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Chapter 32 - Musculoskeletal Disorders

Chapter 32

Musculoskeletal Disorders

 Evidence Base

The nursing care presented in this chapter is in accordance with the National Association for Orthopaedic Nursing. (2007). Core curriculum for orthopaedic nursing (6th ed.). New Jersey: Pearson

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ASSESSMENT

SUBJECTIVE DATA

Much can be learned about musculoskeletal disorders from subjective data. History of injury, description of symptoms, and associated personal health and family history can give clues to the underlying problem and appropriate care for that problem.

Common Manifestations of Musculoskeletal Problems

Pain

- Where is the pain located?
 - Joints, as in osteoarthritis (OA).
 - Muscles or soft tissue, as in contusions, sprains, or strains.
 - Bone, as in fractures or tumors.
- Is it sharp, as in a fracture or sprain, or dull, as in a bone tumor?
- Does the pain radiate?
 - To buttocks or legs, as in lower back pain.
 - To thigh or knee, as in hip fracture.
- What makes the pain increase? What makes it better?
- When was the onset of pain?

Limited Range of Motion

- Is stiffness present? How long does it last?
 - Present in morning for less than 30 minutes or after sitting for long period when due to OA.
 - May persist and is associated with acute pain when due to spasm of lower back strain.
- Is swelling present and limiting mobility?
 - May be due to fracture.
 - May be soft-tissue injury, such as sprain, strain, or contusion.
- How does limited mobility affect activities of daily living (ADLs)?

Associated Symptoms

- Any sensory or motor deficits, such as numbness, paresthesias, or weakness, indicating neurovascular compromise?
- Any weight loss, fever, or malaise, as in bone tumors?
- Any bony nodules or deformity, as in rheumatoid arthritis?

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History

Mechanism of Injury

- How did the injury occur? Essential for all trauma, including fractures, contusions, sprains, and strains to help identify the extent of injury.
- What was the progression of symptoms?
- If not an acute injury, was there any repetitive movement or strain that may have contributed to problem, as in tendinitis?

Medical History

- What medications are you taking (include name, dosage schedule, and last time taken—include prescription medications, vitamins, over-the-counter (OTC) medications, and herbals)?
- Any history of corticosteroid use that predisposes to osteoporosis?
- Is the woman postmenopausal? On estrogen replacement? If estrogen deficient, may predispose to osteoporosis.
- Any history of prostate, breast, or lung cancer, which may metastasize to the bone?
- What are other chronic conditions that may affect immobility imposed by casting, traction, or surgery?

Social History

- What is the patient's occupation, which may contribute to lower back strain or OA?
- Does the patient exercise? What type of exercise is performed, how frequently and what is the duration of exercise? When was the last time this was performed?
- What activities or sports does the patient participate in, such as running or tennis, which may cause tendinitis?
- Are there risk factors for osteoporosis, such as smoking, inactivity, low calcium intake or lack of exposure to the sun?
- Is there a family history of osteoporosis or arthritis?
- What cultural issues/religious beliefs contribute to this history?
- Does the patient drink alcohol? If yes, what is the daily alcohol consumption?

OBJECTIVE DATA

Data on current system condition and functional abilities are secured through inspection, palpation, and measurement. Always compare with contralateral side (one side of the body to the other).

Musculoskeletal System

Skeletal Component

- Note deviation from normal structure—bony deformities, length discrepancies, alignment, symmetry, amputations.
- Identify abnormal motion and crepitus (grating sensation), as found with fractures.

Joint Component

- Identify swelling that may be due to inflammation or effusion.
- Note deformity associated with contractures or dislocations.
- Evaluate stability, which may be altered.
- Estimate active and passive range of motion (ROM).

Muscle Component

- Inspect for size and contour of muscles.
- Assess coordination of movement.
- Palpate for muscle tone.
- Estimate strength through cursory evaluation (ie, handshake) or scaled criteria (ie, 0 = no palpable contraction; 5 = normal ROM against gravity with full resistance).
- Measure girth to note increases due to swelling or bleeding into muscle or decreases due to atrophy (difference of more than 1 cm is significant).
- Identify abnormal clonus (rhythmic contraction and relaxation) or fasciculation (contraction of isolated muscle fibers).

Additional Assessment

Neurovascular Component

- Assess circulatory status of involved extremities by noting skin color and temperature, peripheral pulses, capillary refill response, pain, and edema.
- Assess neurologic status of involved extremities by the patient's ability to move distal muscles and description of sensation (eg, paresthesia).
- Test reflexes of extremities.
- Compare all to uninjured/unaffected extremity.

Skin Component

- Inspect traumatic injuries (eg, cuts, bruises).
- Assess chronic conditions (eg, dermatitis, stasis ulcers).
- Note hair distribution and nail condition.
- Inspect for Heberden's or Bouchard's nodes.
- Assess for warmth or coolness of skin.

DIAGNOSTIC TESTS

RADIOLOGIC AND IMAGING STUDIES

Many radiologic and imaging studies are helpful in evaluating musculoskeletal problems to rule out fracture or skeletal changes and to differentiate soft-tissue injury.

X-rays

- Of bone—to determine bone density, texture, integrity, erosion, changes in bone relationships.
- Of cortex—to detect any widening, narrowing, irregularity.
- Of medullary cavity—to detect any alteration in density.
- Of involved joint—to show fluid, irregularity, spur formation, narrowing, changes in joint contour.
- Tomogram—special X-ray technique for detailed view of special plane of bone.

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Nursing and Patient Care Considerations

- Tell patient that proper positioning is important to obtain a good X-ray, so cooperation is essential.
- Advise patient to remove all jewelry, clothing with zippers or snaps, change from pockets, or other items that may interfere with X-ray.
- Medicate for pain prior to X-ray as needed.

Bone Scan

A bone scan consists of parenteral injection of bone-seeking radiopharmaceutical (such as gallium); concentration of isotope uptake revealed in primary skeletal disease (osteosarcoma), metastatic bone disease, inflammatory skeletal disease (osteomyelitis); fracture.

Nursing and Patient Care Considerations

- Advise patient that a laxative may be needed before the procedure.
- Advise patient to drink 16 to 32 ounces of water prior to the procedure, as directed.
- Injectable radionuclide may be given 24 to 72 hours before the scan.
- Reassure patient that there is no pain and that scan will take 1 to 2 hours.
- Analgesics or sedatives may be ordered for patients for whom lying immobile for any length of time is difficult.
- Breast-feeding should be discontinued for at least 4 weeks after test to prevent radionuclide exposure to infant.
- Inform patient that the exposure to radioactive substances is small (dose of radiation is less than a chest X-ray), and substances are excreted quickly by the body.
- Advise patient to flush the toilet three times after voiding so the small amount of radioactive material does not stay in the toilet bowl.

Bone Densitometry

Bone densitometry is a non-invasive study that yields an actual measurement of bone density and is diagnostic for osteoporosis. Simple portable screening tests that analyze the wrist or heel are also available.

Nursing and Patient Care Considerations

- No special preparation or restrictions.
- Have patient remove clothing and all jewelry or other metal objects.
- Advise patient to lie still with hips flexed for about 20 minutes during test; technician will remain in the room.
- Reassure patient that radiation exposure is minimal.

Magnetic Resonance Imaging

Magnetic resonance imaging (MRI) uses magnetic fields to demonstrate differences in hydrogen density of various tissues. Demonstrates tumors and soft-tissue (muscle, ligament, tendon) abnormalities. Although it is more costly than computed tomography (CT) scans, the cost is typically validated through the diagnostic accuracy. MRI not only clearly defines internal organs, but also is able to detect nerve damage and changes, such as edema or bruises, of bone. Bone bruises (osseous contusions) with traumatic injuries have some predictive value for future development of posttraumatic arthritis.

Nursing and Patient Care Considerations

- Prepare patient for need to lie still for about 1 hour; repetitive clanging noise of machine will be heard; patients may feel closed in.
- Practice relaxation techniques, such as relaxation breathing and imagery, ahead of time.
- Some patients may need sedation; claustrophobic patients may be unable to undergo procedure or may need open MRI.
- Contraindicated for patients with metal implants, prosthetic valves, surgical clips, pacemakers, and orthopedic hardware.

NURSING ALERT

Patients with metal implants or valves, metal braces, or pacemakers are unable to undergo MRI.

Other Tests

- CT scan—narrow beam of X-ray that scans area in successive layers to evaluate disease, bone structure, joint abnormalities, and trauma (fractures).
- Arthrogram—injection of radiopaque substance or air into joint cavity to outline soft-tissue structures (eg, meniscus) and contour of joint.
- Myelogram—injection of contrast medium into subarachnoid space at lumbar spine to determine level of disk herniation or site of tumor.
- Diskogram—injection of small amount of contrast medium into lumbar disk abnormalities.
- Arthrocentesis—insertion of needle into joint and aspiration of synovial fluid for purposes of examination.
- Arthroscopy—endoscopic procedure that allows direct visualization of joint structures (synovium, articular surfaces, menisci, ligaments) through a small needle incision. May be combined with arthrography.
- Nerve studies—to differentiate nerve root compression, muscle disease (eg, dystrophy, myositis), peripheral neuropathies, central nervous system-anterior horn cell neuropathies, neuromuscular junction problems.
 - Electromyography (EMG)—measures electrical potential generated by the muscle during relaxation and contraction.
 - Nerve conduction velocities—measure the rate of potential generation along specific nerves (speed of impulse conduction).

GENERAL PROCEDURES AND TREATMENT MODALITIES

CRUTCH WALKING

Crutches are artificial supports that assist patients who need aid in walking because of disease, injury, or a birth defect.

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Preparation for Crutch Walking

Goals: Develop power in the shoulder girdle and upper extremities that bear the patient's weight in crutch walking. Strengthen and condition the patient.

Strengthening the Muscles Needed for Ambulation

Instruct the patient as follows:

- For quadriceps setting:
 - Contract the quadriceps muscle while attempting to push the popliteal area against the mattress and raise the heel.
 - Maintain the muscle contraction for the count of 5.
 - Relax for the count of 5.
 - Repeat this exercise 10 to 15 times hourly.
- For gluteal setting:
 - Contract or pinch the buttocks together for a count of 5.
 - Relax for the count of 5.
 - Repeat 10 to 15 times hourly.

Strengthening the Muscles of the Upper Extremities and Shoulder Girdle

Instruct the patient as follows:

- Flex and extend arms slowly while holding traction weights; gradually increase poundage of weight and number of repetitions to increase strength and endurance.
- Do push-ups while lying in a prone position.
- Squeeze rubber ball—increases grasping strength.
- Raise head and shoulders from bed; stretch hands forward as far as possible.

- Sit up on bed or chair.
 - Raise body from chair by pushing hands against chair seat (or mattress).
 - Raise body out of seat. Hold. Relax.

Measuring for Crutches

- When the patient is lying down (an approximate measurement):
 - Measure from the anterior fold of the axilla to the sole. Then add 2 inches (5 cm).
 - Alternatively, subtract 16 inches (40 cm) from the patient's height.
- When the patient is standing erect:
 - Stand the patient against the wall with feet slightly apart and away from the wall.
 - The crutches should be fitted with large rubber suction tips.
 - The elbow is flexed 30 degrees with the hand resting on the grip.
 - There should be a two-finger-width insertion between the axillary fold and the underarm piece grip. A foam rubber pad on the underarm piece will relieve pressure on the upper arm and thoracic cage.
 - The tip of the crutch is placed 6 to 8 inches (15 to 20 cm) lateral to the forefoot.

Teaching the Crutch Stance

- Have the patient wear well-fitting shoes with firm soles.
- Before using the crutches, have the patient stand by a chair on the unaffected leg to achieve balance.
- Position the patient against a wall with head in a neutral position.
- Tripod position—basic crutch stance for balance and support.
 - Crutches rest approximately 8 to 10 inches (20 to 25 cm) in front of and to the side of the patient's toes (see Figure 32-1).
 - Taller patient requires a wider base, whereas shorter patient needs a narrower base.
- Teach the patient to support weight on hands; weight borne on the axillae can damage the brachial plexus nerves and produce “crutch paralysis.”

Teaching the Crutch Gait

- Crutch walking requires balance, coordination, and a high expenditure of energy; these can be acquired with diligent and regular practice.
 - Practice balancing with crutches while leaning against the wall.
 - Practice shifting body weight in different positions while standing with crutches.
- P.1101
- The selection of the crutch gait depends on the type and severity of the disability and the patient's physical condition, arm and trunk strength, and body balance.
 - Teach the patient at least two gaits—a faster gait to be used for swiftness and a slower one to be used in crowded places.
 - Instruct the patient to change from one gait to another—relieves fatigue because a different combination of muscles is used.



FIGURE 32-1 The tripod position is the basic crutch stance for balance and support.



FIGURE 32-2 Crutch gaits. Shaded areas are weight bearing. Arrow indicates advance of foot or crutch.

Crutch Gaits

See Figure 32-2.

Four-point Gait (Four-point Alternate Crutch Gait)

- Four-point gait is a slow but stable gait; the patient's weight is constantly being shifted.

- Four-point gait can be used only by patients who can move each leg separately and bear a considerable amount of weight on each of them.
- Crutch-foot sequence:
 - Right crutch
 - Left foot
 - Left crutch
 - Right foot

Three-point Gait

- Three-point gait is used when one leg is affected.
- Both crutches and the affected lower leg are moved forward simultaneously.
- Then the stronger lower extremity is moved forward while most of the body weight is put on the crutches.

Two-point Gait

- Two-point gait is a progression from the four-point gait that allows faster ambulation.
- Weight is borne on both lower extremities and both crutches.
- Advance left foot and right crutch together.
- Then advance right foot and left crutch together.

Crutch-Maneuvering Techniques

See Patient Education Guidelines, page 1102.

AMBULATION WITH A WALKER

A walker provides more support than crutches or a cane for the patient who has poor balance and cannot use crutches.

Technique for Using a Walker

- Be aware that a walker gives stability but does not permit a natural reciprocal walking pattern.
- Rolling walkers may assist the patient who has painful joints in the lower extremities, decreased balance, or decreased cardiopulmonary function.
- Teach the following sequence for a patient using a stationary (nonrolling) walker:
 - Lift the walker, placing it in front of you while leaning your body slightly forward.
 - Take a step or two into the walker.
 - Lift the walker, and place it in front of you again.

AMBULATION WITH A CANE

A cane is used for balance and support. Canes come in a variety of shapes, but the majority have a curved handle and a rubber tip. Tripod canes may offer greater support.

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PATIENT EDUCATION GUIDELINES

Crutch-Maneuvering Techniques

STANDING UP

- Move forward to the edge of the chair with the strong leg slightly under the seat.
- Place both crutches in the hand on the side of the affected extremity.
- Push down on the hand pieces while raising the body to a standing position.

SITTING IN A CHAIR

Grasp the crutches at the hand pieces for control, and bend forward slightly while assuming a sitting position.

GOING UP STAIRS

- Advance the stronger leg first up to the next step.
- Advance the crutches and the weaker extremity.

GOING DOWN STAIRS

- Place feet forward as far as possible on the step.
- Advance crutches to the lower step. The weaker leg is advanced first and then the stronger one—the stronger extremity shares the work of raising and lowering the body weight with the patient's arms.

Note: Strong leg goes up stairs first and down stairs last.

Purposes

- To assist the patient to walk with greater balance and support and less fatigue.
- To compensate for deficiencies of function normally performed by the neuromuscular skeletal system.
- To relieve pressure on weight-bearing joints.
- To provide forces to push or pull the body forward or to restrain the forward motion of the patient while walking.

Principles of Cane Use

- An adjustable aluminum cane fitted with a 1 ½-inch (3.8-cm) rubber suction tip to provide traction while walking gives optimal stability to the patient.
- With bilateral disease, using two canes gives better balance and weight relief.
- To fit for a cane:
 - Have patient flex elbow at a 30-degree angle and hold the cane 6 inches (15 cm) lateral to the base of fifth toe.
 - Adjust the cane so the handle is approximately level with the greater trochanter.
- Alternatively, while the patient is standing with arms at side, the handle of the cane should line up with the crease in wrist.

Technique for Walking with a Cane

- Hold the cane in the hand opposite to the affected extremity (ie, the cane should be used on the good side)—allows partial weight-bearing relief because the cane is in contact with the floor at the same time as the affected extremity.
- Advance the cane at the same time the affected leg is moved forward.
- Keep the cane fairly close to the body to prevent leaning.
- If the patient cannot use the cane in the opposite hand, the cane may be carried on the same side and advanced when the affected leg is advanced.
- To go up and down stairs:
 - Step up on unaffected extremity.
 - Then place cane and affected extremity on the step.
 - Reverse this procedure for the descending steps.

- The strong leg goes up first and comes down last.

CASTS

A cast is an immobilizing device made up of layers of plaster or fiberglass (water-activated polyurethane resin) bandages molded to the body part that it encases. See Procedure Guidelines 32-1. See also Procedure Guidelines 32-2, page 1104, for application and removal of a cast.

Purposes

- To immobilize and hold bone fragments in reduction.
- To apply uniform compression of soft tissues.
- To permit early mobilization.
- To correct and prevent deformities.
- To support and stabilize weak joints.

Types of Casts

Short-arm Cast

Extends from below the elbow to the proximal palmar crease.

Gauntlet Cast

Extends from below the elbow to the proximal palmar crease, including the thumb (thumb spica).

Long-arm Cast

Extends from upper level of axillary fold to proximal palmar crease; elbow usually immobilized at right angle.

Short-leg Cast

Extends from below knee to base of toes.

Long-leg Cast

Extends from upper thigh to the base of toes; foot is at right angle in a neutral position.

Body Cast

Encircles the trunk stabilizing the spine.

Spica Cast

Incorporates the trunk and extremity.

- Shoulder spica cast—a body jacket that encloses trunk, shoulder, and elbow.
- Hip-spica cast—encloses trunk and a lower extremity.
 - Single hip-spica—extends from nipple line to include pelvis and extends to include pelvis and one thigh.
 - Double hip-spica—extends from nipple line or upper abdomen to include pelvis and extends to include both thighs and lower legs.
 - One-and-a-half hip-spica—extends from upper abdomen, includes one entire leg, and extends to the knee of the other.

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PROCEDURE GUIDELINES 32-1

Application of a Cast

EQUIPMENT

- Plaster or synthetic bandages in desired widths
- Stockinette (tubular knitted material)*
- Cast padding (roll padding)*
- Splints (for reinforcement)

- Cotton, polyester, or polyurethane foam padding for bony prominences*
- Cast knives, scissors
- Polyethylene sheeting or newspaper—to protect floor
- Disposable gloves—to protect hands of operator
- Large, plastic-lined pail of water at room temperature—70° to 75° F (21° to 24° C)—or as recommended by cast material manufacturer
- Cast finishing hand cream for synthetic cast as needed

CONSIDERATIONS

- The application of a cast requires two to three persons: one to apply the plaster (operator), one to dip and hand the plaster bandages to the operator, and a third person to hold the extremity in correct position. (Body spicas may require additional personnel.)
- The time required for the cast to become rigid varies with the material used—generally 2 to 6 minutes.
- There should be no movement of the extremity while the cast is being applied and set.
- In general, the joints above and below the involved bone are immobilized.

PROCEDURE

Nursing Action

Rationale

Preparatory phase

- | | |
|--|--|
| 1. Spread polyethylene sheeting or newspaper on floor. | 1. To contain mess. |
| 2. Explain to the patient that there will be a feeling of warmth as the plaster is applied. | 2. Heat is produced by an endothermic reaction causing crystallization as plaster sets. The reaction of water with plaster of paris liberates heat. |
| 3. Apply stockinette and roll cast padding on the extremity or part to be immobilized. | 3. Padding is used to pad the sharp cast margins for patient comfort and to prevent pressure areas, minimize circulatory problems, and facilitate cast removal. It is applied from the distal to the proximal end of the extremity. When too much padding is used, it may shift and produce pressure areas under the cast. |
| a. Apply roll padding as smoothly and snugly as possible so each turn overlaps the preceding turn by one-half the width of the roll. | |
| b. Extra pieces of padding may be placed over bony prominences: olecranon process, malleoli, patella, or ulnar protuberance. | |
| 4. While keeping the thumb under the forward edge of the bandage, submerge the plaster bandage vertically in water (room temperature) for a minute or so, or until bubbles cease to rise.
Check directions on synthetic cast materials. | 4. Water that is too warm will accelerate setting time, may cause a burn, and may result in excessive plaster loss by loosening the adhesive agents that bond the plaster to the fabric. |
| 5. Expel excess water by squeezing (not wringing) toward the center of the bandage; hand bandage to operator with free end hanging loose. | 5. Cast will dry more quickly (thus will acquire maximum strength sooner) if a well-squeezed plaster bandage is used. Maximum strength is achieved by synthetic casts through chemical reaction in about 30 minutes. |


Performance phase (By operator)

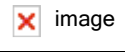
- | | |
|---|---|
| 1. Starting at the distal end, roll the bandage gently and evenly on the extremity overlapping the preceding turn by one-half the | 1. Roll inward toward the patient's body for ease of control. |
|---|---|

- width of the roll.
2. Keep bandage moving and in constant contact with surface of extremity. Smooth and rub down successive layers or turns of each bandage into layers below with the thumbs and thenar eminences (mound on the palm) in circumferential and longitudinal directions.
 3. Take tucks in the lower border of the bandage by lifting the bandage off the surface (without tension) and overlapping it in a V-shaped fashion.
 4. Trim the cast to size with a sharp knife. Fold stockinette over edges of cast and anchor with cast material.
 5. Finish synthetic cast with cast hand cream as indicated.
 6. Ask the patient if there is any discomfort or pain.
2. This keeps the cast uniformly thick. Rubbing the plaster as it is applied will form a smooth, solid, and well-fused cast. Avoid indenting the cast with the fingertips because this may produce pressure sores on underlying skin. Handle fresh casts with palms.
 3. Tucking the bandage helps to contour the cast to the changing circumference of the extremity. Do not twist or reverse the bandage to change its direction because this produces sharp cutting edges.
 4. Stockinette produces smooth, comfortable edges on cast. Do not pull too vigorously on the stockinette because this may cause pressure on bony prominences.
 5. Smooths rough exterior surface.
 6. If a patient complains of pain, it may be due to manipulation of fracture during setting; pain should subside rapidly. If it persists, the cast and encircling dressings are split to avoid constriction, circulatory problems, and pressure sores.

