Working with Geriatric Patients

Today, there is a higher population of people over the age of 60. Geriatric patients can be a challenge to radiographers because of the skills needed to adapt to and accommodate them. The body undergoes many changes as it ages, and a geriatric patient may present with one or all of these changes. There are also pathologies which are largely exclusive to the aging populations. Radiographers must understand the differences and use this knowledge to improve compliance to produce a diagnostic image, while also respecting the geriatric patient's comfort and autonomy.

Physical Effects of Aging

From about age 60 and upward, patterns of disease will begin to differ from those of young adulthood and middle age. Functional and reserve capacities of organs begin to decline, increasing the likelihood of disease. However, this rate of decline will vary among individuals.

As a student technologist you will learn to adapt the normal radiographic examination to the elderly. You will read about the normal changes of aging and how these affect your interaction with your elderly patients. The radiographs you will produce of these patients will have a different appearance than those in young adults and you will learn to recognize these differences. This handout focuses on how to produce diagnostic images of geriatric patients while maintaining the patient's comfort and dignity.

The physical effects of aging include the patient's vision, hearing, balance/coordination, temperature tolerance, dressing/undressing difficulties, skin/soft tissue changes, and cardiac or pulmonary challenges.

Vision

Normal changes with aging that affect vision include:

- Mild loss of visual acuity because the lens of the eye is less pliable.
- Loss of ability to focus on near objects (farsightedness).
- Loss of adaptation from light to dark because of changes to the retina.
- Color perception diminishes because the lens starts to yellow.
- Tear production is reduced or increased.

Pathological conditions can contribute to vision changes. Common causes in the elderly are:

- Cataracts
- Diabetes
- Stroke.

© Edenbrook College

Follow these guidelines to assist an elderly patient with vision difficulties:

1. Speak within the patient's field of vision and maintain eye contact if possible.
2. Keep the room lights on while giving instructions.
3. If the patient is on a stretcher, have them sit up (if they can) in order to see the room.
4. Assist patients on and off footstools as their perception of height may be impaired.
5. Some patients may request that you keep the room lights dim if the light bothers their eyes.
6. If it will not interfere with the examination, allow the patient to wear their glasses. If they must be removed, wait until the patient is in the desired location in the room to remove them.
7. Offer your arm to the patient should they require some extra guidance.
8. Give the patient extra time to adapt from brightly lit hallways to dark x-ray examination rooms.

Hearing

Normal changes in the aging ear can include:

- Decreased ability to hear sounds in the high range tone.
- Sensory, neural and conductive changes in physiology of the ear.

Verbal instructions to our patients are key to the successful outcome of an x-ray examination. Not all elderly people will be hard of hearing, so avoiding making assumptions. Some patients resent the implication that they may be hearing impaired. Assess for deafness by checking for hearing aids, or if the patient is spoken to in a normal voice note if they turn their head to one side to hear better. If you are unsure, ask the patient if they'd like you to speak up.

Follow these guidelines to assist an elderly patient with hearing difficulties:

1. Stand in front of the patient and try to maintain eye contact when you speak.
2. Talk in a lower voice and speak carefully and slowly.
3. Try to eliminate background noise as it can be disruptive.
4. If your patient does not appear to understand your instructions, try to rephrase them slightly.
5. Consider giving instructions one at a time to allow for mental processing time.
6. Demonstrate what you are requesting. Showing them how to position their hand on a cassette may assist them in understanding what it is you need them to do.

© Edenbrook College

Balance/Coordination

Normal changes related to aging can affect balance and coordination. Changes in the brain, inner ear, eye, and musculoskeletal system that can lead to impaired balance and coordination are:

- Muscular atrophy and loss of muscle tone
- Loss of bone mass
- Increased kyphosis of the thoracic spine
    - Center of gravity shifts from the hips to the upper torso
    - Head will tilt backwards to compensate
    - Elbows, hips, and knees flex
- Decreased reflexes
- Sensitivity to rapid changes in lighting can cause momentary blindness
- Decreased ability of the inner ear to respond to position changes, resulting in positional vertigo
- Decreased height perception from declining eyesight

Some elderly patients have great anxiety of falling associated with a decline in their balance and coordination. They may have had previous falls. Offering fall prevention measures will reduce this anxiety considerably and allow the patient to concentrate on your instructions.

