document any drainage.

**Open reduction** is surgical insertion of rods, wire, nails, screws, or pins to secure bones. Nursing management includes post-operative care.

**Skin traction** is used primarily for hip fractures and low back pain to help decrease muscle spasms. Nursing management involves keeping weights and lines free of entanglement, checking slings and ace wraps for smoothness, checking skin for breakdown, and frequent neurovascular checks including pulses distal to the traction.

Nurses may set up and remove this form of traction and should do so to inspect the skin periodically for signs of breakdown.

#### **A. Buck's Traction**

In **skeletal traction** a pin is inserted into the bone distal to the injury and attached to weights to realign bone fragments. Since the patient is on prolonged bed rest, the nurse must assess for and prevent complications of immobility, perform neurovascular checks, and assess the pin site for drainage or slipping pins. Care and cleansing of the pin site is ordered by the physician and involves cleansing with saline, peroxide, or other prescribed solution. Cleansing is usually performed every shift. The nurse should inspect the lines and weights frequently to be sure that the weights are hanging freely. Weights should not be allowed to touch the floor, nor should they be removed without a doctor's order.

External fixation holds bone fragments together and consists of metal devices made up of pins and rods leading from bone fragments to an external stabilizing structure. Nursing management includes cleansing of pin sites following the institution's prescribed protocol, frequent neurovascular checks, observing and teaching the patient to observe for signs and symptoms of infection as well as safety measures to prevent falls. Should the patient be allowed out of bed, the fixation devices are heavy and unwieldy and the patient may be prone to fall. The same is true of the patient wearing a cast, especially the heavier, plaster of Paris type.

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**Self-Test 2**

1. What is the recommended position for the affected extremity following hip arthroplasty?
2. What is the purpose of a CPM machine?
3. Exercises the patient practices following knee arthroplasty include \_\_\_\_\_ and \_\_\_\_\_.
4. Match the condition in Column A with the description statement in Column B.

Column A

- a. strain
- b. sprain
- c. subluxation
- d. dislocation
- e. fracture

Column B

- a. complete separation of the joint
- b. stretching of muscles or tendons
- c. immobilizing joint above and below the injury
- d. forcible wrench with joint hyperextension
- e. may be associated with fat emboli
- f. incomplete joint separation

**Module 29**  
**Answers to Self-Tests**

- Self-Test 1
1. d, f, g, j
  2. f
  3. a, f
  4. e
  5. h, I
  6. b, c

- Self-Test 2
1. Affected extremity should be abducted and extended. No flexion or rotation is usually permitted.
  2. To flex and extend the knee following total knee replacement.
  3. Quadriceps setting and straight leg-raising.
  4.
    1. b
    2. d
    3. f
    4. a
    5. c, e