Follow-up phase

1. Support the cast with the palm of the hand while moving the patient. Avoid indentations from tips of fingers.
 2. Expose the cast to warm, circulating, dry air. Or, blow air over cast with a circulating fan to increase the evaporation of water.
 3. Clean equipment and store ready for use.
1. Finger indentation on a fresh cast can produce pressure sores.
 2. Avoid covering the cast when it is drying because this delays drying time. Usually the plaster cast will reach its maximum temperature 5 to 15 minutes after it is applied and will then cool rapidly. The ultimate plaster cast strength is obtained after the cast is dry (up to 48 hours, depending on outside temperature and humidity).
The synthetic cast strength is maximum within 30 minutes of application and not dependent on being dry.

 Evidence Base
NAON. (2007). Core curriculum for orthopedic nursing (6th ed.). New Jersey: Pearson Custom

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P.1104

PROCEDURE GUIDELINES 32-2

Removal of a Cast EQUIPMENT

- Cast cutter—an electric saw with circular blade that oscillates and is connected to a vacuum collector
- Cast spreader
- Plaster knife

- Scissors
- Felt-tip pen

PROCEDURE

Nursing Action

Rationale

Preparatory phase

- | | |
|--|--|
| 1. Describe to the patient how and where the cast cutter will be used and the expected sensations. | 1. Reassures the patient that the cutter produces vibrations but not pain. |
| 2. Determine whether the cast is padded. | 2. An electric plaster cast cutter should not be used on unpadded casts. |
| 3. Determine where the cut will be made. Mark the area to be cut with a felt pen. | 3. The line should be in front of the lateral malleolus and behind the medial malleolus on a lower extremity cast. An upper extremity cast is usually split along the ulnar or flexor surface. |

Performance phase

- | | |
|--|--|
| 1. Inform the patient to shield eyes. | 1. Plaster dust may be irritating to the eyes. |
| 2. Grasp the electric cutter as illustrated. | |
| 3. Rest the thumb on the cast. | 3. The thumb serves as a depth gauge and acts as a guard |
| 4. Turn on the electric cutter. Push the blade firmly and gently through the cast while holding the thumb against the cast to steady the blade while cutting through the cast. | <div data-bbox="1117 814 1256 877" data-label="Image"> </div> |
| 5. As the blade cuts through the plaster, a sudden lack of resistance is felt; plaster will “give” (or “dip”) when the cut is completed. | As th"> |
| 6. Lift the cutting blade up a degree (but not out of the cutting groove) and advance the blade at a slightly higher or lower level. The cast is cut by a series of alternating pressure and linear movements along the line of the cut (see accompanying figure). | <i>Operating a cast cutter.</i> |
| 7. Avoid drawing the cutting blade along the extremity in a single motion. | 7. This will cut the skin. If saw blade is in contact with padding too long, the patient will feel burning sensation on skin from rapidly oscillating blade. |
| 8. Cut the cast on both sides. Then rock the anterior portion of the cast over the posterior portion. | 8. This maneuver allows the operator to determine if the cast is completely cut. |
| 9. Insert the blades of the cast spreader in the cut trough. Separate the two halves with the spreader at several sites along the cast split. Separate the cast with the hands. | |
| 10. Cut through the padding and stockinette with scissors, keeping the scissor blade that is closest to the skin parallel to the skin. | 10. Use bandage scissors; place the flat blade closest to the skin. |
| 11. Lift the extremity carefully out of the posterior portion of the cast. Support the extremity so it is maintained in the same position as when in the cast. | 11. When the support of the cast has been removed, stresses and strain are placed on parts that have been at rest. |

After removal of cast

- | | |
|--|---|
| 1. Clean the skin gently with mild soap and water. Blot dry. Apply a skin cream. | 1. Explain to the patient that the skin will be scaly and the extremity will appear “thin” from disuse. Reassure him that it will |
|--|---|


2. Emphasize the importance of continuing the prescribed exercises, reporting for physical therapy, and so forth.
- take a few weeks to regain normal appearance and function.
2. Exercises are necessary to redevelop and increase strength and function. Pain and stiffness may be expected after cast removal.

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 Evidence Base

NAON. (2007). Core curriculum for orthopedic nursing (6th ed.). New Jersey: Pearson Custom

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Cast-brace

 image

External support about a fracture that is constructed with hinges to permit early motion of joints, early mobilization, and independence.

- Cast bracing is based on the concept that some weight-bearing is physiologic and will promote the formation of bone and contain fluid within a tight compartment that compresses soft tissues, providing a distribution of forces across the fracture site.

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- Cast-brace is applied after initial edema and pain have subsided and there is evidence of fracture stability.

Cylinder Cast

Can be used for upper or lower extremity. Used for fracture or dislocation of knee (lower extremity) or elbow dislocation (upper extremity).

Complications of Casts

- Pressure of cast on neurovascular and bony structures causes necrosis, pressure sores, and nerve palsies.
- Compartment syndrome is a condition resulting from increased progressive pressure within a confined space, thus compromising the circulation and the function of tissues within that space. This is a medical emergency and can be limb-threatening. A tight cast, trauma, fracture, prolonged compression of an extremity, bleeding, and edema put patients at risk for compartment syndrome.
- Immobility and confinement in a cast, particularly a body cast, can result in multisystem problems.
 - Nausea, vomiting, and abdominal distention associated with cast syndrome (superior mesenteric artery syndrome, resulting in diminished blood flow to the bowel), adynamic ileus, and possible intestinal obstruction.
 - Acute anxiety reaction symptoms (ie, behavioral changes and autonomic responses—increased respiratory and heart rate, elevated blood pressure [BP], diaphoresis) associated with confinement in a space.
 - Thrombophlebitis and possible pulmonary emboli associated with immobility and ineffective circulation (eg, venous stasis).
 - Respiratory atelectasis and pneumonia associated with ineffective respiratory effort.
 - Urinary tract infection (UTI)—renal and bladder calculi associated with urinary stasis, low fluid intake, and calcium excretion associated with immobility.
 - Anorexia and constipation associated with decreased activity.
 - Psychological reaction (eg, depression) associated with immobility, dependence, and loss of control.

Nursing Assessment

- Assess neurovascular status of the extremity with a cast for signs of compromise.
 - Pain (pain out of proportion to injury is an indication for compartment syndrome).
 - Swelling.
 - Discoloration—pale or blue.
 - Cool skin distal to injury.
 - Tingling or numbness (paresthesia).
 - Pain on passive extension (muscle stretch).
 - Slow capillary refill; diminished or absent pulse.
 - Paralysis.
- Assess skin integrity of casted extremity. Be alert for:
 - Severe initial pain over bony prominences; this is a warning symptom of an impending pressure ulcer. Pain increases when ulceration occurs.
 - Odor.
 - Drainage on cast.
- Carefully assess for positioning and potential pressure sites of the casted extremity (see Figure 32-3).
 - Lower extremity—heel, malleoli, dorsum of foot, head of fibula, anterior surface of patella.
 - Upper extremity—medial epicondyle of humerus, ulnar styloid.
 - Plaster jackets or body spica casts—sacrum, anterior and superior iliac spines, vertebral borders of scapulae.
- Assess cardiovascular, respiratory, and GI systems for possible complications of immobility.
- Assess psychological reaction to illness, cast, and immobility.

NURSING ALERT

Do not ignore the complaint of pain of the patient in a cast. Suspect compartment syndrome or a pressure ulcer. Notify health care provider if symptoms persist. Cast may have to be split or removed.

Nursing Diagnoses

- Ineffective Tissue Perfusion (extremity) related to swelling and constrictive bandage or cast
- Impaired Physical Mobility related to condition and casting
- Risk for Injury related to potential complications

Nursing Interventions

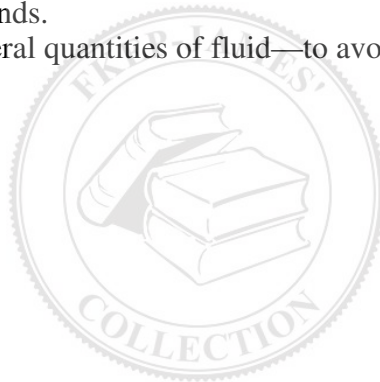
Maintaining Adequate Tissue Perfusion

- Elevate the extremity on cloth-covered pillow above the level of the heart. Keep the heel off the mattress.
- Avoid resting cast on hard surfaces or sharp edges that can cause denting or flattening of the cast and consequent pressure sores.
- Handle moist cast with palms of hands.
- Turn patient every 2 hours while cast dries.
- Assess neurovascular status hourly during the first 24 hours, then less frequently as condition warrants and swelling resolves.
- If symptoms of neurovascular compromise occur:
 - Notify health care provider immediately.
 - Bivalve the cast—split cast on each side over its full length into two halves.
 - Cut the underlying padding—blood-soaked padding may shrink and cause constriction of circulation.
 - Spread cast sufficiently to relieve constriction.

- If symptoms of pressure area occur, cast may be “windowed” (hole cut in it) so the skin at the pain point can be examined and treated. The window must be replaced so the tissue does not swell and cause additional pressure problems at window edge.

Minimizing the Effects of Immobility

- Encourage the patient to move about as normally as possible.
P.1107
- Encourage compliance with prescribed exercises to avoid muscle atrophy and loss of strength.
 - Active ROM for every joint that is not immobilized at regular and frequent intervals.
 - Isometric exercises for the muscles of the casted extremity. Instruct patient to alternately contract and relax muscles without moving affected part.
- Reposition and turn patient frequently.
- Avoid pressure behind knees, which reduces venous return and predisposes to thromboembolism.
- Use antiembolism stockings and sequential compression devices (SCD) as indicated.
- Administer prophylactic anticoagulants as prescribed.
- Encourage deep-breathing exercises and coughing at regular intervals to prevent atelectasis and pneumonia.
- Observe for symptoms of cast syndrome—nausea, vomiting, abdominal distention, abdominal pain, and decreased bowel sounds.
- Encourage patient to drink liberal quantities of fluid—to avoid urinary infection and calculi secondary to immobility.



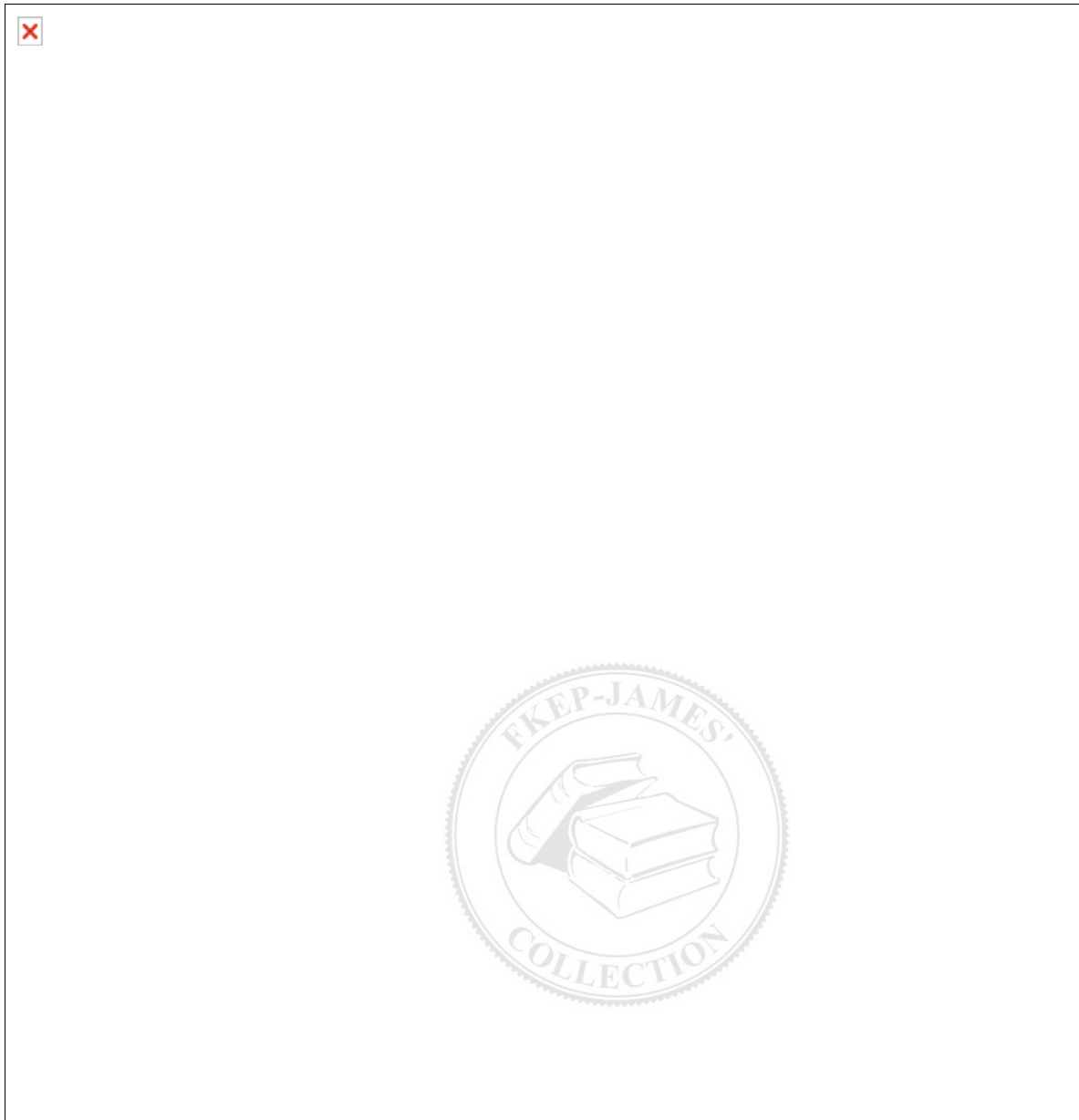


FIGURE 32-3 Pressure areas in different types of casts.

NURSING ALERT

People at high risk for pulmonary emboli include older adults and persons with previous thromboembolism, obesity, heart failure, or multiple trauma. These patients require prophylaxis against thromboembolism.

NURSING ALERT

Cast syndrome (superior mesenteric artery syndrome) is a rare sequela of body cast application, yet it is a potentially fatal complication. It is important to teach patients about this syndrome because this can develop as late as several weeks after cast application.

Preventing Complications

- Encourage balanced nutritional intake.
 - Assess the patient's food preferences. Serve small meals.
P.1108
 - Provide natural bowel stimulants (eg, fiber).

- Monitor bowels, and use a bowel program if necessary.
- If symptoms of cast syndrome develop, report immediately to the health care provider.
 - Place patient in a prone position, if tolerated, to relieve pressure symptoms.
 - Use nasogastric suction as prescribed.
 - Maintain electrolyte balance by I.V. replacement of fluids as prescribed.
 - Prepare the patient for removal of the cast or surgical relief of duodenal obstruction if necessary.
- Facilitate patient participation in care planning and activities. Encourage verbalization of feelings and concerns regarding casting.
- Provide and encourage diversional activities.
- Instruct patient not to place objects into their casts. Advise patient of alternative methods of managing itching such as blowing cool air under the cast.

Specific Care for Patient in Spica or Body Cast Positioning

- Place a bed board under the mattress for uniform support of the body.
- Support the curves of the cast with cloth-covered flexible pillows—prevents cracking and flat spots while cast is drying.
 - Place three pillows crosswise on bed for body cast.
 - Place one pillow crosswise at the waist and two pillows lengthwise for affected leg for spica cast. If both legs are involved, use two additional pillows.
- Encourage the patient to maintain physiologic position by:
 - Using the overhead trapeze.
 - Placing good foot flat on bed and pushing down while lifting himself up on the trapeze.
 - Avoiding twisting motions.
 - Avoiding positions that produce pressure on groin, back, chest, and abdomen.

Turning

- Move the patient to the side of the bed using a steady, even pulling motion.
- Place pillows along the other side of the bed—one for the chest and two (lengthwise) for the legs.
- Instruct the patient to place arms at side or above head.
- Turn the patient as a unit. Avoid twisting the patient in the cast.
- Turn the patient toward the leg not encased in plaster or toward the unoperated side if both legs are in plaster.
 - One nurse stands at other side of bed to receive the patient's shoulders.
 - Second nurse supports leg in plaster while the third nurse supports the patient's back as he is turned.
 - Turn the patient in body cast to a prone position twice daily—provides postural drainage of bronchial tree; relieves pressure on back.
- Keep the cast level by elevating the lumbar sacral area with a small pillow when the head of the bed is elevated.

NURSING ALERT

Do not grasp cross bar of spica cast to move the patient. The purpose of the bar is to maintain the integrity of the cast.

Hygienic Care

- Provide hygienic care of the patient.
- Protect cast from soiling.

- Cover perineum with a towel and apply spray (lacquertype) to perineal area of cast. Tuck 4-inch (10-cm) strips of thin polyethylene sheeting under perineal area of cast and tape to cast exterior. Replace when soiling occurs.
- Clean outside of soiled cast with a mild powdered cleanser and a slightly dampened or dry, clean cloth and pat dry completely, only when necessary.
- Roll the patient onto fracture bedpan; use small pillow in lumbosacral area for support.

Skin Care

- Inspect skin for signs of irritation:
 - Around cast edge.
 - Under cast—pull skin taut and inspect under cast, using a flashlight for illumination.
- Reach up under cast, and massage accessible skin.
- Protect the toes from the pressure of the bedding.

Patient Education and Health Maintenance

Neurovascular Status

- Instruct patient to check neurovascular status and to control swelling.
 - Watch for signs and symptoms of circulatory disturbance, including blueness or paleness of fingernails or toenails accompanied by pain and tightness, numbness, cold or tingling sensation.
 - Elevate affected extremity, and wiggle fingers or toes.
 - Apply ice bags as prescribed (one-third to one-half full) to each side of the cast, making sure they do not make indentations in plaster.
 - Call health care provider promptly if excessive swelling, paresthesia, persistent pain, pain on passive stretch, or paralysis occurs.
- Instruct patient to alternate ambulation with periods of elevation to the cast when seated. Encourage the patient to lie down several times daily with cast elevated.

Skin Irritation

Advise patient to prevent skin irritation at cast edge by padding edges of cast with moleskin or “petaling” cast edges with strips of adhesive tape.

Exercise

- Instruct patient to actively exercise every joint that is not immobilized and to perform isometric exercises (contract muscles without moving joint) of those immobilized to maintain muscle strength and to prevent atrophy.
P.1109
- Tell patient to perform hourly when awake:
 - Leg cast—Push down on the popliteal space, hold it, relax, repeat. Move toes back and forth; bend toes down, then pull them back.
 - Arm cast—Make a fist, hold it, relax, repeat. Move shoulders.
- Encourage ambulation with weight-bearing restrictions.

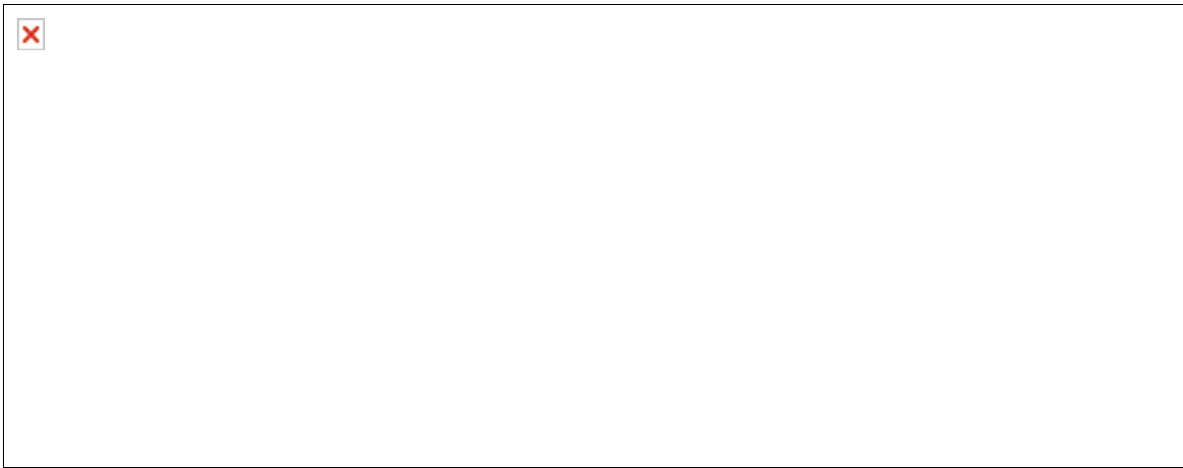


FIGURE 32-4 Buck's extension traction. (A) Skin traction is accomplished through a boot device in contact with the skin. (B) Weight is applied to exert running traction in one plane, while the body acts as a counterweight. (Courtesy DM Systems Inc., www.dmsystems.com.)