Follow these guidelines to assist an elderly patient with balance or coordination difficulties:

1. Offer your assistance to the patient when moving around the exam room, changing positions, and getting on and off the radiographic table. ALWAYS practice good body mechanics when assisting patients.
2. Some patients will want to move themselves with their walker or cane. Allow them to use their walking aids and ensure they are close by.
3. Ask the patient if they need assistance and in which way you can help them. It may be assisting them gown, remove jewelry, a steady arm, etc.
4. Let the patient rest a few minutes after sitting up from a reclining position to reduce dizziness. Also encourage them to keep their eyes opened and focused as this will help combat vertigo.
5. Provide handgrips where possible. (if standing/sitting at upright detector let them hold the hand bars to steady themselves)
6. Watch that the patient does not hold onto the edge of the x-ray table as you can pinch their fingers.
7. Use caution at all times. If the patient seems unable to weight bear alone, provide an alternative for them. (if chest x-ray ordered leave them in the stretcher to complete and adapt your exam accordingly)
8. Most importantly, reassurance and attention can go a long way towards reducing anxiety and ensuring patient dignity and respect as well as safety.

© Edenbrook College

Temperature Tolerance

Normal age-related changes include a diminished ability of the body to control temperature because the sweat glands may atrophy. Patients are more often cold than hot. Cold can be a problem for patients in the Radiology Department since the rooms and hallways tend to be cooler. Traveling to a radiology department on a stretcher or wheelchair wearing a hospital gown can be downright cold for an elderly patient. Some geriatric units dress their patients in street clothes for dignity and warmth. Before patient is transported to the department, alert the unit ahead of time of what needs to be removed for the x-ray examination to maintain patient dignity and efficiency within the department.

Follow these guidelines to assist an elderly patient with temperature regulation difficulties:

1. If completing an exam in the supine position on the x-ray table, put a sheet down or use a mattress to provide additional warmth and comfort.
2. Maintain a sheet or blanket over the patient whenever possible and expose only those areas that are required.
3. If your department has a blanket warmer, offer one to your patient for their return trip back to the unit.

Dressing/Undressing

Elderly patients tend to wear more clothes and are not able to move as quickly as young people. Some physical conditions may limit the range of movement of shoulder and hip joints. This may cause changing clothes to be difficult or slow. However, these patients have been dressing themselves for years and often do not need or want help. Ask the patient if they wish or require help before beginning to assist. Do not rush the patient while they change. If the patient is rushed, anxiety will increase, and the degree of compliance will decrease.

If the patient does not follow instructions such as "remove your blouse", it is possible that the patient has dressing apraxia. Apraxia is the inability to use objects correctly. The patient may not be able to undress as you have requested. Specific clues may help the patient understand your intent. Use different words or show the patient where the buttons are on the shirt.

For patients with a limited range of movement due to a stroke, undress the patient by removing the clothing from the unaffected side first, then remove from the affected limb. The opposite holds true for dressing.

© Edenbrook College

Skin/Soft Tissue Changes

Skin and its accessory organs make up the body's most visible and largest system. In the elderly the skin becomes more translucent and fragile as the dermis and epidermis are thinned. The collagen and elastin connective tissue becomes less uniform and are replaced with inelastic fibrous tissue, reducing the resilience of the skin.

Normal aging also affects the distribution of body fat. The changes include an increase in intracellular, intercellular, and visceral fat, with a decrease in subcutaneous fat. There may be a doubling of fat composition from age 25 to 75 years, although the body weight can remain the same. The diagnostic quality of images will be reduced since there will be an increase in fat and a decrease in contrast on the radiograph. You can compensate for this long scale contrast by utilizing a lower kVp/higher mAs technique.

A loss of muscle mass and tone is also common as a person ages. This loss is greater in the legs than in the arms for a patient who is inactive or bedridden.

These factors combined with chronic conditions such as diabetes, renal failure, and an extended stay on a hard x-ray table, may lead to the development of decubitus ulcers. Healing of those ulcers can take several months.

Remember the following guidelines when working with elderly patients with skin or soft tissue changes:

1. Be more aware of the patient's skin when transferring the patient.
2. Apply sleeve gauze to your patient's elbows if they will be required to roll on the bed.
3. To reduce the risk of decubitus ulcers, utilize radiolucent mattress pads to cover the table and use sponges as positioning aids to spread out the patient's weight on the x-ray table and prevent pressure on a small area.
4. Never pull on a patient's arm to help them up. Slight subluxation of the shoulder joint may occur, resulting in long term pain for the individual. Support the patient instead with your arm around their shoulders or by assisting them with their legs. ALWAYS practice good body mechanics when assisting patients.