Cast Care

- Advise to avoid getting cast wet, especially padding under cast—causes skin breakdown as plaster cast becomes soft.
- Warn against covering a leg cast with plastic or rubber boots because this causes condensation and wetting of the cast.
- Instruct to avoid weight bearing or stress on plaster cast for 24 hours.
- Instruct to report to health care provider if the cast cracks or breaks; instruct the patient not to try to fix it.
- Teach how to clean the cast:
 - Remove surface soil with slightly damp cloth.
 - Rub soiled areas with household scouring powder.
 - Wipe off residual moisture.

Teaching Safety Measures

To prevent falls, avoid walking on wet floors or sidewalks. To prevent pressure and injury to the skin, do not place objects inside the cast.

After Cast Removal

- Instruct to clean skin with mild soap and water, blot dry, and apply emollient lotion to dry skin.
- Warn against scratching the skin.
- Advise to continue prescribed exercises. Gradually resume activities, and elevate extremity to control swelling.

Evaluation: Expected Outcomes

- No pain, discoloration, or sensory or motor impairment of affected extremity; warm, with good capillary refill
- Ambulates with assistance; performing active ROM and isometric exercises every 1 to 2 hours
- No signs of complications

TRACTION

Traction is force applied in a specific direction. To apply the force needed to overcome the natural force or pull of muscle groups, a system of ropes, pulleys, and weights is used. See Procedure Guidelines 32-3, page 1110.

Purposes of Traction

- To reduce and immobilize fracture.
- To regain normal length and alignment of an injured extremity.
- To lessen or eliminate muscle spasm.
- To prevent deformity.
- To give the patient freedom for “in-bed” activities.
- To reduce pain.

Types of Traction

Running Traction

- A form of traction in which the pull is exerted in one plane.
- May use either skin or skeletal traction.
- Buck's extension traction (see Figure 32-4) is an example of running skin traction.

P.1110

PROCEDURE GUIDELINES 32-3

Application of Buck's Extension Traction

PURPOSE

Buck's extension skin traction is used as a temporary measure to provide immobility, support, and comfort until definitive treatment is accomplished.

EQUIPMENT

- Foam Buck's traction boot or traction tape and 4-inch elastic bandage
- Spreader block or metal spreader
- Pulley, nylon rope, and weights (5-7 lb [2.5-3 kg] is usual [amount of weight is prescribed, generally not more than 10 lb (4.5 kg)])
- Sheepskin pad
- Shock blocks or adjustable bed for Trendelenburg's position

PROCEDURE

Nursing Action

Rationale

Preparatory phase

- | | |
|---|--|
| 1. Bed position is flat or in Trendelenburg's position. This depends on the size of the patient and the weight applied. | 1. Elevating the foot of the bed (countertraction) helps prevent the patient from sliding down toward the foot of the bed. |
| 2. Question the patient to determine previous skin conditions (contact dermatitis). Inspect skin for evidences of atrophy, abrasions, and circulatory disturbances. | 2. The skin must be in healthy condition to tolerate skin traction. |
| 3. Make sure the skin of the extremity is clean and dry. | 3. Clean, dry skin helps traction tape adherence. |
| 4. Document the neurovascular status of the extremity, any evidence of skin problems or varicosities. | |

Performance phase

- | | |
|---|--------------------------------|
| 1. Position the patient in center of bed in good alignment. | 1. For effective line of pull. |
|---|--------------------------------|

If traction tape is used:

2. Apply continuous traction tape to medial and lateral aspects of lower leg (below knee and loosely around foot to allow for attachment of spreader).
3. Have a second person elevate and support the extremity under the ankle and knee while the elastic bandage is applied. Beginning at the ankle, wrap the elastic bandage snugly over the tape up to the tibial tubercle.
4. Attach a spreader block (or metal spreader) to the distal end of the tape. Attach a rope to the spreader block and pass it over a pulley fastened to the end of the bed and gently apply weights.
5. Place a sheepskin pad under the leg (or use a commercial heel protector).
2. Avoid pressure over malleoli and head of fibula. Pressure sores develop rapidly over bony prominences. Pressure over the region of the fibular head and common peroneal nerve may produce peroneal palsy and footdrop.
3. The elastic bandage holds tape to the skin and helps prevent slipping.
4. The spreader block prevents pressure along the side of the foot. The spreader should not be too narrow (causes pressure sores on ankle) or too wide (pulls traction tape away from the heel).
5. Sheepskin is used to reduce friction of the heel against the bed.


If foam boot is used:

1. Apply antiembolism stockings if prescribed.
2. Place leg in foam boot, adjusting it so the heel is in the heel of the boot.
3. Secure Velcro bootstraps, avoiding excessive pressure on malleoli and fibular head.
4. Attach rope to built-in spreader plate, pass it over pulley, and apply weights gently.
1. Prophylactic measure in high-risk population.
2. Preventing sore heels is a primary concern.
3. Pressure over bony prominences causes skin breakdown, and pressure on peroneal nerve may result in footdrop.
4. The rope should move unobstructed, and the weights should hang free of the bed and not touch the floor.

 Evidence Base

NAON. (2007). Core curriculum for orthopedic nursing (6th ed.). New Jersey: Pearson Custom

Publishing.

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P.1111

Balanced Suspension Traction

- Uses additional weights to counterbalance the traction force and floats the extremity in the traction apparatus.
- The line of pull on the extremity remains fairly constant despite changes in the patient's position.

Application of Traction

Traction may be applied to the skin or to the skeletal system.

Skin Traction

- Accomplished by applying a light force that pulls on tape, sponge rubber, or special device (boot, cervical halter, pelvic belt) that is in contact with the skin.
- The pulling force is transmitted to the musculoskeletal structures.
- Skin traction is used as a temporary measure in adults to control muscle spasm and pain.
- It is used before surgery in the treatment of hip fracture (Buck's extension) and femoral shaft fractures (Russell's traction).
- It may be used definitively to treat fractures in children.

Skeletal Traction

See Figure 32-5.

- Traction applied by the orthopedic surgeon under aseptic conditions using wires, pins, or tongs placed through bones and provides a strong, steady, continuous pull.
- Skeletal traction is used most frequently in treating fractures of the femur, humerus (supracondylar fractures), tibia, and cervical spine.

Complications

- Infection of pin tracts in skeletal traction.
- Skin breakdown and dermatitis under skin traction.
- Neurovascular compromise resulting in increased pain, muscle spasms, numbness, tingling, and loss of sensation.
- Inadequate fracture alignment resulting in posttreatment arthritis.
- Complications of immobility include:
 - Stasis pneumonia
 - Thrombophlebitis
 - Pressure ulcers
 - Urinary infection and calculi
 - Constipation.



FIGURE 32-5 Balanced skeletal traction using (A) Thomas leg splint and Pearson attachment, and (B) slings for support and suspension.

Nursing Assessment

- Assess for pain, deformity, swelling, motor and sensory function, and circulatory status of the affected extremity.
- Assess skin condition of the affected extremity, under skin traction and around skeletal traction, as well as over body prominences throughout the body.
- Assess for alignment of affected body part.
- Assess for signs and symptoms of complications.
- Assess traction equipment for safety and effectiveness.
 - The patient is placed on a firm mattress.
 - The ropes and the pulleys should be in alignment.
 - The pull should be in line with the long axis of the bone.
 - Any factor that might reduce the pull or alter its direction must be eliminated.
 - Weights should hang freely.
 - Ropes should be unobstructed and not in contact with the bed or equipment.
 - Help the patient to pull himself up in bed at frequent intervals.

- The amount of weight applied in skin traction must not exceed the tolerance of the skin. The condition of the skin must be inspected frequently.
P.1112
- Cover exposed sharp ends of skeletal pins with cork or other pin covering to protect patient and caregivers from injury.
- Assess emotional reaction to condition and traction.
- Assess understanding of the treatment plan.

NURSING ALERT

Traction is not accomplished if the knot in the rope or the footplate is touching the pulley or the foot of the bed or if the weights are resting on the floor. Never remove the weights when repositioning the patient who is in skeletal traction because this will interrupt the line of pull and cause the patient considerable pain.

Nursing Diagnoses

- Impaired Physical Mobility related to traction therapy and underlying pathology
- Risk for Impaired Skin Integrity related to pressure on soft tissues
- Risk for Infection related to bacterial invasion at skeletal traction site
- Ineffective Tissue Perfusion: Peripheral related to injury or traction therapy

Nursing Interventions

Minimizing the Effects of Immobility

- Encourage active exercise of uninvolved muscles and joints to maintain strength and function. Dorsiflex feet hourly to avoid development of footdrop and aid in venous return.
- Encourage deep breathing hourly to facilitate expansion of lungs and movement of respiratory secretions.
- Auscultate lung fields twice per day.
- Encourage fluid intake of 2,000 to 2,500 mL daily.
- Provide balanced high-fiber diet rich in protein; avoid excessive calcium intake.
- Establish bowel routine through use of diet and stool softeners, laxatives, and enemas, as prescribed.
- Prevent pressure on the calf, and evaluate twice daily for the development of thrombophlebitis.
- Check traction apparatus at repeated intervals—the traction must be continuous to be effective, unless prescribed as intermittent, as with pelvic traction.
 - With running traction, the patient may not be turned without disrupting the line of pull.
 - With balanced suspension traction, the patient may be elevated, turned slightly, and moved as desired.
- Use SCDs and compression stockings as indicated.
- Administer prophylactic anticoagulants as prescribed.

NURSING ALERT

Every complaint of the patient in traction should be investigated immediately to prevent injury.

Maintaining Skin Integrity

- Examine bony prominences frequently for evidence of pressure or friction irritation.
- Observe for skin irritation around the traction bandage.
- Observe for pressure at traction-skin contact points.
- Report complaint of burning sensation under traction.
- Relieve pressure without disrupting traction effectiveness.

- Make sure that linens and clothing are wrinkle-free.
- Use lambs' wool pads, heel and elbow protectors, and special mattresses as needed.
- Special care must be given to the back every 2 hours because the patient maintains a supine position.
 - Have patient use trapeze to pull self up and relieve back pressure.
 - Provide backrubs.

Avoiding Infection at Pin Site

- Monitor vital signs for fever or tachycardia.
- Watch for signs of infection, especially around the pin tract.
 - The pin should be immobile in the bone, and the skin surrounding the wound should be dry. Small amount of serous oozing from pin site may occur.
 - If infection is suspected, percuss gently over the tibia; this may elicit pain if infection is developing.
 - Assess for other signs of infection: heat, redness, fever.
- If directed, clean the pin tract with sterile applicators and prescribed solution or ointment (ie, normal saline, sterile water, chlorhexidine)—to clear drainage at the entrance of tract and around the pin, because plugging at this site can predispose to bacterial invasion of the tract and bone.

Promoting Tissue Perfusion

- Assess motor and sensory function of specific nerves that might be compromised.
 - Peroneal nerve—have patient point great toe toward nose; check sensation on dorsum of foot; presence of footdrop.
 - Radial nerve—have patient extend thumb; check sensation in web between thumb and index finger.
 - Median nerve—thumb-middle finger apposition; check sensation of index finger.
- Determine adequacy of circulation (eg, color, temperature, motion, capillary refill of peripheral fingers or toes).
 - With Buck's traction, inspect the foot for circulatory difficulties within a few minutes and then periodically after the elastic bandage has been applied.
- Report promptly if change in neurovascular status is identified.

Patient Education and Health Maintenance

- Teach the patient the purpose of traction therapy.
- Delineate limitations of activity necessary to maintain effective traction.
- Teach use of patient aids (eg, trapeze).
- Instruct the patient not to adjust or modify traction apparatus.
- Instruct the patient in activities designed to minimize effects of immobility on body systems.
- Teach the patient necessity for reporting changes in sensations, pain, movement.

Evaluation: Expected Outcomes

- Exercises as instructed; deep breaths hourly; fluid intake 2,000 to 2,500 mL/24 hours
- No signs of skin breakdown under traction bandage or over bony prominences
P.1113
- No drainage, redness, or odor at pin site
- No motor or sensory impairment; good capillary refill, color, and warmth of extremity

EXTERNAL FIXATION

External fixation is a technique of fracture immobilization in which a series of transfixing pins is inserted through bone and attached to a rigid external metal frame (see Figure 32-6). The method is used mainly in the management of open fractures with severe soft-tissue damage.

Advantages

- Permits rigid support of severely comminuted open fractures, infected nonunions, and infected unstable joints.
- Facilitates wound care (frequent debridements, irrigations, dressing changes) and soft tissue reconstruction (delayed wound closure, muscle flaps, skin grafts).
- Allows early function of muscles and joints.
- Allows early patient comfort.

Circular Fixators

Purpose

May be used for limb lengthening, correction of angulation and rotation defects, and in treatment of nonunion.



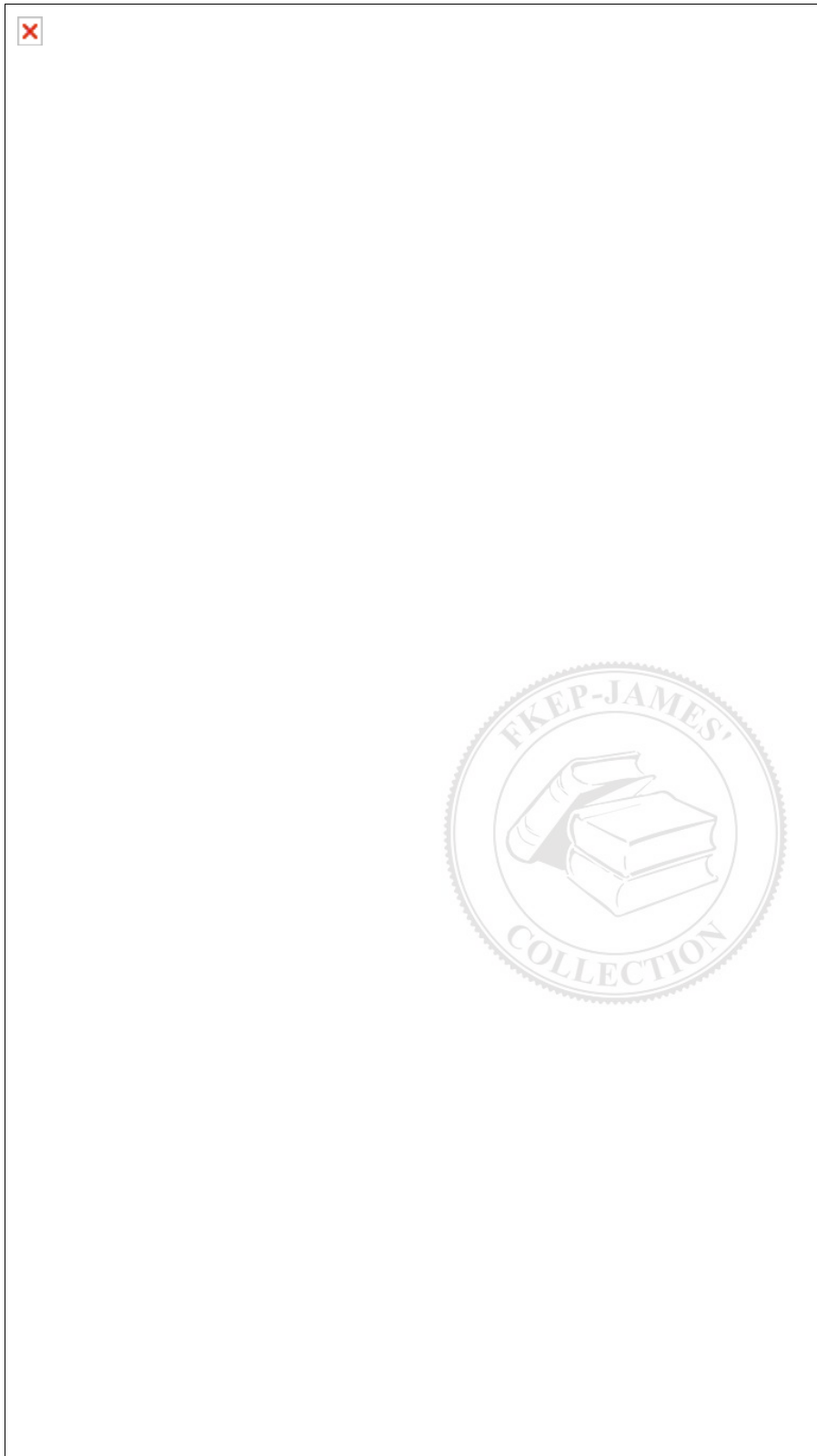


FIGURE 32-6 External fixation device used for reduction and immobilization of open fracture, allowing treatment of soft-tissue wounds.

Components

- This fixator apparatus consists of through-the-bone tension wires placed above and below the treatment site.

- The wires are attached to fixator rings surrounding the limb.
- The rings are connected to one another by telescoping rods.

Management

- Adjustments are made daily at about 1 mm/day, stimulating callus and bone formation.
- Patient compliance is essential.
- Weight bearing is encouraged.
- When the desired length or correction is achieved, the fixator is left in place without further adjustment until bone healing occurs.

Application of External Fixator

- Under general anesthesia, the skin is cleaned and transfixing pins are inserted into the bone through small incisions above and below the fracture.
- After reduction of the fracture, the appliance is stabilized by adjusting and tightening the bars connecting the sets of pins.
- The sharp pinheads are covered with plastic, cork, or rubber covers to protect the other extremity and caregivers.

Nursing Assessment

- Determine the patient's understanding of procedure and fixation device.
- Evaluate neurovascular status of involved body part.
- Inspect each pin site for redness, drainage, tenderness, pain, and loosening of the pin.
- Inspect open wounds for healing, infection, or devitalized tissue.
- Assess functioning of other body systems affected by injury or immobilization.

Nursing Diagnoses

- Anxiety related to appearance of external fixation device and wound
- Risk for Peripheral Neurovascular Dysfunction related to swelling, fixator, and underlying condition
- Risk for Infection related to open injury and skeletal pin insertion
- Impaired Physical Mobility related to presence of fixator and condition

Nursing Interventions

Relieving Anxiety

- If possible, before placement of the device, reassure the patient that, although the fixator appears clumsy and cumbersome, it should not hurt once it is in place.
- Emphasize the positive aspects of this device in treating complex musculoskeletal problems.
- Encourage the patient to verbalize reaction to the device.
P.1114
- Inform the patient that greater mobility can be achieved with an external fixation device, thereby minimizing the development of other system problems.
- Involve the patient in care and in the management of external fixator.

Maintaining Intact Neurovascular Status

- Assess neurovascular status frequently—every 15 minutes to 1 hour while swelling is significant and later, every 2 to 8 hours.
- Establish baseline of functioning for comparative monitoring. Complex musculoskeletal injuries frequently result in disruption of soft-tissue functioning.
- Elevate extremity to reduce swelling.
 - Extremity can be suspended by hanging the fixator directly on the traction frame.
 - Suspension is for control of edema and not for application of traction force.
- Report any change in neurovascular status.

NURSING ALERT

Assess neurovascular status frequently, and record findings.

Preventing Infection

- Provide site and fixator care.
 - Clean pin sites, and remove crusts with sterile cotton applicator, using solution as prescribed, or established standard of care.
 - Crusts formed by serous drainage can prevent fluid from draining and can cause infection.
 - A small amount of serous drainage from the pin sites is normal.
 - Note and report inflammation, swelling, tenderness, and purulent drainage at pin site.
 - Note skin tension at pin site—tension can cause discomfort. d. Report loosened pins.
 - Clean fixator with clean cloth and water as needed.
- Provide wound care.
 - The open wounds at the fracture site are usually treated by daily dressing changes.
 - Use sterile technique.
 - Note wound appearance. Monitor healing. Report signs of infection.
- Monitor for local and systemic indicators of infection.

Encouraging Mobility

- Encourage the patient to participate in care activities.
- Assure the patient that pain associated with injury will diminish as tissue reactions to injury and manipulation resolve and healing progresses.
- Inform the patient that the external fixator maintains the fracture in a stable position and that the extremity can be moved. Adjustment of the fixator is done by the health care provider. (Patient is taught how to adjust the circular fixator.)
- To move the extremity, grasp the frame and assist the patient to move. Reassure the patient that the fixator can withstand normal movement.
- Teach quadriceps exercises and ROM exercises for joints; usually started on first postoperative day.
- Teach crutch walking when soft-tissue swelling has diminished; encourage weight bearing as prescribed.

Patient Education and Health Maintenance

- Instruct patient to inspect around each pin site daily for signs of infection and loosening of pins. Watch for pain, soft-tissue swelling, and drainage.
- Teach patient how to clean around each pin daily, using aseptic technique. Do not touch wound with hands.
- Advise patient to clean fixator regularly—to keep it free of dust and contamination.
- Warn against tampering with clamps or nuts—can alter compression and misalign fracture.

- Review weight-bearing and other restrictions associated with injury and treatment regimen.
- Encourage the patient to follow rehabilitation regimen.

Evaluation: Expected Outcomes

- Verbalizes understanding of and comfort with fixator device
- Swelling relieved; neurovascular status intact
- No drainage or signs of infection at pin sites; pin tracts remain intact, no loosening of pins
- Ambulating with crutches as directed

ORTHOPEDIC SURGERY

Types of Surgery

- Open reduction—reduction and alignment of the fracture through surgical incision.
- Closed reduction—manipulation of bone fragments or joint dislocation without surgical incision.
- Internal fixation—stabilization of the reduced fracture with use of metal screw, plates, nails, or pins.
- Bone graft—placement of autologous or homologous bone tissue to replace, promote healing of, or stabilize diseased bone.
- Arthroplasty—repair of a joint; may be done through arthroscope (arthroscopy) or open joint repair.
- Joint replacement—type of arthroplasty that involves replacement of joint surfaces with metal or plastic materials.
- Total joint replacement—replacement of both articular surfaces within a joint.
- Meniscectomy—excision of damaged meniscus (fibrocartilage) of the knee.
- Tendon transfer—movement of tendon insertion point to improve function.
- Fasciotomy—cutting muscle fascia to relieve constriction or contracture.
- Amputation—removal of a body part.

Note: Joint replacement and amputation will be covered separately.

P.1115

Preoperative Management and Nursing Care

- Hydration, protein, and caloric intake are assessed. The goal is to maximize healing and reduce risk of complications by providing I.V. fluids, vitamins, and nutritional supplements as indicated.
- If patient has had previous corticosteroid therapy, it could contribute to current orthopedic condition (aseptic necrosis of the femoral head, osteoporosis) as well as affect the patient's response to anesthesia and the stress of surgery; may need corticotropin postoperatively.
- Evaluate for infection (cold, dental, skin, UTI), which could contribute to development of osteomyelitis after surgery. It is important to determine whether preoperative antibiotics will be necessary.
- Coughing and deep breathing, frequent vital sign and wound checks, repositioning are described to prepare patient.
- The patient should practice voiding in bedpan or urinal in recumbent position before surgery. This helps reduce the need for postoperative catheterization.
- The patient is acquainted with traction apparatus and the need for splint or cast, as indicated by type of surgery.
- Review discharge and rehabilitation options post-surgery.

 GERONTOLOGIC ALERT

Many elderly patients are at risk for poor healing due to undernutrition. Suggest obtaining prealbumin evaluation and nutrition consult in advance of surgery.

Postoperative Management and Nursing Care

- Neurovascular status is monitored, and swelling caused by edema and bleeding into tissues needs to be controlled.
- The affected area is immobilized and activity limited to protect the operative site and stabilize musculoskeletal structures.
- Hemorrhage and shock, which may result from significant bleeding and poor hemostasis of muscles that occur with orthopedic surgery, are monitored.
- Complications of immobility are prevented through aggressive and vigilant postoperative care.

Complications

- Compartment syndrome
- Shock
- Atelectasis and pneumonia
- Osteomyelitis, wound infections
- Thromboembolism
- Fat embolus
- Anemia

Nursing Diagnoses

- Risk for Deficient Fluid Volume related to hemorrhage
- Ineffective Breathing Pattern related to effects of anesthesia, analgesics, and immobility
- Risk for Peripheral Neurovascular Dysfunction related to swelling
- Acute Pain related to surgical intervention
- Risk for Infection related to surgical intervention
- Impaired Physical Mobility related to immobilization therapy and pain
- Imbalanced Nutrition: Less Than Body Requirements related to blood loss and the demands of healing

Nursing Interventions

Monitoring for Shock and Hemorrhage

- Evaluate BP and pulse rates frequently—rising pulse rate, widening pulse pressure, or slowly falling BP indicate persistent bleeding or development of a state of shock.
- Monitor for hemorrhage—orthopedic wounds have a tendency to ooze more than other surgical wounds.
 - Measure suction drainage if used.
 - Anticipate up to 500 mL of drainage in the first 24 hours, decreasing to less than 30 mL per 8 hours within 48 hours, depending on surgical procedure.
 - Report increased wound drainage or steady increase in pain of operative area.
- Administer I.V. fluids and blood products as ordered.

Promoting Effective Breathing Pattern

- Give respiratory depressant drugs cautiously. Monitor respiration depth and rate frequently. Opioid analgesic effects may be cumulative.

- Change position every 2 hours—mobilizes secretions and helps prevent bronchial obstruction.
- Encourage use of incentive spirometer and coughing and deep-breathing exercises every 2 hours.
- Auscultate lungs for atelectasis and retention of secretions.

Monitoring Peripheral Neurovascular Status

- Watch circulation distal to the part where cast, bandage, or splint has been applied.
- Prevent constriction leading to interference with blood or nerve supply.
- Elevate affected extremity, and apply ice packs, as directed, to reduce swelling and bleeding into tissues.
- Observe toes and fingers for healthy color and good capillary refill.
- Check pulses of affected extremity; compare with unaffected extremity.
- Note skin temperature and sensation.
- Document observations.

NURSING ALERT

If neurovascular problems are identified, loosen cast or dressing at once and notify surgeon.

Relieving Pain

- Institute pain-relief measures, as prescribed, as well as nursing measures as indicated: backrubs, soft light, soft tranquil music.
- Be aware that muscle spasms may contribute to pain experience.
- Use patient-controlled analgesia according to standards of care.
- Facilitate progression from I.V. medications to by mouth when tolerated.

P.1116

Preventing Infection

- Monitor vital signs for fever, tachycardia, or increased respiratory rate, which may indicate infection.
- Examine incision for redness, increased temperature, swelling, and induration.
- Note character of drainage.
- Evaluate complaints of recurrent or increasing pain.
- Administer antibiotic therapy as prescribed.
- Maintain aseptic technique for dressing changes and wound care.

Minimizing the Effects of Immobility

- Encourage patient to exercise by self with a planned program of exercise as soon as possible after surgery.
- Have patient flex knee, extend the knee with hip still flexed, and then lower the extremity to the bed.
- Encourage patient to move fingers and toes hourly.
- Advise patient to move joints that are not fixed by traction or appliance through their ROM as fully as possible.
- Suggest muscle-setting exercises (quadriceps setting) if active motion is contraindicated.
- Apply antiembolism stockings, foot pumps, or SCDs as prescribed by surgeon.
- Give prophylactic anticoagulants as directed (eg, heparin, warfarin, aspirin, a low-molecular-weight heparin).
- Encourage early resumption of activity.

Providing Adequate Nutrition

- Watch for signs and symptoms of anemia, especially after fracture of long bones:
 - Fatigue
 - Shortness of breath
 - Pallor
 - Tachycardia
- Monitor hemoglobin and hematocrit levels. Report below-normal results to health care provider.
- Encourage high-iron diet, and administer blood products and iron supplements as directed.
- Provide a balanced diet, and increase fluids and fiber to reduce incidence of constipation associated with immobility.
- Maintain urinary output and prevent infection and calculi by increased fluid intake.
- Watch for urinary retention—elderly men with some degree of prostatism may have difficulty in voiding.

Patient Education and Health Maintenance

- Teach patient activities that will minimize the development of complications (eg, turning, ankle pumps, antiembolism stockings, SCDs, coughing, and deep breathing).
- Instruct patient in dietary considerations to facilitate healing and minimize development of constipation and renal calculi.
- Inform patient of techniques that facilitate moving while minimizing associated discomforts (eg, supporting injured area and practicing smooth, gentle position changes).
- Encourage long-term follow-up and physical therapy (PT) exercises, as prescribed, to regain maximum functional potential.

Evaluation: Expected Outcomes

- BP stable; drainage from wound less than 30 mL
- Respirations, deep; performing effective deep breathing and coughing every 2 hours
- Extremity beyond operative site neurovascularly intact
- Verbalizes decreased pain
- Afebrile; incision without drainage
- Ambulating as directed
- Eats a balanced diet high in iron; hemoglobin within normal range

ARTHROPLASTY AND TOTAL JOINT REPLACEMENT

Arthroplasty is reconstructive surgery to restore joint motion and function and to relieve pain. It generally involves replacement of bony joint structure by a prosthesis.

Total joint arthroplasty is the replacement of both articular surfaces with metal or plastic components.

The most common types of joint replacement (see Figure 32-7) include:

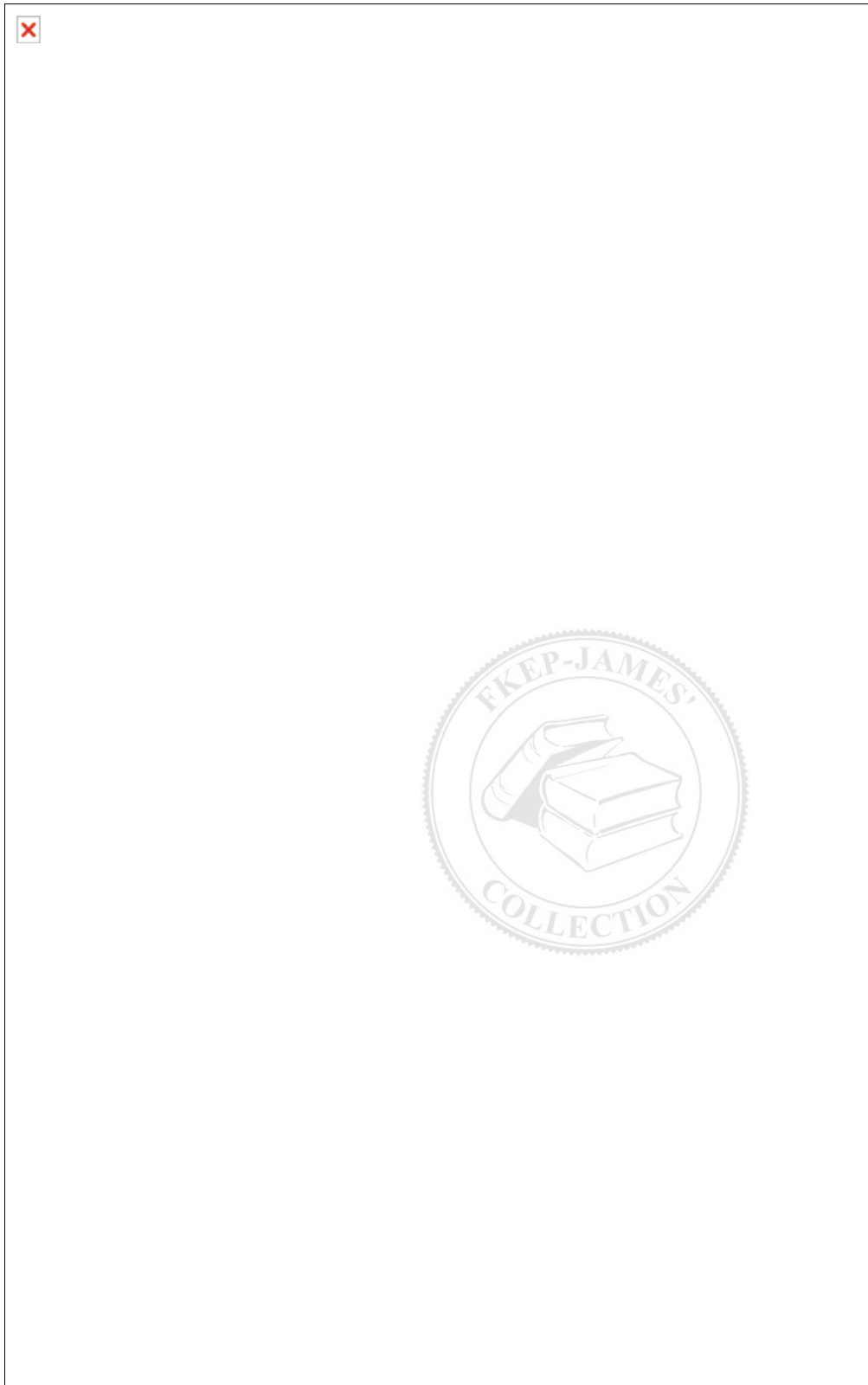


FIGURE 32-7 Hip and knee replacement.

P.1117

Total hip replacement (total joint arthroplasty)—replacement of a severely damaged hip with an artificial joint. Although a large number of implants are available, most consist of a metal femoral component topped by a spherical ball fitted into a plastic acetabular socket.

Total knee arthroplasty—implant procedure in which tibial, femoral, and patellar joint surfaces are replaced because of destroyed knee joint.

Total shoulder arthroplasty—replacement of the humeral head and the glenoid surface with prostheses.
Clinical Indications

- For patients with unremitting pain and irreversibly damaged joints:
 - Primary OA.
 - Rheumatoid arthritis (RA).
- Selected fractures (eg, femoral neck fracture).
- Failure of previous reconstructive surgery (osteotomy, cup arthroplasty, femoral neck fracture complications—nonunion, avascular necrosis).
- Congenital hip disease.
- Pathologic fractures from metastatic cancer.
- Joint instability.

Considerations

- The prostheses are of various designs and may be fixed to the remaining bone by cement, press fit, or bone ingrowth.
- Selection of the prosthesis and fixation technique depends on patient's bone structure, joint stability, and other individual characteristics, including age, weight, and activity level.
- Arthroplasty is an exacting and meticulous procedure. To reduce the risk of an infected prosthesis, special precautions are carried out in the operating room (impermeable operating room attire, clean air system) to reduce particulate matter and bacterial count of the air.

Preoperative Management and Nursing Care

- Infections (bladder, dental, skin) are ruled out—potential foci of infection for seeding prosthesis infection.
- Preoperative patient teaching is provided.
 - Postoperative regimen (eg, extended exercise program) that will be carried out after surgery is explained; atrophied muscles must be reeducated and strengthened.
 - Isometric exercises (muscle setting) of quadriceps and gluteal muscles are taught.
 - Bed-to-wheelchair transfer without going beyond the hip flexion limits (usually 60 to 90 degrees) is taught.
 - Non-weight- and partial weight-bearing ambulation with ambulatory aid (walker, crutches) is taught to facilitate postoperative ambulation.
 - Abduction splint, knee immobilizer, or continuous passive motion is demonstrated if equipment will be used postoperatively.
- Antiembolism stockings are applied to minimize development of thrombophlebitis.
- Skin preparation includes antimicrobial solution to reduce skin microorganisms, a potential source of infection.
- Antibiotics are administered, as prescribed, to ensure therapeutic blood level during and immediately after surgery. Antimicrobials usually are given immediately preoperatively, intraoperatively, and postoperatively to reduce incidence of infection.
- Cardiovascular, respiratory, renal, and hepatic function are assessed, and measures are taken to maximize general health condition.
- Review discharge and rehabilitation options post-surgery.

Postoperative Management

Use of Appropriate Positioning

To prevent dislocation of prosthesis and facilitate healing. Numerous modifications are required in positioning these patients postoperatively.

- After hip arthroplasty:
 - The patient is usually positioned supine in bed.
 - The affected extremity is held in slight abduction by either an abduction splint or pillow or Buck's extension traction to prevent dislocation of the prosthesis.
 - Avoid acute flexion of the hip.
 - Two nurses turn patient on unoperated side while supporting operated hip securely in an abducted position; the entire length of leg is supported by pillows.
 - Use pillows to keep the leg abducted; place pillow at back for comfort.
 - Use overhead trapeze to assist with position changes.
 - The bed is usually not elevated more than 45 to 60 degrees; placing patient in an upright sitting position puts a strain on the hip joint and may cause dislocation.
 - A fracture bedpan is used. Instruct patient to flex the unoperated hip and knee and pull up on the trapeze to lift buttocks onto pan. Instruct patient not to bear down on the operated hip in flexion when getting off the pan.
- After knee arthroplasty:
 - The knee may be immobilized in extension with a firm compression dressing and an adjustable soft extension splint or long-leg plaster cast.
 - Leg is elevated on pillows to control swelling.
 - Alternatively, continuous passive motion may be started to facilitate joint healing and restoration of joint ROM.

NURSING ALERT

The patient must not adduct or flex the operated hip—may lead to subluxation or dislocation of the hip. Signs of joint dislocation include shortened extremity, increasing discomfort, inability to move joints.

Detering Complications

- Provide aggressive care and continuous assessment.
- Prevent thromboembolism by continuous use of elastic hose and SCD while patient is in bed. Discontinue SCD when patient is ambulatory.

P.1118

Promoting Early Ambulation

- Within 1 day after surgery, short periods of standing may be ordered.
 - Monitor for orthostatic hypotension.
 - Weight bearing may be limited with ingrowth prosthesis to prevent disruption of bone growth.
- Transfers to the chair or ambulation with aids, such as walkers, are encouraged as tolerated and based on patient's condition and type of prosthesis.

Nursing Diagnoses

See Orthopedic Surgery, page 1115.

- Impaired Physical Mobility related to prosthetic joint

Nursing Interventions

See page 1115.

Promoting Mobility

After Hip Arthroplasty

- Use an abduction splint or pillows while assisting patient out of bed.
 - Keep the hip at maximum extension.
 - Instruct patient to pivot on unoperated extremity.
 - Assess patient for orthostatic hypotension.
- When ready to ambulate, teach patient to advance the walker and then advance the operated extremity to the walker, permitting weight bearing as prescribed.
- With increased stability, assist patient to use crutches or cane as prescribed.
- Encourage practice of PT exercises to strengthen muscles and prevent contractures.
- Encourage bed mobility by providing an overhead frame/trapeze.

After Knee Arthroplasty

- Assist patient with transfer out of bed into wheelchair with extension splint in place.
- Ensure that no weight bearing is permitted until prescribed by the orthopedic surgeon.
- Apply continuous passive motion equipment or carry out passive ROM exercises as prescribed.

Community and Home Care Considerations

- Encourage patient to continue to wear elastic stockings after discharge until full activities are resumed.
- Ensure that patient avoids excessive hip adduction, flexion, and rotation for 6 weeks after hip arthroplasty (hip precautions).
 - Avoid sitting in low chair or toilet seat to avoid flexing hip more than 90 degrees.
 - Keep knees apart; do not cross legs.
 - Limit sitting to 30 minutes at a time—to minimize hip flexion and the risk of prosthetic dislocation and to prevent hip stiffness and flexion contracture.
 - Avoid internal rotation of the hip.
 - Follow weight-bearing restrictions from surgeon.
- Encourage quadriceps setting and ROM exercises as directed.
 - Have a daily program of stretching, exercise, and rest throughout life-time.
 - Do not participate in any activity placing undue or sudden stress on joint (jogging, jumping, lifting heavy loads, gaining weight, excessive bending and twisting).
 - Use a cane when taking fairly long walks.
- Suggest self-help and energy-saving devices:
 - Handrails by toilet.
 - Raised toilet seat if there is some residual hip flexion problem.
 - Bar-type stool for kitchen work.
 - Occupational therapy (OT) devices for dressing, reaching.
 - Adequate home lighting to prevent falls.
 - Removal of scatter rugs.
- Advise patient to sleep with two pillows between legs to prevent turning over in sleep. Patient should get out of bed with nonoperative leg.
- Tell patient to lie prone when able twice daily for 30 minutes to promote full extension of hip.
- Monitor for late complications—deep infection, increased pain or decreased function associated with loosening of prosthetic components, implant wear, dislocation, fracture of components, avascular necrosis or dead bone caused by loss of blood supply; heterotrophic ossification (formation of bone in periprosthetic space).

- Assess home for safety to prevent falls—long phone cords, scatter rugs, pets that run underfoot, slippery floors.

Patient Education and Health Maintenance

- Teach patient use of supportive equipment (crutches, canes, raised toilet seat) as prescribed.
- Advise patient to notify all health care providers about prosthetic joint because prophylactic antibiotic (to prevent implant infection) will be needed for first 2 years following joint replacement, if undergoing any procedure known to cause bacteremia (tooth extraction, manipulation of genitourinary tract). Patients with inflammatory arthropathies, immunosuppressive therapies, and immunocompromising conditions will need prophylaxis indefinitely.
- Avoid MRI studies because of implanted metal component.
- Advise patient that metal component in hip or knee may set off metal detectors (airports, some buildings). The patient should carry a medical identification card.
- New hip or knee is designed for low-impact exercise, such as walking, golf, dancing. High-impact exercises, such as jogging, may cause the prosthesis to loosen.

Evidence Base

American Dental Association and American Academy of Orthopedic Surgeons. (2003). Antibiotic prophylaxis for dental patients with total joint replacements. *Journal of the American Dental Association*

134:895-898.
P.1119



Evaluation: Expected Outcomes

Maintains proper positioning without evidence of complications

AMPUTATION

Amputation is the total or partial surgical removal of an extremity. Amputation is considered a surgical reconstructive procedure.

Indications

- Inadequate tissue perfusion caused by peripheral vascular diseases
- Severe trauma
- Malignant tumor
- Congenital deformity
- Osteomyelitis/infection

Types of Amputation

Open (Guillotine)

- Used with infection and for patients who are poor surgical risks.
- Wound heals by granulation over time or secondary closure 1 week later.

Closed (Myoplastic or Flap)

- Residual limb is covered by a flap of skin.
- Flap of skin is sutured posteriorly.
- Most common technique used for vascular disease.

Surgical Considerations

- The surgeon considers possible limb-salvage techniques.
 - Revascularization (Research is focusing on angiogenesis and stem cell therapy.)
 - Hyperbaric oxygenation
 - Tumor resection with bone grafting
- Determines level for amputation based on level of maximal viable tissue for wound healing.
- Develops a functional, nontender, pressure-tolerant residual limb.

Types of Dressings

Soft Dressing

- Secured with elastic bandage.
- Permits wound inspection.
- Used with patients who should avoid early weight bearing (eg, those with peripheral vascular disease).

Closed, Rigid Plaster Dressing

- Applied immediately after surgery (ie, immediate postoperative prosthesis).
- Controls edema.
- Supports circulation, promoting healing.
- Minimizes pain on movement.
- Shapes residual limb.
- Permits attachment of prosthetic extension (pylon) and early ambulation.