© Edenbrook College

Cardiac or Pulmonary Changes

Normal aging changes can include:

- Decreased cough reflex
- Decreased respiratory defense mechanism
    - Cilia within the airways are less efficient at removing pollutants and debris
- Decreased pulmonary function and stiffening of the chest wall

The respiratory and cardiovascular system may be compromised and working at a lower capacity due to various reasons. Increased incidence of pneumonia, COPD and other chronic pulmonary disorders are common in older patients. Decreased pulmonary function in some elderly patients must be considered when performing long procedures that require extensive positioning. Lying down for these individuals, especially prone for procedures may be somewhat difficult for patients because their breathing becomes laboured, resulting in increased anxiety. For example, the physical exertion required for an air contrast barium enema or a UGI exam may place some patients in a state of overexertion. Be aware of their condition during such procedures. Alert the radiologist or nurse to any change in their breathing, skin colour, or level of awareness.

Remember the following guidelines when working with elderly patients with cardiac or pulmonary difficulties:

1. If an exam is to be done on the x-ray table, supine positioning is preferred over prone positioning.
2. If patient is supine, build up their head with extra pillows to allow the patient to breathe easier.
3. Consider doing cross-table views rather than having your patient roll on the table, especially if they are also in in pain.
4. Use positioning aids to decrease the amount of work the patient must do to hold the required position.
5. Allow patients time to catch their breath between various positions required for their examination.
6. Be aware of your patient's condition and check in with them throughout the examination.
7. Adjust technical factors appropriately.

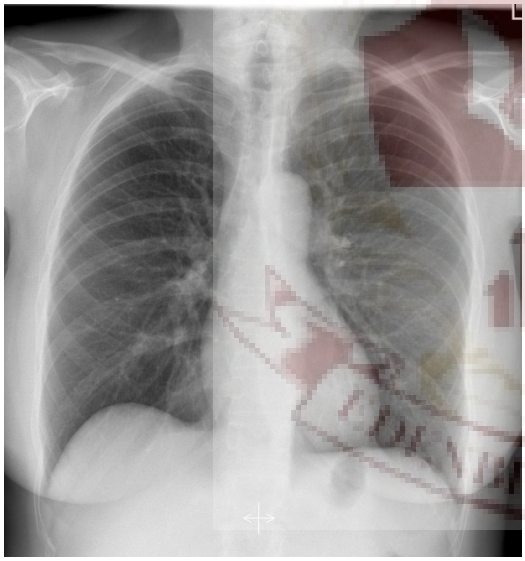
© Edenbrook College

Common Conditions and Pathologies and Radiographic Adjustments

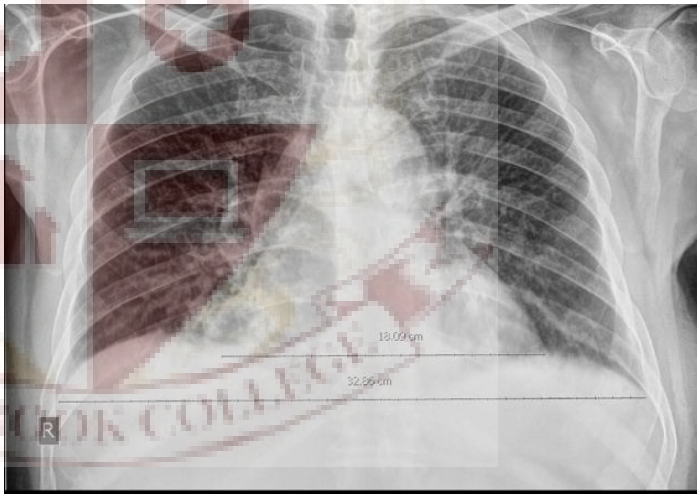
Cardiomegaly

An increase in heart size can be caused by several conditions, including congenital heart disease, atherosclerosis, and mitral valve disease. The most reliable way to measure heart size is on a PA chest radiograph taken at 180 cm SID. The measurement of the diameter of the heart should be less than 50% of the diameter of the chest at the level of the diaphragm. On the lateral view, the size of the left ventricle is judged by its projection posteriorly. The right ventricle can be seen by the filling of the retrosternal space.

Radiographically the choice of AP or PA projection has implications for evaluating the heart size. The increased OID in an AP chest will magnify the heart shadow. The same goes for a PA image done on a highly kyphotic patient or one done supine. In addition, when a patient is supine, the abdominal organs push the diaphragm and heart up into the thoracic cavity, causing distortion on the image. The position in which the radiographs are taken should be identified on the image. Shorter exposure times are desirable since heart motion can increase the cardiac shadow.