Preoperative Management

- Hemodynamic evaluation is performed through testing, such as angiography, arterial blood flow, and xenon 133 scan—to determine optimal amputation level.
- Culture and sensitivity tests of draining wounds are done to assist in control of infection preoperatively.
- Evaluation of sound (contralateral) extremity is performed to determine functional potential postoperatively.
- Evaluation of cardiovascular, respiratory, renal, and other body systems is necessary to determine preoperative condition of patient and reduce the risks of surgery by optimizing function.
- Nutritional status is evaluated and optimized with adequate protein to enhance wound healing.
- Exercises are taught to strengthen muscles for use of ambulatory aids (lower limb amputee).
 - Flex and extend arms while holding traction weights.
 - Do push-ups from a prone position if feasible.
 - Do sit-ups from a seated position if feasible.
- Use of ambulatory aids is taught.
 - Instills confidence in ability.
 - Maintains mobility.
 - Prepares for postoperative mobility.
- Phantom sensation is explained—the patient will continue to “feel” the amputated body part for some time.
- Emotional support is given.
 - Support concept of amputation as a surgical reconstructive procedure.
 - Explore patient's perception of procedure and effect on lifestyle.
 - Avoid unrealistic and misleading reassurance—management of prosthesis can be slow and painful.

 GERONTOLOGIC ALERT

Amputation of the lower extremity can be a life-threatening procedure, especially in patients older than age 60 with peripheral vascular disease. Significant morbidity accompanies above-knee amputations because of associated poor health and disease as well as the complications of sepsis and malnutrition and the physiologic insult of amputation.

Postoperative Management

- The extremity should be in full extension and may be elevated (if possible). An extension splint/immobilizer may be indicated.
- Complications are monitored—hemorrhage, infection, unrelieved phantom pain, nonhealing wound.
- Rehabilitation is initiated through PT and prosthetic fitting (if indicated).
- Optimal treatment is provided for diabetes mellitus, heart disease, infection, stroke, chronic obstructive pulmonary disease, peripheral vascular disease, and age-related deterioration, which are factors limiting rehabilitation.
- If wound breakdown, infection, delay in healing of residual limb occur, therapy is provided to prevent delay in rehabilitation.
- Acceptance of body image change is promoted.

P.1120

Nursing Diagnoses

- Risk for Deficient Fluid Volume related to hemorrhage from disrupted surgical homeostasis
- Ineffective Tissue Perfusion related to edema and tissue responses to surgery and prosthesis
- Ineffective Coping related to change in body image
- Acute or Chronic Pain related to surgical procedure and phantom sensations
- Impaired Physical Mobility related to amputation, muscle weakness, alteration in body weight distribution

Nursing Interventions

 NURSING ALERT

Prevention of complications associated with a major operation and facilitation of early rehabilitation are essential to prevent prolonged disability. Frequent monitoring of patient's physiologic responses to anesthesia, surgery, and immobility is required.

Monitoring Fluid Balance

- Monitor patient for systemic symptoms of excessive blood loss—hypotension, widening pulse pressure, tachycardia, diaphoresis, decreased level of consciousness.
- Watch for excessive wound drainage.
 - Keep tourniquet (in view) attached to end of bed to apply to residual limb (stump) if excessive bleeding occurs.
 - Reinforce dressing as required, using aseptic technique.
 - Measure suction drainage.
 - Maintain accurate record of bloody drainage on dressing and in drainage system.
- Monitor intake and output for fluid balance.

Maintaining Adequate Tissue Perfusion

- Control edema.
 - Elevate residual limb to promote venous return.

- Use air splint if prescribed.
- Maintain pressure dressing.
 - Reapply if necessary, using sterile dressing secured with elastic bandage.
 - Notify surgeon if rigid cast dressing comes off.

Supporting Effective Coping

- Accept patient responses to loss of body part (ie, depression, withdrawal, denial, frustration).
- Encourage expression of fears and concerns.
- Recognize that modification of body image takes time.
- Encourage participation in rehabilitation planning and self-care.
- Assist patient to adapt to changes in self-care activities.
 - Upper extremity amputation—encourage independence in one-handed self-care activities using one-handed aids (eg, one-handed knife) as needed.
 - Lower extremity amputation—encourage mobility using transfer assistance and ambulatory aids as needed.

Controlling Pain

- Surgical pain
 - Assess patient's pain experience.
 - Administer prescribed medications, as needed, to control postoperative pain.
 - Use nonpharmaceutical pain-management techniques, such as progressive muscle relaxation and imagery.
 - Recognize that increasing discomfort may indicate presence of hematoma, infection, or necrosis.
- Phantom sensations (pain)
 - Anticipate complaint of pain and sensation located in the missing limb (“phantom pain”).
 - Use physical modalities (eg, wrapping, temperature changes) and transcutaneous electrical nerve stimulation (TENS), if prescribed, in relieving discomfort.
 - Encourage patient activity to decrease awareness of phantom limb pain.
 - Reassure patient that phantom limb pain will diminish over time.

Promoting Physical Activity

- Encourage frequent repositioning in bed.
- Teach patient to avoid long periods in one position.
 - Avoids dependent edema.
 - Avoids flexion deformity.
 - Avoids skin pressure areas.
- Prevent deformities.
 - Lower extremity amputations—hip flexion contracture (avoid placing residual limb on pillow; encourage prone position twice per day) and abduction deformity (use trochanter roll; avoid pillow between legs).
 - Upper extremity amputations—postural abnormalities (encourage good posture).
- Encourage active ROM and muscle-strengthening exercises when prescribed to:
 - Minimize muscle atrophy.
 - Increase muscle strength.
 - Prepare residual limb for prosthesis.
- Promote reestablishment of balance (amputation alters distribution of body weight).
 - Transfer to chair within 48 hours after surgery.

- Instruct and guard lower limb amputee during balance exercises (ie, arise from chair; stand on toes holding on to chair; bend knee holding onto chair; balance on one leg without support; hop on one foot while holding on to chair).
- Supervise ambulation, use of wheelchair, and self-care activities.

Patient Education and Health Maintenance

- Teach patient and family how to wrap residual limb with elastic bandage to control edema and to form a firm conical shape for prosthesis fitting (see Figures 32-8 and 32-9).
 - Wrapping generally begins 1 to 3 days after surgery or after hard plaster dressing is removed.
 - Use diagonal figure-eight bandaging technique.
 - Wrap distal to proximal to maintain pressure gradient and to control edema.
 - Begin wrapping with minimal tension, and increase as wound heals and sutures are removed.
 - Flatten skin at ends of incision to ensure conical stump shape.
 - Rewrap residual limb a couple of times per day and as necessary to achieve a smooth, graded tension dressing.
 - Rewrap if patient complains of more pain—dressing is probably too tight.
 - Keep residual limb wrapped at all times except when bathing.
- Teach patient residual limb conditioning.
 - Push the residual limb against a soft pillow.
 - Gradually push residual limb against harder surfaces.
 - Massage healed residual limb to soften scar, decrease tenderness, and improve vascularity.
- Fitting of prosthesis.
 - Note residual limb contour.
 - Assess for residual limb contraction.
 - When maximum shrinkage occurs, the prosthetist measures and fits the prosthesis.
 - Adjustments are made by the prosthetist to minimize skin problems.
- Continuing care of residual limb and prosthesis.
 - Instruct patient to wash and dry limb thoroughly at least twice per day, removing all soap residue, to prevent skin irritation and infection.
 - Avoid soaking residual limb because it results in edema.
 - Inspect residual limb and skin under prosthesis harness daily for pressure, irritation, and actual skin breakdown.
 - Wear residual limb sock or cotton underwear—to absorb perspiration and to avoid direct contact between prosthetic socket or harness and skin.
 - Avoid wrinkles in residual limb sock—potential pressure areas.
 - Wipe socket of prosthesis with a damp cloth when prosthesis is removed for evening.
 - Have prosthesis checked periodically.
- Teach patient to protect the remaining extremity from injury and to secure prompt treatment of problems.

P.1121

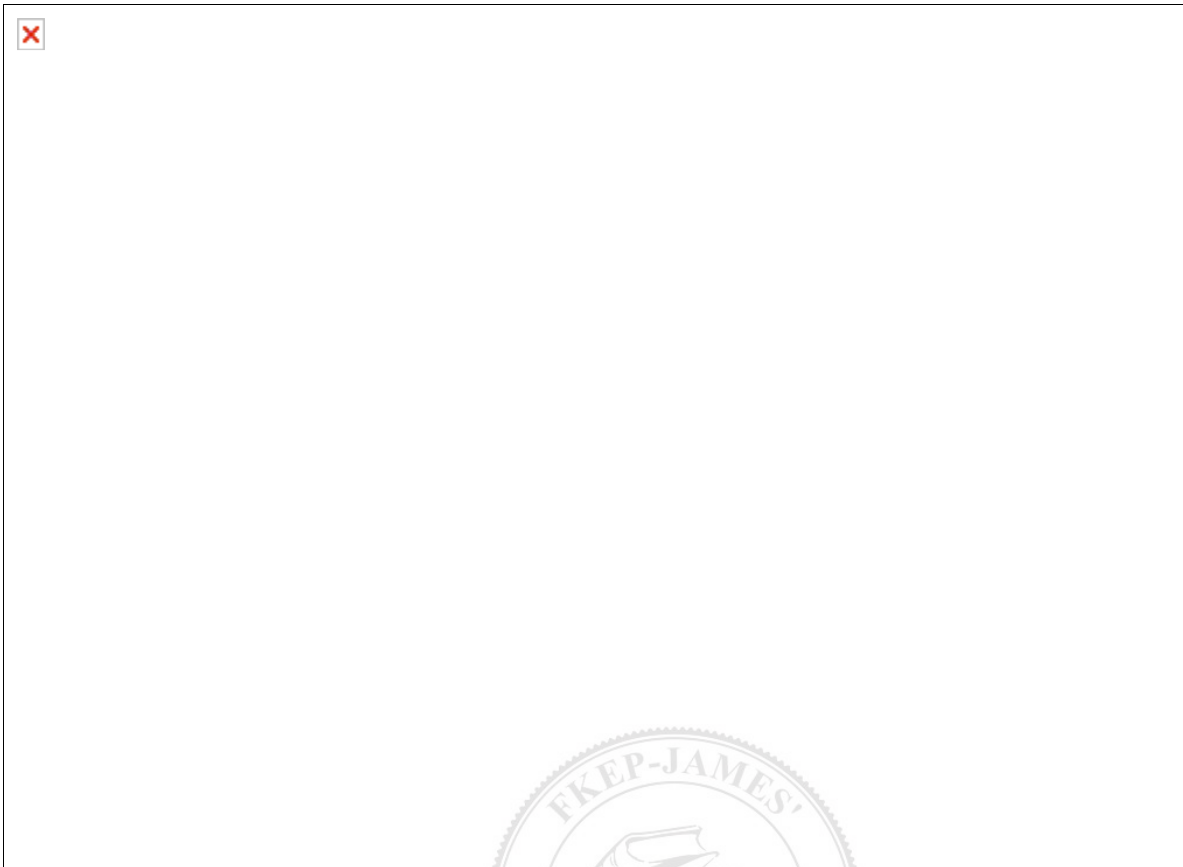
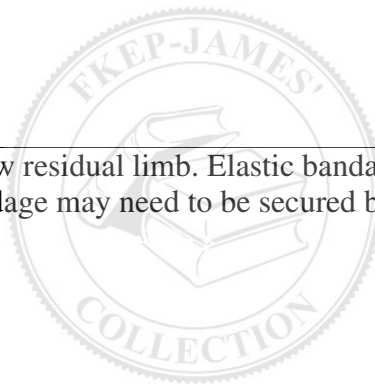


FIGURE 32-8 Wrapping above-elbow residual limb. Elastic bandaging reduces edema and shapes the residual limb for the prosthesis. Bandage may need to be secured by wrapping across back and shoulders.



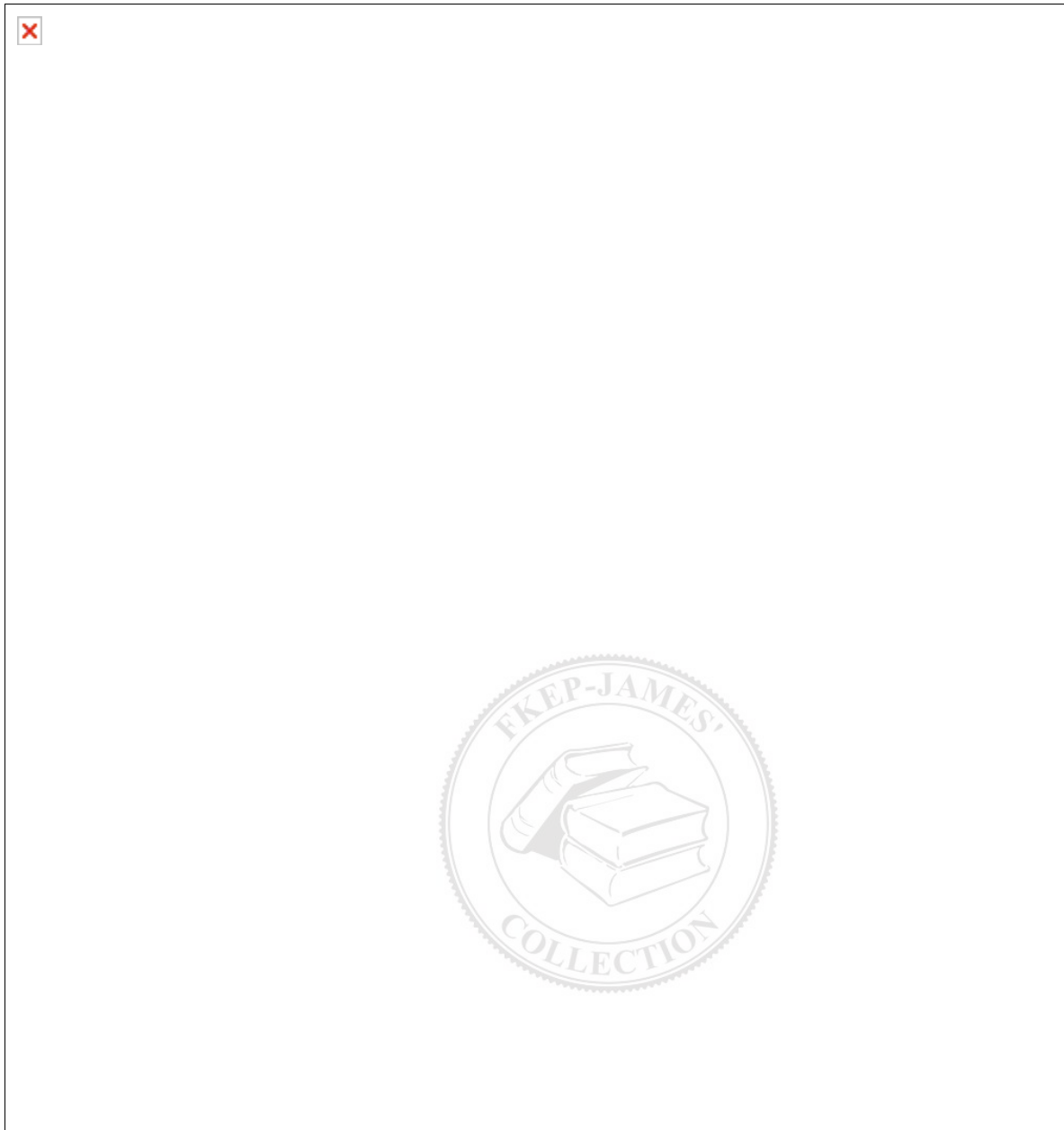


FIGURE 32-9 Wrapping above-knee residual limb. Elastic bandaging reduces edema and shapes the residual limb in a firm conical form for the prosthesis.

P.1122

Evaluation: Expected Outcomes

- Vital signs stable; dressing reinforced once in 4 hours
- Pressure dressing intact; stump elevated without edema
- Participates in care plan; expresses concerns about independence
- Verbalizes relief of incisional pain; dull phantom sensation tolerable
- Performs ROM actively; transfers to wheelchair with assistance; participates in PT and OT activities

MUSCULOSKELETAL TRAUMA

See Standards of Care Guidelines.

CONTUSIONS, STRAINS, AND SPRAINS

Evidence Base

Institute for Clinical Systems Improvement (ICSI). (2006). Ankle sprain. Bloomington, Minn.:

ICSI. Available: www.guideline.gov.



A contusion is an injury to the soft tissue produced by a blunt force (blow, kick, or fall). A strain is a microscopic tearing of the muscle caused by excessive force, stretching, or overuse. A sprain is an injury to ligamentous structures surrounding a joint; it is usually caused by a wrench or twist resulting in a decrease in joint stability.

Clinical Manifestations

Contusion

- Hemorrhage into injured part (ecchymosis)—from rupture of small blood vessels; also associated with fractures.
- Pain, swelling, and ecchymosis.
P.1123
- Hyperkalemia may be present with extensive contusions, resulting in destruction of body tissue and loss of blood.

STANDARDS OF CARE GUIDELINES

Caring for a Patient with Musculoskeletal Trauma, Surgery, Casting, or Immobilization

When caring for a patient with musculoskeletal trauma, surgery, casting, or immobilization, provide the following care as indicated:

- Check neurovascular status of involved extremities.
- Palpate for intact and equal pulses bilaterally.
- Palpate for proper warmth of the skin.
- Check for brisk capillary refill.
- Test sensation to light touch and pain.
- Observe for unusual or increased swelling.
- Ensure that patient can move affected parts.
- Ensure proper positioning for comfort and alignment.
- Determine pressure points and take precautions to prevent pressure sores.
- Medicate to control pain, particularly before movement, procedures, and physical therapy.
- Provide diversional activities and emotional support during long immobilizations.
- Always document assessments and interventions meticulously, realizing that patient may be involved in Workers' Compensation claim or litigation due to accident and that records will be essential to patient's future well-being.

This information should serve as a general guideline only. Each patient situation presents a unique set of clinical factors and requires nursing judgment to guide care, which may include additional or alternative measures and approaches.

Strain

- Hemorrhage into the muscle.
- Swelling.
- Tenderness.
- Pain with isometric contraction.
- May be associated spasm.

Sprain

- Rapid swelling—due to extravasation of blood within tissues.
- Pain on passive movement of joint.
- Increasing pain during first few hours due to continued swelling.

Management

- X-ray may be done to rule out fracture.
- Immobilize in splint, elastic wrap, or compression dressing to support painful structures and control swelling.
- Apply ice while swelling is present.
- Analgesics usually include nonsteroidal anti-inflammatory drugs (NSAIDs).
- Severe sprains may require surgical repair or cast immobilization.

Nursing Interventions and Patient Education

- Elevate the affected part to reduce swelling. Maintain splint or immobilization as prescribed.
- Apply cold compresses for the first several days (15 to 20 minutes at a time every few hours)—to produce vasoconstriction, decrease edema, and reduce discomfort (do not apply ice directly to skin). Ice may be needed for up to a week to control acute swelling.
- Assess neurovascular status of contused extremity every 1 to 4 hours as patient's condition indicates.
- Instruct patient on use of pain medication as prescribed.
- Ensure correct use of crutches or other mobility aid with or without weight bearing, as prescribed.
- Educate on need to rest injured part for about a month to allow for healing.
- Teach patient to resume activities gradually.
- Teach patient to avoid excessive exercise of injured part.
- Teach patient to avoid reinjury by “warming up” before exercise and stretching tendons and muscles before and after exercise.
- Complementary methods, such as acupuncture, biofeedback, and imagery, may contribute to healing by reducing anxiety and pain.

NURSING ALERT

Teach patients to use PRICE at home for minor injuries: Protection—of the affected part from injury; Rest—to promote healing; Ice—to control swelling (do not use heat until acute swelling is relieved); Compression—with an elastic wrap or splint to control swelling and prevent stiffness, can be removed at night; Elevation—above the level of the heart to reduce swelling.

TENDINITIS

Tendinitis is an inflammation of a tendon caused by a lack of sufficient lubrication of the tendon sheath. May be caused by acute stress on tendon structure or by chronic overuse.

Clinical Manifestations

- Onset of pain may occur immediately after activity or delayed up to a day later. ROM and resistance testing is painful.
- Mild swelling occurs, and the tendon sheath is tender to the touch.
- Sudden onset of sharp pain in extremity and hearing or feeling a “snap” are associated with tendon rupture, as in Achilles tendinitis due to running injuries or stop-start activities such as basketball. Also occurs in gastrocnemius and biceps

Management

- X-rays are not usually diagnostic.

- Thompson's test helps with diagnosis of Achilles rupture. Patient kneels on chair or lies prone. Examiner squeezes calf of affected leg. Normal response: foot moves downward, denoting intact tendon. If foot does not move, tendon is assumed to be ruptured.
- Initial treatment includes rest, ice, compression, elevation (RICE).
- Splinting or casting for up to 6 weeks in functional position usually necessary.
- Surgical intervention may be necessary if rupture is complete.
- PT to regain strength and function.
- Corticosteroid injection.
- NSAIDs for pain and inflammation.

Nursing Interventions and Patient Education

- Ensure understanding of need for proper immobilization for full time period even though fracture is not present.
- Encourage the use of warm compresses after 24 hours to relieve pain and inflammation.
- Advise patient not to return to full activity until strength is equal to unaffected extremity.
- Teach proper warm-up before exercise and sports activities (stretching of all major tendons).

BURSITIS

Bursitis is a painful inflammation of the bursae, fluid-filled sacs lined with synovium similar to the lining of the joint spaces. Bursae reduce friction between tendons and bones or tendons and ligaments. They are found over joints with bony prominences, such as the trochanter, patella, and olecranon. Friction between skin and musculoskeletal tissues may result in bursitis.

Clinical Manifestations

- Pain around a joint—commonly the knee, elbow, shoulder, and hip.
P.1124
- Varying degrees of redness, warmth, and swelling may be visible.
- There is point tenderness and limited ROM on examination.

Management and Nursing Interventions

- Rest and immobilization of affected joint
- Ice for the first 48 hours; moist heat every 4 hours thereafter
- Nonopioid analgesics such as NSAIDs
- ROM exercises
- Corticosteroid injection into the area
- Surgery indicated when calcified deposits or adhesions have diminished function

PLANTAR FASCIITIS

Plantar fasciitis is inflammation of the fascia that runs along the bottom of the foot from heel to toes. As the fascia is stretched, microscopic tears develop at the point where fascia attaches to the calcaneus.

Clinical Manifestations

- Pain along sole of foot, usually unilateral, but may be bilateral.
- Worse upon arising, long period of standing, and walking.
- Tenderness of heel area.

Management and Nursing Interventions

- Rest—decrease walking, running, exercise, standing.
- NSAIDs for pain and inflammation.
- Good supportive footwear.
- Orthotic devices may be beneficial.
 - Heel cup to cushion the heel (OTC).
 - Arch support orthotics for pes planus (flat foot).
 - Cushioning of arches for pes cavus (high arch).
- Stretching exercises several times per day.
- Massage of bottom of foot.
- Steroid injection into painful area.
- Surgery for release of fascia as last resort.

TRAUMATIC JOINT DISLOCATION

Dislocation of a joint occurs when the surfaces of the bones forming the joint are no longer in anatomic contact. This is a medical emergency because of associated disruption of surrounding blood and nerve supplies. Shoulder, fingers, elbow are the most commonly dislocated joints. Mechanism of injury can be anterior, posterior (most common), lateral, or medial force.

Clinical Manifestations

- Pain.
- Deformity.
- Change in the length of the extremity.
- Loss of normal movement.
- X-ray confirmation of dislocation without associated fracture.

Management

- Immobilize part while patient is transported to emergency department, X-ray department, or clinical unit.
- Secure reduction of dislocation (bring displaced parts into normal position) as soon as possible to prevent circulatory or nerve impairments; usually performed under anesthesia.
- Stabilize reduction until joint structures are healed to prevent permanently unstable joint or aseptic necrosis of bone.

Nursing Interventions and Patient Education

- Assess neurovascular status of extremity before and after reduction of dislocation.
- Administer or teach self-administration of pain medications such as NSAIDs.
- Ensure proper use of immobilization device after reduction.
- Review instructions for activity restrictions and need for PT and follow-up.

KNEE INJURIES

The knee ligaments provide stability to the knee joint. These ligaments promote rotational stability (anterior cruciate ligament [ACL] and posterior cruciate ligament) and prevent varus and valgus instability (medial and lateral collateral ligaments). Pieces of cartilage that stabilize the knee internally are known as the medial and lateral menisci. ACL injuries and medial meniscus tears are common due to sports injuries.

Clinical Manifestations

- Severe stresses are applied to the knee during many sports activities (eg, soccer, skiing, running).
- Injury to knee structures occurs during rapid position changes involving flexing and twisting of

the joint.

- Torn cartilage (meniscus) causes pain, tenderness, joint effusion, clicking sensations, and decreased ROM.
- Knee ligaments may be torn, resulting in pain on ambulation, swelling, and joint instability. The patellar tendon may rupture.

Management

- Special assessment techniques are done to detect ACL injury (see Table 32-1).
- MRI shows injury to soft tissue involved.
- Some injuries may be immobilized (splint, brace, or cast) and treated with PT.
- ACL reconstruction frequently indicated.
 - Arthroscopic surgery preferred; synthetic ligaments selected where ligaments failed. Graft rejection is a complication.
 - Postoperative continuous passive motion used.
 - Postoperative ACL rehabilitation program includes progressive ROM, bracing (not done with synthetic ligaments).
 - Long-term bracing during sports controversial.

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- Meniscal injury—damaged cartilage removed.
 - Arthroscopic or open meniscectomy.
 - Rehabilitation includes progressive ROM and quadriceps strengthening.

TABLE 32-1 Assessment Techniques for Anterior Cruciate Ligament Injury

TEST	DESCRIPTION	POSITIVE FINDING
Anterior drawer test	Place patient supine with knee in 90 degrees of flexion with foot flat on table. Proximal tibia is pulled forward by examiner using two hands.	Tibia subluxes (dislocates) forward on femur.
Lachman test	Place patient supine with knee in 15 to 20 degrees of flexion. Distal femur is grasped by examiner with one hand while the other hand grasps the proximal tibia and applies forward pressure.	Tibia subluxes forward on femur.
Pivot shift test (evaluates anterolateral rotational stability)	Place patient supine with knee slightly flexed. Examiner grasps patient's ankle in one hand and places palm of other hand over the lateral aspect of the knee distal to the joint. Lower leg is extended and internally rotated, applying a valgus (lateral) stress to knee.	Tibia subluxes and reduces itself ("pivots and shifts")

Nursing Interventions and Patient Education

- After arthroscopic surgery, ensure proper use of crutches, as indicated, and encourage pain control through medications as prescribed and RICE.
- For open joint surgery, see care of patient undergoing orthopedic surgery, page 1115.
- Teach patient strengthening exercises for affected extremity.
- Teach patient to prevent fatigue through rest periods, conservation of energy.
- Advise on prevention of injuries using proper equipment and footwear for sports.

FRACTURES

A fracture is a break in the continuity of bone. A fracture occurs when the stress placed on a bone is

greater than the bone can absorb. Muscles, blood vessels, nerves, tendons, joints, and other organs may be injured when fracture occurs.

Types of Fractures

- Complete—involves the entire cross section of the bone, usually displaced (abnormal position).
- Incomplete—involves a portion of the cross section of the bone or may be longitudinal.
- Closed (simple)—skin not broken.
- Open (compound)—skin broken, leading directly to fracture.
 - Grade I—minimal soft tissue injury.
 - Grade II—laceration greater than 1 cm without extensive soft tissue flaps.
 - Grade III—extensive soft tissue injury, including skin, muscle, neurovascular structure, with crushing.
- Pathologic—through an area of diseased bone (osteoporosis, bone cyst, bone tumor, bony metastasis).

Patterns of Fracture

See Figure 32-10, page 1126.

- Greenstick—one side of the bone is broken and the other side is bent.
- Transverse—straight across the bone.
- Oblique—at an angle across the bone.
- Spiral—twists around the shaft of the bone.
- Comminuted—bone splintered into more than three fragments.
- Depressed—fragments are driven inward (seen in fractures of the skull and facial bones).
- Compression—bone collapses in on itself (seen in vertebral fractures).
- Avulsion—fragment of bone pulled off by ligament or tendon attachment.
- Impacted—fragment of bone wedged into other bone fragment.
- Fracture-dislocation—fracture complicated by the bone being out of the joint.
- Other—described according to anatomic location: epiphyseal (end of large bones containing growth plate), supracondylar (above the articular prominence of a bone), midshaft, intra-articular.

GERONTOLOGIC ALERT

Osteoporosis is a major risk for fractures, particularly hip and vertebral compression fractures.

Clinical Manifestations

Physical Findings

- Pain at site of injury
- Swelling
- Tenderness
- False motion and crepitus (grating sensation)
- Deformity
- Loss of function
- Ecchymosis
- Paresthesia

P.1126



FIGURE 32-10 Patterns of fractures.

Altered Neurovascular Status

- Injured muscle, blood vessels, nerves.
- Compression of structures resulting in ischemia.
- Findings:
 - Progressive uncontrollable pain.
 - Pain on passive movement.
 - Altered sensations (paresthesia).
 - Loss of active motion.
 - P.1127

 - Diminished capillary refill response, diminished distal pulse.
 - Pallor.

Shock

- Bone is very vascular.
- Overt hemorrhage through open wound.
- Covert hemorrhage into soft tissues (especially with femoral fracture) or body cavity, as with pelvic fracture.
- May be fatal if not detected.

Diagnostic Evaluation

- X-ray and other imaging studies to determine integrity of bone.
- Blood studies (complete blood count [CBC], electrolytes) with blood loss and extensive muscle damage—may show decreased hemoglobin level and hematocrit.
- Arthroscopy to detect joint involvement.
- Angiography if associated with blood vessel injury.
- Nerve conduction and electromyogram studies to detect nerve injury.

Management

For emergency management, see page 1204.

Principles of Management

- Factors influencing choice of management include:
 - Type, location, and severity of fracture.
 - Soft tissue damage.
 - Age and health status of patient, including type and extent of other injuries.
- Goals include:
 - To regain and maintain correct position and alignment.
 - To regain the function of the involved part.
 - To return patient to usual activities in the shortest time and at the least expense.
- The management process is a three-step process:
 - Reduction—setting the bone; refers to restoration of the fracture fragments into anatomic position and alignment.
 - Immobilization—maintains reduction until bone healing occurs (see Figures 32-11 and 32-12).
 - Rehabilitation—regaining normal function of the affected part.

Approaches to Management

Vary by specific site of fracture (see Table 32-2, page 1128).

- Closed reduction
 - Bony fragments are brought into apposition (ends in contact) by manipulation and manual traction restoring alignment.
 - May be done under anesthesia for pain relief and muscle relaxation.
 - Cast or splint applied to immobilize extremity and maintain reduction (see Casts, page 1102).
- Traction
 - Pulling force applied to accomplish and maintain reduction and alignment (see Traction, page 1109).
 - Used for fractures of long bones.
 - Techniques
 - Skin traction—force applied to the skin using foam rubber, tape.

- Skeletal traction—force applied to the bony skeleton directly, using wires, pins, or tongs placed into or through the bone.
- Open reduction with internal fixation (ORIF)
 - Operative intervention to achieve reduction, alignment, and stabilization.
 - Bone fragments are directly visualized.
 - Internal fixation devices (metal pins, wires, screws, plates, nails, rods) used to hold bone fragments in position until solid bone healing occurs (may be removed when bone is healed).
 - After closure of the wound, splints or casts may be used for additional stabilization and support.
- Endoprosthetic replacement
 - Replacement of a fracture fragment with an implanted metal device.
 - Used when fracture disrupts nutrition of the bone or treatment of choice is bony replacement.
- External fixation device
 - Stabilization of complex and open fracture with use of a metal frame and pin system.
 - Permits active treatment of injured soft tissue.
 - Wound may be left open (delayed primary wound closure).
 - Repair of damage to blood vessels, soft tissue, muscles, nerves, and tendons as indicated.
 - Reconstructive surgery may be necessary (see External Fixation, page 1113).

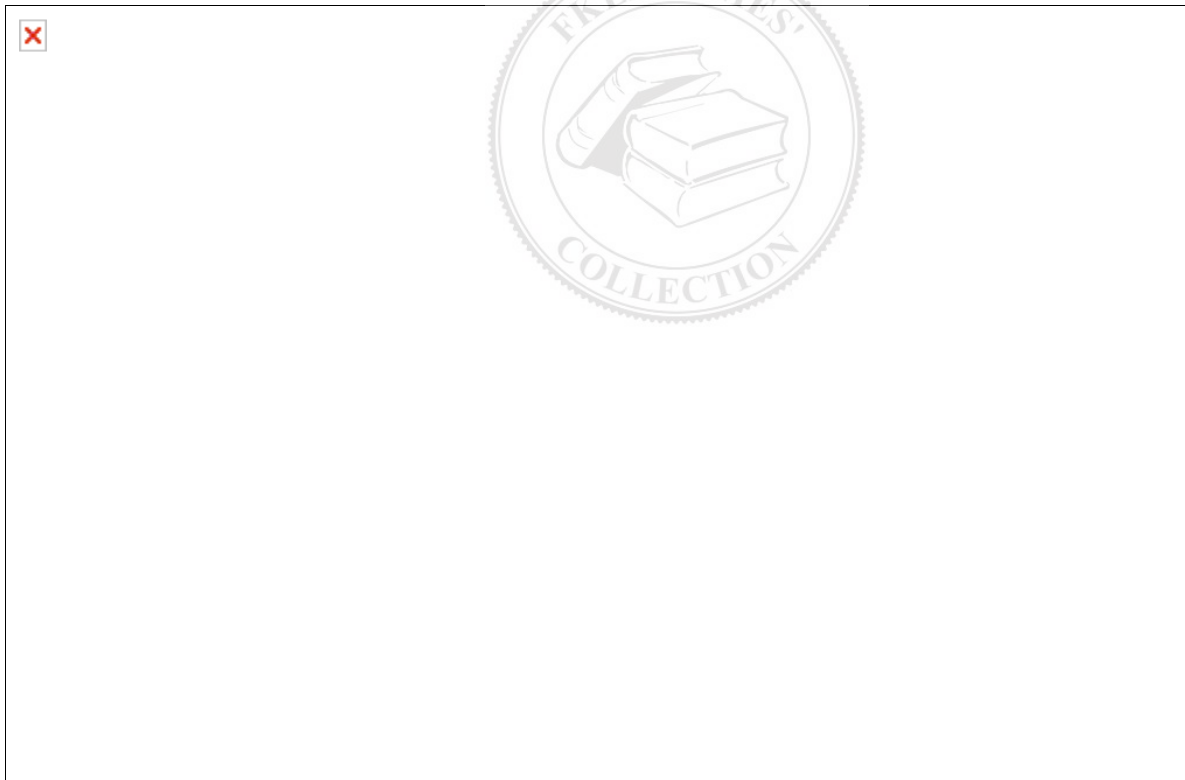


FIGURE 32-11 Method for immobilizing a clavicular fracture with a clavicular strap.

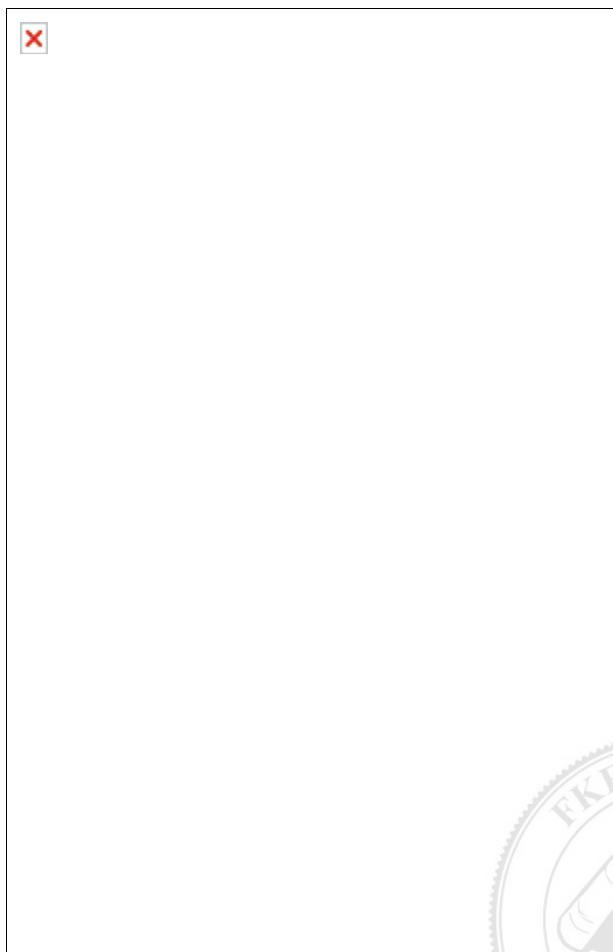


FIGURE 32-12 Immobilization of fracture of upper humerus can be achieved with conventional sling and swathe.

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TABLE 32-2 Fractures of Specific Sites

SITE AND MECHANISM	MANAGEMENT	NURSING CONSIDERATIONS
Clavicle Fall on shoulder	<ul style="list-style-type: none"> ▪ Closed reduction and immobilization with clavicular strap (see Figure 32-11) figure-eight bandage, or sling ▪ Open reduction with internal fixation (ORIF) for marked displacement, severely comminuted fracture, and extensive soft tissue injury 	<ul style="list-style-type: none"> ▪ Pad axilla to prevent nerve damage from pressure of figure-immobilizer ▪ Assess neurovascular status of arm ▪ Teach exercises of elbow, wrist, and fingers ▪ Teach shoulder exercises through full range of motion (ROM) as prescribed
Proximal humerus Fall on outstretched arm; osteoporosis is predisposing factor	<ul style="list-style-type: none"> ▪ Many remain in alignment and are supported by a sling and swathe or Velpeau bandage for comfort (see 	<ul style="list-style-type: none"> ▪ Place a soft pad under the axilla to prevent skin maceration ▪ Encourage shoulder ROM exercises after specified period of

Figure 32-12)

▪ If displaced, treated with reduction under X-ray control, or replacement of humeral head with prosthesis

immobilization to prevent frozen shoulder
 ▪ Instruct patient to lean forward and allow affected arm to abduct and rotate

Shaft of humerus

Direct fall, blow to arm, or auto injury; damage to radial nerve may occur

▪ Immobilize with sling and swathe, splint, or hanging cast
 ▪ A hanging cast is applied for its weight to correct displaced fractures with shortening of the humeral shaft
 ▪ ORIF for associated vascular injury or pathologic fracture, followed by support in sling

▪ Hanging cast must remain unsupported to maintain traction
 - Teach patient to avoid supporting elbow in lap or arm on pillow
 - Patient should sleep in upright position to maintain 24-hour traction.
 ▪ Encourage exercise of fingers immediately after application of cast
 ▪ Teach pendulum exercises of arm as prescribed to prevent frozen shoulder

Elbow and forearm

Fall on elbow, outstretched hand, or direct blow (sideswipe injury)

▪ Treatment depends on specific characteristics of fracture—ORIF, arthroplasty, external fixation, casting
 ▪ Closed drainage system may be used to decrease hematoma formation and swelling

▪ Assess neurovascular status of forearm and hand
 ▪ If radial pulse weakens or disappears, report immediately to prevent irreversible ischemia
 ▪ Elevate arm to control edema
 ▪ Encourage finger and shoulder exercises

Wrist

Colles' fracture is common ($\frac{1}{2}$ to 1 inch [1.2 to 2.5 cm] above the wrist with dorsal displacement of lower fragment); caused by fall on outstretched palm; commonly associated with osteoporosis

▪ Closed reduction with splint or cast support
 ▪ Percutaneous pins and external fixator or plaster cast

▪ Elevate arm above level of heart for 48 hours after reduction to promote venous and lymphatic return and reduce swelling
 ▪ Watch for swelling of fingers and check for constricting bandages or cast
 ▪ Teach finger exercises to reduce swelling and stiffness
 - Hold hand above level of heart
 - Move fingers from full extension to flexion
 - Hold and release
 - Repeat at least 10 times every half hour when awake for as long as swelling occurs
 ▪ Encourage daily-prescribed exercises to restore full extension and supination

Hand

Caused by numerous injuries

▪ Splinting for undisplaced

▪ Provide aggressive care and

fractures of fingers encouragement with rehabilitation
 ▪ Debridement, irrigation, and plan to regain maximal function of
 Kirchner wire fixation for openhand.
 fractures
 ▪ Reconstructive surgery may
 be necessary for complex
 injuries

Hip (Proximal Femur)

occur frequently in older adults, women with osteoporosis, and with falls Types:

- Intracapsular—femoral neck within joint capsule
- Extracapsular—femoral neck between greater and lesser trochanter (intertrochanteric) or of femoral shaft
- Subtrochanteric—of femur just below level of lesser trochanter

- Hip fracture identified by shortening and external rotation of affected leg; pain in hip or knee; inability to move leg
- Immobilization with Buck's extension traction until surgery
- Surgery as soon as medically stable; choice depends on location, character, and patient factors
 - Internal fixation with nail, nail-plate combination, multiple pins, screw, or sliding nails
 - Femoral prosthetic replacement
 - Total hip replacement
- Provide constant monitoring and nursing care to reduce the risk of complications, such as pneumonia, thrombophlebitis, fat emboli, dislocation of prosthesis, infection, and pressure sores
- Administer aspirin, warfarin, subcutaneous heparin, or low-molecular-weight heparin as ordered
 - Use sequential compression devices as ordered
 - Provide meticulous skin care to prevent breakdown
 - Use trapeze for patient to assist with position changes
 - Use special bed or mattress as indicated
 - Inspect heels daily and use heel protection measures
 - Prevent UTI by increasing fluids, limiting use of indwelling catheter, and encouraging frequent voiding
 - Keep affected leg in abduction and neutral rotation
 - Teach quadriceps setting exercise to prevent muscle atrophy of affected leg

Femoral Shaft

- Closed reduction and stabilization with skeletal traction—Thomas leg splint with Pearson attachment; followed by use of orthosis (cast-brace) to allow weight bearing
- Open reduction with hardware or with bone grafting may be necessary
- External fixator may be used
- Marked concealed blood loss may occur; watch for signs of shock initially and anemia later
- Examine skin under the ring of the Thomas splint for signs of pressure

Knee

Direct blow to knee area; involve distal shaft of femur

- Closed reduction and immobilization through
- Elevate extremity by raising foot gatch of bed

(supracondylar), articular surfaces, or patella	casting, traction, braces, splints ▪ ORIF ▪ Goal is to preserve knee mobility	▪ Evaluate for effusion—report and loosen pressure dressing if pain is severe; prepare for joint aspiration ▪ Teach quadriceps setting exercises and limited weight bearing as prescribed
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Tibia and Fibula/Ankle

Distal tibia or fibula, malleoli, or talus fractures generally result from forceful twisting of ankle and commonly associated with ligament disruption: also high incidence of open fractures of tibial shaft because tibia lies superficially beneath the skin	▪ Closed reduction and toe-to-groin cast for closed fractures, later replaced by short leg cast or orthosis ▪ ORIF may be necessary for some closed fractures ▪ External fixator for open fracture	▪ Elevate lower leg to control edema ▪ Avoid dependent position of extremity for prolonged periods ▪ Prepare patient for long immobilization period, as union is slow (12-16 weeks, longer for open and comminuted fractures) ▪ Prepare patient for stiff ankle joint following immobilization
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Foot

Metatarsal fracture due to crush injuries of foot	▪ Immobilization with cast, splint, or strapping	▪ Encourage partial weight bearing as allowed ▪ Elevate foot to control edema
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Thoracic and Lumbar Spine

Trauma from falls, contact sports, or auto accidents, or excessive loading may cause fracture of vertebral body, lamina, spinous and transverse processes; usually stable compression fractures	▪ Suspected with pain that is worsened by movement and coughing and radiates to extremities, abdomen, or intercostal muscles; and presence of sensory and motor deficits ▪ Bed rest on firm mattress and pain relief followed by progressive ambulation and back strengthening to treat stable fractures; takes about 6 weeks to heal ▪ ORIF with Harrington rod, body cast, or laminectomy with spinal fusion may be necessary for unstable or displaced fractures	▪ Use log roll technique to change positions ▪ Monitor bowel and bladder dysfunction, as paralytic ileus and bladder distention may occur with nerve root injury ▪ Assist patient to ambulate when pain subsides, no neurologic deficit exists, and X-rays reveal no displacement ▪ Teach proper body mechanics and back preservation techniques ▪ Encourage weight reduction ▪ Teach patient with osteoporosis the importance of safety measures to avoid falls
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Pelvis

Sacrum, ilium, pubic, ischium, and coccyx fractures may occur from auto accidents, crush injuries, and falls; most are stable fractures that do not involve the pelvic ring and have minimal displacement	▪ Emergency management to treat multiple trauma, shock from intraperitoneal hemorrhage, and injury to internal organs is necessary (see pages 1208 to 1213) ▪ Bed rest for several days followed by progressive weight bearing for stable fracture ▪ Prolonged bed rest, external	▪ Monitor and support vital functions as indicated ▪ Observe urine output for blood indicating genitourinary injury ▪ Do not attempt to insert urethral catheter until patency of urethra is known; incidence of urethral injury in males is high with anterior fractures ▪ Assist the patient being treated in pelvic sling
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fixation, ORIF, skeletal traction, or pelvic sling are options for unstable fracture

- Fold sling back over buttocks to enable the patient to use bedpan
- Reach under sling to give skin care; line sling with sheepskin
- Loosen sling only as directed

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Complications

Complications Associated with Immobility

- Muscle atrophy, loss of muscle strength and endurance.
- Loss of ROM due to joint contracture.
- Pressure sores at bony prominences from immobilizing device pressing on skin.
- Diminished respiratory, cardiovascular, GI function, resulting in possible pooling of respiratory secretions, orthostatic hypotension, ileus, anorexia, and constipation.
- Psychosocial compromise resulting in feelings of isolation and depression.

Other Acute Complications

- Venous stasis and thromboembolism—particularly with fractures of the hip and lower extremities.
- Neurovascular compromise.
- Infection especially with open fractures.
- Shock due to significant hemorrhage related to trauma or as a postoperative complication.
- Pulmonary emboli.

Fat Emboli Syndrome

- Associated with embolization of marrow or tissue fat or platelets and free fatty acids to the pulmonary capillaries, producing rapid onset of symptoms.
- Clinical manifestations
 - Respiratory distress—tachypnea, hypoxemia, crackles, wheezes, acute pulmonary edema, interstitial pneumonitis
 - Mental disturbances—irritability, restlessness, confusion, disorientation, stupor, coma due to systemic embolization, and severe hypoxia
 - Fever
 - Petechiae in buccal membranes, hard palate, conjunctival sacs, chest, anterior axillary folds, due to occlusion of capillaries

NURSING ALERT

Restlessness, confusion, irritability, and disorientation may be the first signs of fat embolism syndrome. Confirm hypoxia with arterial blood gas (ABG) analysis. Young adults (ages 20 to 30) and older adults (ages 60 to 70) with multiple fractures or fractures of long bones or pelvis are particularly susceptible to development of fat emboli.

Bone Union Problems

- Delayed union (takes longer to heal than average for type of fracture)
- Nonunion (fractured bone fails to unite)
- Malunion (union occurs but is faulty—misaligned)

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Nursing Assessment

- Ask patient how the fracture occurred—mechanism of injury important in determining possible associated injuries.
- Ask patient to describe location, character, and intensity of pain to help determine possible source of discomfort.
- Ask patient to describe sensations in injured extremity to aid in evaluation of neurovascular status.
- Observe patient's ability to change position to assess functional mobility.
- Note patient's emotional status and behavior—indicators of ability to cope with stress of injury.
- Assess patient's support system; identify current and potential sources of support, assistance, and caregiving.
- Review findings on past and present health status to aid in formulating care plan.
- Conduct physical examination.
 - Examine skin for lacerations, abrasions, ecchymosis, edema, and temperature.
 - Auscultate lungs to establish baseline assessment of respiratory function.
 - Assess pulses and BP; assess peripheral tissue perfusion, especially in injured extremity, to establish circulatory status baseline.
 - Determine neurologic status (sensations and movement) of extremity distal to injury.
 - Note length, alignment, and immobilization of injured extremity.
 - Evaluate behavior and cognitive functioning of patient to determine ability to participate in care planning and patient education activities.

NURSING ALERT

Change in behavior or cerebral functioning may be an early indicator of cerebral anoxia from shock or pulmonary or fat emboli.

GERONTOLOGIC ALERT

Assessment of patient's health and functional abilities before a fracture along with available support systems facilitates development of realistic rehabilitation and discharge goals.

Nursing Diagnoses

- Risk for Deficient Fluid Volume related to hemorrhage and shock
- Impaired Gas Exchange related to immobility and potential pulmonary emboli or fat emboli
- Risk for Peripheral Neurovascular Dysfunction
- Risk for Injury related to thromboembolism
- Acute or Chronic Pain related to injury
- Risk for Infection related to open fracture or surgical intervention
- Bathing or Hygiene Self-Care Deficit related to immobility
- Impaired Physical Mobility related to injury/treatment modality
- Risk for Disuse Syndrome related to injury and immobilization
- Risk for Posttrauma Syndrome related to cause of injury

Nursing Interventions

Evaluating for Hemorrhage and Shock

- Monitor vital signs as frequently as clinical condition indicates, observing for hypotension, elevated pulse, widening pulse pressure, cold clammy skin, restlessness, pallor.
- Watch for evidence of hemorrhage on dressings or in drainage containers.
- Review laboratory data; report abnormal values.
- Administer prescribed fluids/blood to maintain circulating volume.
- Monitor intake and output.

Monitoring for Impaired Gas Exchange

- Evaluate changes in mental status and restlessness that may indicate hypoxia.
- Review diagnostic evaluation data—especially ABG values and chest X-ray.
- Position to enhance respiratory effort. Report any sudden or progressive changes in respiratory status.
- Encourage coughing and deep breathing to promote lung expansion and diminish pooling of pulmonary secretions.
- Monitor pulse oximetry. Administer oxygen as prescribed.
- Maintain cervical spine precautions if spinal injury is suspected.

Preventing Neurovascular Compromise

- Monitor neurovascular status for compression of nerve, diminished circulation, development of compartment syndrome.
 - Pain—progressive, localized, deep throbbing, persistent, unrelieved by immobilization and medications
 - Pain on passive stretch
 - Weakness progressing to paralysis
 - Altered sensation, hypoesthesia, paresthesia
 - Poor capillary refill (> 3 seconds)
 - Skin color—pale, cyanotic
 - Elevated compartment pressure—palpable tightness of muscle compartment, elevated measured tissue pressure
 - Pulselessness—a late sign
- Reduce swelling.
 - Elevate injured extremity (unless compartment syndrome is suspected—may contribute to vascular compromise).
 - Apply cold to injury if prescribed.
- Relieve pressure caused by immobilizing device as prescribed (such as bivalving cast, rewrapping elastic bandage, or splinting device).
- Relieve pressure on skin to prevent development of pressure sore.
 - Frequent repositioning.
 - Skin care—do not massage bony prominences.
 - Special mattresses.

NURSING ALERT

Monitoring the neurovascular integrity of the injured extremity is essential. Development of compartment syndrome (increased tissue pressure causing hypoxemia) leads to permanent loss of function in 6 to 8 hours. This situation must be identified and managed promptly.

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Preventing Development of Thromboembolism

GERONTOLOGIC ALERT

Older adults with fractures, trauma, immobility, obesity, or history of thrombophlebitis are at high risk for developing thromboembolism.

- Encourage active and passive ankle exercises.
- Use elastic stockings, foot pumps, or SCDs, as prescribed.
- Elevate legs to prevent stasis, avoiding pressure on blood vessels.
- Encourage mobility; change position frequently; encourage ambulation.

- Administer anticoagulants as prescribed.
- Monitor for development of thrombophlebitis.
 - Note complaint of pain and tenderness in calf.
 - Report calf pain.
 - Report increased size and temperature of calf.
 - Homans' sign has not been proved to be an effective screen for deep vein thrombosis (DVT); therefore, it is no longer an acceptable measure for assessing DVT.

Relieving Pain

- Perform a comprehensive pain assessment.
 - Have patient describe the pain, location, characteristics (dull, sharp, continuous, throbbing, bony, radiating, aching).
 - Ask patient what causes the pain, makes the pain worse, relieves the pain. Evaluate patient for proper body alignment, pressure from equipment (casts, traction, splints, appliances).
- Initiate activities to prevent or modify pain.
 - Assist patient with pain-reduction techniques—cutaneous stimulation, distraction, guided imagery, TENS, biofeedback.
 - Immobilize injured part.
 - Position patient in correct alignment.
 - Support splinted fracture above and below fracture when repositioning or moving patient.
 - Reposition patient with slow and steady motion; use additional personnel as needed.
 - Elevate painful extremity to diminish venous congestion.
 - Apply heat or cold modalities as prescribed. Heat versus cold is controversial. One randomly controlled trial found significantly less edema with cold packs versus heat 3 to 5 days post-injury.
 - Modify environment to facilitate rest and relaxation.
- Administer prescribed pharmaceuticals as indicated. Encourage use of less potent drugs as severity of discomfort decreases.
- Establish a supportive relationship to assist patient to deal with discomfort.
- Encourage patient to become an active participant in rehabilitative plans.

NURSING ALERT

Meperidine (Demerol) may cause toxicity as it breaks down into the metabolite normeperidine, which has a 15- to 20-hour half-life, especially in patients with impaired renal function or elderly patients.

Monitoring for Development of Infection

- Clean, debride, and irrigate open fracture wound, as prescribed, as soon as possible to minimize risk of infection.
 - All open fractures are contaminated.
 - Begin prescribed antibiotic therapy promptly after wound culture obtained.
- Use sterile technique during dressing changes to minimize infection of wound, soft tissues, and bone.
- Evaluate patient for elevation of temperature every 4 hours.
- Note and report elevated white blood cell (WBC) counts.
- Report areas of inflammation and swelling around incision or open wound.
- Report purulent odiferous drainage.
- Obtain specimens for culture and sensitivity to determine causative organism.
- Administer antibiotic therapy as prescribed.

Promoting Adequate Hygiene

- Encourage participation in care.
- Arrange patient area and personal items for patient convenience and to promote independence.
- Modify activities to facilitate maximum independence within prescribed limits.
- Allow time for patient to accomplish task.
- Teach safe use of mobility and necessary aids.
- Assist with ADLs as needed.
- Teach family how to assist patient while promoting independence in self-care.

Promoting Physical Mobility

- Perform active and passive exercises to all non-immobilized joints.
- Encourage patient participation in frequent position changes, maintaining support to fracture during position changes.
- Minimize prolonged periods of physical inactivity, encouraging ambulation when prescribed.
- Administer prescribed analgesics judiciously to decrease pain associated with movement.

Preventing Disuse Syndrome

- Teach and encourage isometric exercises to diminish muscle atrophy.
- Encourage use of immobilized extremity within prescribed limits.

Minimizing the Psychological Effects of Trauma

- Monitor patient for symptoms of posttraumatic stress disorder.
 - Memory of event; anger, helplessness, vulnerability, mood swings, depression, cognitive impairment, sleep disturbance, increased dependency, and social withdrawal.
- Assist patient to move through phases of posttraumatic stress (outcry, denial, intrusiveness, working through, completion).

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- Establish trusting therapeutic relationship with patient.
- Encourage patient to express thoughts and feelings about traumatic event.
- Encourage patient to participate in decision making to reestablish control and overcome feelings of helplessness.
- Teach relaxation techniques to decrease anxiety.
- Encourage development of adaptive responses and participation in support groups.
- Refer patient to psychiatric liaison nurse or refer for psychotherapy, as needed.

Community and Home Care Considerations

- Assist patient to actively exercise joints above and below the immobilized fracture at frequent intervals.
 - Isometric exercises of muscles covered by cast—start exercise as soon as possible after cast application.
 - Increase isometric exercises as fracture stabilizes.
- After removal of immobilizing device (eg, cast, splint), have patient start isotonic exercises and continue with isometric exercises.
- Assess the home for any fall hazards when patient ambulates.

- Obtain PT/OT consultation for assistance with ADLs, transferring technique, gait strengthening, and conditioning after lengthy immobilization, as needed.
- Assess orthostatic BP when patient begins to ambulate to prevent falls.

Patient Education and Health Maintenance

- Explain basis for fracture treatment and need for patient participation in therapeutic regimen.
- Promote adjustment of usual lifestyle and responsibilities to accommodate limitations imposed by fracture.
- Instruct patient on exercises to strengthen upper extremity muscles if crutch walking is planned.
- Instruct patient in methods of safe ambulation—walker, crutches, cane.
- Emphasize instructions concerning amount of weight bearing that will be permitted on fractured extremity.
- Discuss prevention of recurrent fractures—safety considerations, avoidance of fatigue, proper footwear.
- Encourage follow-up medical supervision to monitor for union problems.
- Teach symptoms needing attention, such as numbness, decreased function, increased pain, elevated temperature.
- Encourage adequate balanced diet to promote bone and soft tissue healing.

Evaluation: Expected Outcomes

- Vital signs within normal parameters; urine output at least 30 mL/hour
- Respirations unlabored; alert and oriented
- No signs of neurovascular compromise (ie, circulation, motor, sensory intact)
- No calf pain reported
- Reports decreased pain with elevation, ice, and analgesic
- Afebrile; no wound drainage
- Performing hygiene and dressing practices with minimal assistance
- Performing active ROM correctly
- Using affected extremity for light activity as allowed
- Denies acute symptoms of stress; reports working through feelings about trauma

OTHER MUSCULOSKELETAL DISORDERS

LOWER BACK PAIN

Lower back pain is characterized by an uncomfortable or acute pain in the lumbosacral area associated with severe spasm of the paraspinal muscles, usually with pain radiating to the lower extremities.

Pathophysiology and Etiology

Multiple causes:

- Mechanical (joint, muscular, or ligamentous sprain)
- Degenerative disk disease; acute herniation of disks
- Lack of physical activity and exercise; weakness of musculature of back
- Arthritic conditions
- Diseases of bone (osteoporosis, vertebral fracture, Paget's disease, metastatic carcinoma)
- Congenital disorders
- Systemic diseases
- Infections of disk spaces or vertebrae
- Spinal cord tumors
- Referred pain from other areas

Clinical Manifestations

- Pain localized or radiating to buttocks or to one or both legs
- Paresthesias, numbness, and weakness of lower extremities
- Spasm in acute phase
- Bowel or bladder dysfunction in cauda equina syndrome

Diagnostic Evaluation

- X-rays of lumbar spine are usually negative.
- CT of spine—to detect arthritic changes, degenerative disk disease, tumor, and other abnormalities.
- Myelography—to confirm and localize disk herniation.
- MRI—to detect pathology, disk herniation, soft tissue injury, such as stenosis and nerve impingement
- EMG of lower extremities—to detect nerve changes related to back pathology.
- Diskogram—to evaluate herniated disk.

Management

For management of herniated disk, see page 573. For management of spinal cord tumors, see page 562.

- Avoid activities that may strain the back until healed, but bed rest is to be avoided as well because it may significantly decrease the rate of recovery, increase pain and disability, and lengthen time spent absent from work.
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 - When in bed, sleep in a supine to semi-Fowler's position with hips and knees flexed to relieve painful muscle and ligament sprain, heal soft-tissue injury, remove stress from lumbar sacral area, relieve tension on sciatic nerves, and open the posterior part of the intervertebral spaces.
 - Acute spasm and pain should subside in 3 to 7 days if there is no nerve involvement or other serious underlying disease.
 - Isometric exercises should be done hourly while in bed, if possible.
- Heat or ice is used to relax muscle spasm and relieve discomfort. Follow heat with massage.
- Medications
 - Oral analgesic and anti-inflammatory agent—usually NSAID is first-line agent, unless contraindicated due to history or high risk of GI bleeding, renal insufficiency, or allergy. If there is a high risk of GI bleeding, COX-2 inhibitors may be used unless the patient has a sulfa or aspirin allergy, or is in the third trimester of pregnancy.
 - Painful trigger points may be injected with hydrocortisone/Xylocaine for pain relief.
P.1135
 - Pain may be treated with opioid when severe. Opioids may be sedating.
 - Muscle relaxant to relieve spasm and tense muscles. Muscle relaxants may be sedating.
- Lumbosacral support may be used—provides abdominal compression and decreases load on lumbar intervertebral disks.
- TENS may be helpful in relieving chronic pain.
- Psychiatric intervention may be needed for patient with chronic depression, anxiety, and lower back syndrome.
 - Psychotropic medication may be used for treatment of depression and anxiety, which potentiate pain.

- Focus on getting back to functional state after long disability.

PATIENT EDUCATION GUIDELINES

Taking Care of Your Lower Back

Almost everyone has lower back pain at some time. Chronic pain will develop in some, and a few will become disabled because of it. Risk factors for chronic lower back pain include being overweight, being deconditioned (out of shape), having poor posture, and having poor abdominal muscle tone. You can relieve pain and avoid disability by adhering to the following instructions:

DO BACK EXERCISES EVERY DAY

- Lie on your back on the floor or a firm mattress. Bend one knee, and bring that leg up toward your chest. Hold it against your chest a few seconds. Then repeat with the other leg. Alternate legs several times.
- Lie on your back with your knees bent and feet flat on the floor. Tighten your abdomen and buttocks and push your lower back to the floor. Hold for a few seconds, then relax. Repeat several times.
- Lie on your back with knees bent and feet flat on the floor. Do a partial sit-up by crossing your arms on your chest or behind your head and lifting your shoulders off the floor 6-12 inches (15-30.5 cm). Repeat several times.



Back exercises to strengthen abdominal and postural muscles, to stretch contracted back muscles, and to maintain flexibility.

BE CAREFUL HOW YOU LIFT

- Move your body close to an object before picking it up.
- Bend at the knees, not the back, to pick up an object that is low.
- Hold the object close to your abdomen and chest.
- Bend at the knees again to put down an object.
- Avoid reaching, twisting, or turning your back as you lift or carry an object.

PROTECT YOUR BACK WHILE SITTING AND STANDING

- Avoid sitting in soft, cushioned chairs too long.
- If you sit for long periods at work, make sure your knees are level with your hips. Use a step stool if necessary.
- If you stand for long periods, try to put one foot up on a stool, then the other. Walk around and change position periodically.
- Adjust your car seat so there is a bend in your knees. Do not stretch.
- Put a firm pillow behind your lower back if it does not feel supported while you are sitting.

STAY ACTIVE AND IN GOOD HEALTH

- Take a walk every day wearing comfortable, low-heeled shoes.
- Eat a balanced, low-fat diet with plenty of fruits and vegetables to avoid constipation.
- Get plenty of sleep on a firm mattress.
- See your health care provider promptly for worsening pain or new injury.

Complications

- Spinal instability, infection, sensory and motor deficits
- Chronic pain
- Malingering and other psychosocial reactions

Nursing Assessment

- Obtain history to determine when, where, and how the pain occurs, aggravating or relieving factors, relationship of pain to specific activities, presence of numbness or paresthesia.
- Perform physical examination of neurologic system—spots localized weakness of extremities and reflex and sensory loss.
- Perform musculoskeletal examination for changes in strength, tone, and ROM.
- If condition is chronic, assess coping ability of patient and family or significant others.
- Assess effect of illness on daily living—work, school.

Nursing Diagnoses

- Acute or Chronic Pain related to injury
- Impaired Physical Mobility related to pain

Nursing Interventions

Relieving Pain

- Advise patient to stay active and avoid bed rest, in most cases.
- Keep pillow between flexed knees while in side-lying position—minimizes strain on back muscles.
- Apply heat (moist towels; Hydrocollator packs) or ice, as prescribed.
- Administer or teach self-administration of pain medications and muscle relaxants, as prescribed.
 - Give NSAIDs with meals to prevent GI upset and bleeding.
 - Muscle relaxants and opioids may cause drowsiness.

Promoting Mobility

- Encourage ROM of all uninvolved muscle groups.
- Suggest gradual increase of activities and alternating activities with rest in semi-Fowler's position.
- Avoid prolonged periods of sitting, standing, or lying down.
- Encourage patient to discuss problems that may be contributing to backache.
- Encourage patient to do prescribed back exercises. Exercise keeps postural muscles strong, helps recondition the back and abdominal musculature, and serves as an outlet for emotional tension.

Patient Education and Health Maintenance


Instruct patient to avoid recurrences as follows:

- Standing, sitting, lying, and lifting properly are necessary for a healthy back.
- Alternate periods of activity with periods of rest.
 - Avoid prolonged sitting (intradiskal pressure in lumbar spine is higher during sitting), standing, and driving.
 - Change positions and rest at frequent intervals.
 - Avoid assuming tense, cramped positions.
 - Sit in a straight-back chair with the knees slightly higher than the hips. Use a footstool if necessary.
 - Flatten the hollow of the back by sitting with the buttocks “tucked under.” Pelvic tilt (small of back is pressed against a flat surface) decreases lordosis.
 - Avoid knee and hip extension. When driving a car, have the seat pushed forward as necessary for comfort. Place a cushion in the small of the back for support.
- When standing for any length of time, rest one foot on a small stool or platform to relieve lumbar lordosis.
- Avoid fatigue, which contributes to spasm of back muscles.
- Use good body mechanics when lifting or moving about.
- Daily exercise is important in the prevention of back problems (see Patient Education Guidelines).
 - Do prescribed back exercises twice daily—strengthens back, leg, and abdominal muscles.
 - Walking outdoors (progressively increasing distance and pace) is recommended.
 - Reduce weight if necessary—decreases strain on back muscles.


Evaluation: Expected Outcomes

- Verbalizes relief of pain with rest and medication
- Performs back exercises correctly

OSTEOARTHRITIS

 Evidence Base

Institute for Clinical Systems Improvement (ICSI). (2007). Diagnosis and treatment of adult degenerative joint disease (DJD)/osteoarthritis (OA) of the knee. Bloomington, Minn.: ICSI. Available:

www.guideline.gov. 

Osteoarthritis, or degenerative joint disease, is a chronic, non-inflammatory, slowly progressing disorder that causes deterioration of articular cartilage. It affects weight-bearing joints (hips and knees) as well as joints of the distal interphalangeal and proximal interphalangeal joints of the fingers.

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Pathophysiology and Etiology

- Changes in articular cartilage occur first; later, secondary soft-tissue changes may occur.
- Progressive wear and tear on cartilage leads to thinning of joint surface and ulceration into bone.

- Leads to inflammation of the joint and increased blood flow and hypertrophy of subchondral bone.
- New cartilage and bone formation at joint margins result in osteophytosis (bone spurs), altering the size and shape of bone.
- Generally affects adults ages 50 to 90; equal in males and females.
- Cause is unknown, but aging and obesity are contributing factors. Previous trauma may cause secondary OA.

Clinical Manifestations

- Pain in one or more joints, may be long-standing pain that increases with weight bearing or use of joint; may have been a gradual, insidious onset, or may have been some history of trauma to the joint in the past.
- Less than 30 minutes of morning stiffness.
- Bony deformity (osteophyte) or enlargement of the joint.
- Possible crepitation, effusion.

Diagnostic Evaluation

- No specific laboratory examination.
- X-rays of affected joints show joint space narrowing, osteophytes, and sclerosis.
- Radionuclide imaging (bone scan)—shows increased uptake in affected bones.
- Analysis of synovial fluid differentiates OA from RA.

Management

Conservative Management

- Includes PT and OT to maintain function while preserving the joints.
- Pain management using nonopioid analgesics, such as acetaminophen and NSAIDs, mostly for analgesic effects; and, possibly, such opioids as oxycodone, codeine, or hydrocodone (these may be used in combination with nonopioid analgesics).
- Hyaluronate (Hyalgan) and hylan G-F 20 (Synvisc), agents known as viscosupplements, have been approved by the Food and Drug Administration. These drugs are administered over time through intra-articular injections into the knee.
 - They relieve pain and are most effective for people with mild to moderate knee OA.
 - After the injection, patient is instructed to avoid prolonged weight-bearing activities for 48 hours.
 - Contraindicated for patients with joint infections and for those with allergies to hyaluronate preparations, avian proteins, and bird feathers or eggs.
- Weight loss, if necessary, to relieve stress on joints.
- Proper nutrition, sleep, and stress reduction to improve well-being.
- OTC supplements glucosamine and chondroitin sulfate are common alternative remedies that have potential cartilage-rebuilding effects, but clinical trials in humans have been scant up to this point.

Surgical Intervention

Surgical intervention is considered when the pain becomes intolerable to patient and mobility is severely compromised. Options include osteotomy, debridement, joint fusion, arthroscopy, and arthroplasty.

Complications

- Limited mobility
- Neurologic deficits associated with spinal involvement

Nursing Assessment

- Obtain history of pain and its characteristics, including specific joints involved.
- Evaluate ROM and strength.
- Assess effect on ADLs and emotional status.

Nursing Diagnoses

- Acute or Chronic Pain related to joint degeneration and muscle spasm
- Impaired Physical Mobility related to pain and limited joint motion
- Bathing, Hygiene, Feeding, and Toileting Self-Care Deficits related to pain and limited joint movement

Nursing Interventions

Relieving Pain

- Advise patient to take prescribed NSAIDs or OTC analgesics as directed to relieve inflammation and pain. May alternate with opioid analgesic, if prescribed.
- Provide rest for involved joints—excessive use aggravates the symptoms and accelerates degeneration.
 - Use splints, braces, cervical collars, traction, and lumbosacral corsets as necessary.
 - Have prescribed rest periods in recumbent position.
- Advise patient to avoid activities that precipitate pain.
- Apply heat as prescribed—relieves muscle spasm and stiffness; avoid prolonged application of heat—may cause increased swelling and flare symptoms.
- Teach correct posture and body mechanics—postural alterations lead to chronic muscle tension and pain.
- Advise sleeping with a rolled terry cloth towel under the neck—for relief of cervical OA.
- Provide crutches, braces, or cane when indicated—to reduce weight-bearing stress on hips and knees.
- Teach use of cane in hand on side opposite involved hip or knee.
P.1137
- Advise wearing corrective shoes and metatarsal supports for foot disorders—also helps in the treatment of arthritis of the knee.
- Encourage weight loss to decrease stress on weight-bearing joints.
- Support patient undergoing orthopedic surgery for unremitting pain and disabling arthritis of joints (see page 1115).

GERONTOLOGIC ALERT

Elderly patients are at greater risk for GI bleeding and renal failure associated with NSAID use. Encourage administration with meals, and monitor stool for occult blood. Celecoxib (Celebrex) is associated with less risk of GI bleeding, but may have deleterious effects on the kidneys in those with decreased glomerular filtration rate (as do other NSAIDs).

Increasing Physical Mobility

- Encourage activity as much as possible without causing pain.
- Teach ROM exercises to maintain joint mobility and muscle tone for joint support, to prevent capsular and tendon tightening, and to prevent deformities. Avoid flexion and adduction deformities.
- Teach isometric exercises and graded exercises to improve muscle strength around the involved

joint.

- Advise putting joints through ROM after periods of inactivity (eg, automobile ride).

Promoting Self-Care

- Suggest performing important activities in morning, after stiffness has been abated and before fatigue and pain become a problem.
- Advise on modifications, such as wearing looser clothing without buttons, placing bench in tub or shower for bathing, sitting at table or counter in kitchen to prepare meals.
- Help with obtaining assistive devices, such as padded handles for utensils and grooming aids, to promote independence.
- Refer to OT for additional assistance.

Patient Education and Health Maintenance

- Suggest swimming or water aerobics (offered by the YMCA) as a form of nonstressful exercise to preserve mobility.
- Encourage adequate diet and sleep to enhance general health.
- Advise patient to discuss the use of complementary therapies, such as glucosamine and chondroitin sulfate, with his health care provider.
- Refer for additional information and support to the Arthritis Foundation, www.arthritis.org.

Evaluation: Expected Outcomes

- Reports reduction in pain while ambulatory
- Performs ROM exercises
- Dresses, bathes self, and grooms with assistive devices

NEOPLASMS OF THE MUSCULOSKELETAL SYSTEM

Musculoskeletal neoplasms include primary sarcomas, metastatic bone disease, and benign tumors (osteoma, chondroma, osteoclastoma) of the bone. More than 60% of bone neoplasms are metastatic from other sites of cancer.

Pathophysiology and Etiology

Benign Bone Tumors

Osteoid osteoma, chondroma, and osteoclastoma (benign giant cell tumor) are examples of benign bone tumors. Malignant transformation occurs with some.

Malignant Bone Tumors

- Chondrosarcoma and osteosarcoma are examples of primary malignant bone tumors.
 - Tumors develop in areas of rapid growth.
 - Risk factors include Paget's disease, previous radiation therapy to the bone, and other bone diseases.
 - Hematogenous spread to the lung occurs.
- Multiple myeloma is a malignant neoplasm arising from the bone marrow.

Metastatic Bone Tumors

- Metastatic bone tumors are most frequently associated with cancers of the breast, prostate, and lung (primary malignancy site).
- Bone metastasis most frequently occurs in the vertebrae and results in pathologic fracture.

Clinical Manifestations

- Pain in the involved bone—from effects of tumor (destruction, erosion, and expansion of tumor).
 - Generally mild to constant pain, which may be worse at night or with activity.
 - Pain will be acute with fracture.
 - Neurologic symptoms may present with nerve root compression.
- Swelling and limitation of motion and joint effusion.
- Physical findings.
 - Palpable, tender, fixed bony mass.
 - Increase in skin temperature over mass.
 - Superficial veins dilated and prominent.

Diagnostic Evaluation

- X-ray will usually reveal bone tumor; may show increased or decreased bone density. Tomograms may be helpful for some benign osseous lesions.
- CT and MRI demonstrate soft-tissue involvement and location of tumors.
- Bone scan—helpful in detecting initial extent of malignancy, planning therapy, defining level of amputation, and following course of radiation or chemotherapy.
- Ultrasound may help with identification of the lesion.
- Serum alkaline phosphatase—usually increased.
- Bence Jones protein in urine with multiple myeloma.
- Biopsy of bone—to confirm suspected diagnosis.
- Chest X-ray and lung scan—to determine if metastasis is present.
- Arteriography—to assess soft-tissue involvement.

Management

A multidisciplinary approach in a cancer center is usually preferred. The basic objective is to halt the progression of the
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tumor by destroying or removing the lesion. Treatment depends on the type of tumor. Combinations of chemotherapy, surgery, and radiation may be indicated as most appropriate for specific type of tumor.
Surgery

- Tumor curettage or resection with bone grafting may be used.
- Limb-salvaging procedures involve resection of affected bone and surrounding normal muscle tissue and reconstruction using metallic prostheses or allografts for bone or joint replacement and skin grafting, as needed.
- Amputation is necessary in some cases.

Chemotherapy

May be used as preoperative, adjunctive, and palliative treatment.

- Chemotherapy may be administered before (to shrink the tumor) and after (to destroy metastasis) surgery.
- Chemotherapy used in combination to achieve a greater patient response at a lower toxicity rate and to minimize potential problems of drug resistance and may be given in varying courses separated by rest periods.

Radiotherapy

- Tumor irradiation may be used.
- Prophylactic lung irradiation may be performed—to suppress metastasis.

Other Therapies

- Immunotherapy—interferon.
- Hormone therapy may be used with metastatic tumors of the breast and prostate.
- If pathologic fracture occurs, the fracture is managed with open reduction and internal fixation or other fracture treatment method.

Complications

- Lack of tumor control and metastases
- Pathologic fracture
- Hypercalcemia from bone destruction

Nursing Assessment

- Obtain history of progression of disease; presence of pain, fever, weight loss, malaise.
- Examine for painless mass.
- Review records for evidence of pathologic fracture.
- Assess knowledge of cancer, experiences with family or others, and present coping.

Nursing Diagnoses

- Acute Pain related to effects of tumor
- Risk for Injury related to altered bone structure
- Ineffective Coping related to diagnosis and treatment options

Nursing Interventions

See also Orthopedic Surgery, page 1114, and Amputation, page 1119.

Relieving Pain

- Use multiple approaches to reduce discomfort.
- Administer pain medications 30 minutes before ambulation or other uncomfortable movement.
- Support painful extremities on pillows.

Preventing Pathologic Fractures

- Assist patient in movement with gentleness and patience.
- Avoid jarring patient or bed.
- Support joints when repositioning patient.
- Guard patient to avoid falls.
- Create a hazard-free environment.

Strengthening Coping Ability

- Create a supportive environment.
- Use psychological support services as needed.
- Answer questions and clear up misconceptions about treatment options.

Patient Education and Health Maintenance

- Teach about particular treatment selected. See page 139 for information on chemotherapy, and page 153 for radiation therapy information.
- Encourage appropriate follow-up and diagnostic testing for recurrence.
- Refer for additional information and support to the American Cancer Society, www.cancer.org.

Evaluation: Expected Outcomes

- Reports decreased pain with ambulation
- No signs or symptoms of fractures
- Verbalizes understanding of treatment options and strength to make decisions

OSTEOMYELITIS

Osteomyelitis is a severe pyogenic infection of the bone and surrounding tissues that requires immediate treatment. Generally three routes:

- Bloodstream (hematogenous spread)
- Adjacent soft tissue infection (contiguous focus)
- Direct introduction of microorganisms into the bone

Pathophysiology and Etiology

- Bacteria lodge and multiply in bone.
- Pressure increases as pus collects in confined rigid bone, contributing to ischemia, vascular occlusion, and leading to bone necrosis.
- Staphylococcus aureus is the most common infecting microorganism, although others are prevalent: Escherichia coli, Pseudomonas, Klebsiella, Salmonella, and Proteus.
- Hematogenous osteomyelitis is the most common method of spread in prepubescent children.

Clinical Manifestations

- Infection of long bones with acute pain and signs of sepsis.
- Localized pain and drainage.
P.1139
- Symptoms vary in adult and children according to the site of involvement.

Diagnostic Evaluation

- Acute osteomyelitis diagnosis made on initial clinical signs (history, physical examination, CBC, erythrocyte sedimentation rate [ESR]).
- Aerobic and anaerobic cultures of bone and deep tissue to identify the organism. Wound cultures are not reliable.
- ESR elevated, WBC and hemoglobin decreased.
- Radiographic evidence of osteomyelitis lags behind symptoms by up to 14 days.
- Radionuclide bone scans used to diagnose early acute osteomyelitis.
- MRI used increasingly—distinguishes between soft tissue and bone marrow.

Management

- Acute: full recovery possible with minimal loss of function.
- Chronic: develops with inadequate or ineffective course of antibiotics or delayed treatment.

Surgical Intervention

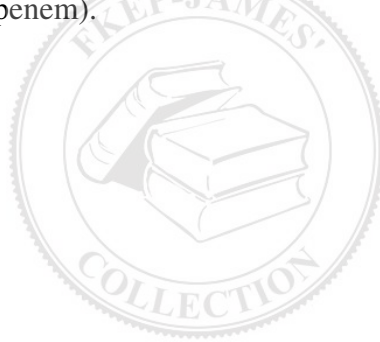
- Needle aspiration or needle biopsy done initially.
- Surgical intervention may be needed to obtain culture and sensitivity of specimen.
- Surgical decompression considered when patient does not improve after 36 to 48 hours of antimicrobial therapy.
- Debridement may be done, or antibiotic-impregnated beads used in wound (removed after 2 to 4 weeks and replaced with bone graft).
- Hyperbaric oxygen therapy may be used as an adjunctive therapy.

Pharmacologic Intervention

- Employ quickly after presentation of symptoms to avoid chronicity.
- Parental antimicrobial therapy based on blood/wound cultures.
- Medications depend on organism, but include:
 - Penicillins (Pen G, Pen V).
 - Semisynthetic penicillins (nafcillin, oxacillin, methicillin).
 - Extended-spectrum penicillins (ampicillin, carbenicillin, amoxicillin).
 - Beta-lactam agents (Imipenem).
 - Tetracyclines.
 - Cephalosporins.
 - Aminoglycosides.

Complications

- Nonhealing wound
- Sepsis
- Immobility
- Amputation



Nursing Assessment

- Obtain detailed history of injury.
- Assess pain and functional deficits.
- Be aware that systemic symptoms are acute in children, but vary in intensity with adults.
- Perform general systemic assessment because adults with long bone involvement generally have more systemic septic symptoms.

Nursing Diagnoses

- Acute or Chronic Pain related to inflammatory process
- Deficient Knowledge related to disease and medications
- Impaired Physical Mobility related to rest of affected part

Nursing Interventions

Relieving Pain

- Administer opioids for acute pain; nonopioids for chronic pain.
- Administer medications around the clock versus as necessary to establish a consistent blood level.
- Report any increase in pain that may indicate worsening infection.

Increasing Knowledge

- Describe the infectious process and rationale for prolonged treatment with osteomyelitis.
- Explain I.V. antibiotic therapy, potential adverse effects, and reactions.
- Explain strict adherence to infection-control practices (sterile technique, hand washing, selection of roommate) to prevent spread of infection in some cases.

Promoting Rest without Complications

- Support the affected extremity (splint, traction) to minimize pain.
- If patient is on bed rest, prevent hazards of immobility (passive ROM, position changes, coughing, and deep breathing).
- Encourage distraction activities.

Patient Education and Health Maintenance

- Advise patient to adhere to infection-control principles —proper hand washing, disposal of wound drainage, dressings to prevent reinfection or transmission of infection at home.
- Stress adherence to medication regimen, which may be prolonged, with frequent follow-up visits.
- Teach care of indwelling device for medication delivery (such as Hickman catheter).

Evaluation: Expected Outcomes

- Pain managed with nonopioid analgesics
- Infectious process minimized
- Functional status of affected joint intact

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PAGET'S DISEASE (OSTEITIS DEFORMANS)

Paget's disease of the bone is a skeletal disorder resulting from excessive osteoclastic activity, affecting the long bones, pelvis, lumbar vertebrae, and the skull predominantly.

Pathophysiology and Etiology

- The cause of this disease is unknown, although there is evidence of familial tendency (25% to 40% have at least one affected relative).
- More common in men than women.
- Rare before age 40 and increases as age does—12% after age 80.
- May be caused by infection from blood-borne viruses. After acute viremia, osteoclasts become chronically infected, stimulating osteoclastic proliferation.

Clinical Manifestations

- Generally, asymptomatic.
- Most common symptoms are pain and predisposition to fracture.
- Pagetic lesions can lead to OA, joint destruction, spinal deformity.

- Decrease in hearing as a result of skull enlargement.
- Tinnitus or vertigo may also occur.
- Rarely, heart failure, hypertension, atherosclerosis, and aortic valve calcification occur.
- Malignant bone tumor.

Diagnostic Evaluation

- Elevated serum alkaline phosphatase.
- Serum calcium, phosphorus, and albumin levels usually normal.
- Generally confirmed with radiologic examinations.
- Bone scans can evaluate pagetic activity.
- Bone biopsy.

Management

- No treatment for asymptomatic Paget's.
- Pain management—NSAIDs, aspirin.
- Medications—calcitonin is the main medication used for this disease.
- Other medications used to block bone resorption—the bisphosphonates etidronate disodium (Didronel), alendronate (Fosamax), pamidronate (Aredia), risedronate (Actonel); an antineoplastic agent, plicamycin (Mithramycin).
- Tibial osteotomy done to realign knees and relieve pain.

Nursing Assessment

- Assess pain and functional ability.
- Observe for bowing (legs) or complaint that hats feel tight.
- Assess for cardiovascular complications.
- Assess for auditory symptoms—tinnitus, vertigo, and hearing loss.

Nursing Diagnoses

- Chronic Pain related to pathophysiologic process
- Risk for Injury related to falls

Nursing Interventions

Reducing Pain

- Administer and teach self-administration of analgesics.
- Avoid sedation due to opioids, which may increase risk of falls.

Preventing Injury

- Establish exercise protocols through a PT consult to maintain physical abilities and prevent falls.
- Teach safe transferring, and make sure patient can alert nurses if he needs help.
- Assist patient with activities as necessary.
- Provide function and mobility aids such as heel lifts, walking aids as needed, through an OT consult.

Patient Education and Health Maintenance

- Teach safety measures in the home—removal of loose rugs and obstacles to prevent falls, good lighting.
- Provide education about the disease process and medication treatment.
- Make sure that patient knows how to use mobility aids.
- Initiate home care referral as indicated.
- Provide information about The Paget Foundation, www.paget.org.
- Encourage followup for periodic hearing tests and blood work.

HALLUX VALGUS

Also called bunion, hallux valgus is a deformity of the foot involving the first metatarsal and great toe. Occurs in females more frequently than males, and incidence increases with age; may have a genetic predisposition. Commonly occurs with other deformities of the feet, such as hammertoe, mallet toe, and claw toe.

Clinical Manifestations

- Pain
- Possible callus of skin overlying bunion and accompanying toe deformities
- Diminished ROM
- Generally associated with tight footwear

Management and Nursing Interventions

Conservative Management

- Wearing footwear made of soft leather with a wider toe box, rounded rather than pointed, and with low heel.
- Special orthoses can be ordered.
- Steroid injections to relieve pain.

Surgical Management

Surgical alignment of the great toe by osteotomy of metatarsal or proximal phalanx of the great toe or fusion of the metatarsal-metatarsophalangeal joint

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Postoperative Care

- Elevation of the foot to reduce pain
- Initial non-weight-bearing activity, with very gradual progress in activity
- Crutch walking initially, followed by wooden shoe immobilizer for several weeks
- NSAIDs and opioid analgesics for pain
- Bandages changed by surgeon initially

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