Normal CXR



Cardiomegaly

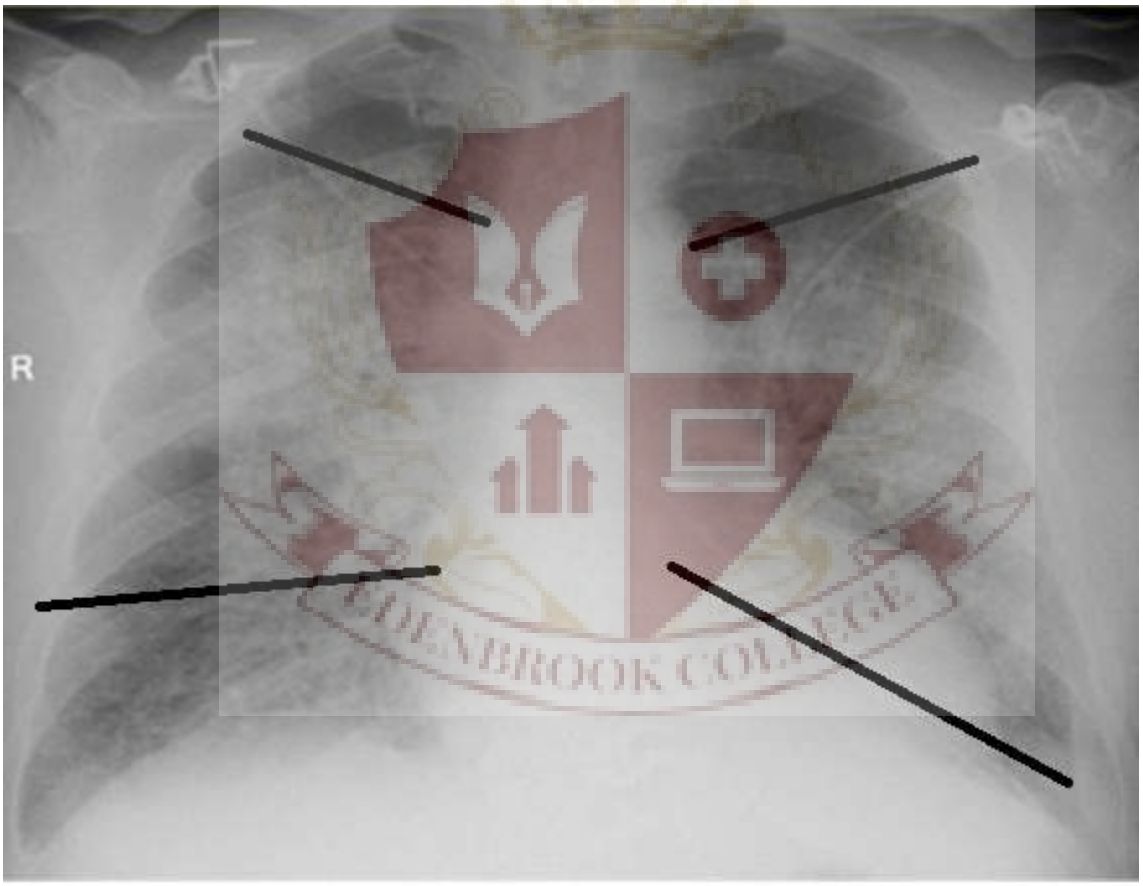
© Edenbrook College

Congestive Heart Failure

Congestive heart failure (CHF) results from a decrease in blood flow to the myocardium due to constricted cardiac arteries supplying the muscle. The heart cannot contract as efficiently as it should and results in a decreased cardiac output. The increase in blood volume in the heart will result in right ventricular failure and increased pulmonary venous pressure.

On chest radiographs the veins of the upper lobe will be more prominent and larger than the veins of the lower lobe. Fluid will accumulate at lung bases. Acute pulmonary edema results in a "batwing" pattern of increased density in the hilum.

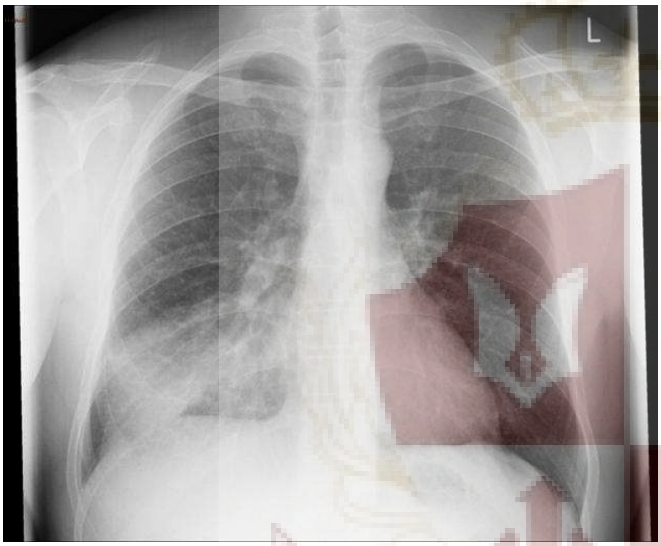
An increase in both mAs and kVp is needed to visualize the heart borders.



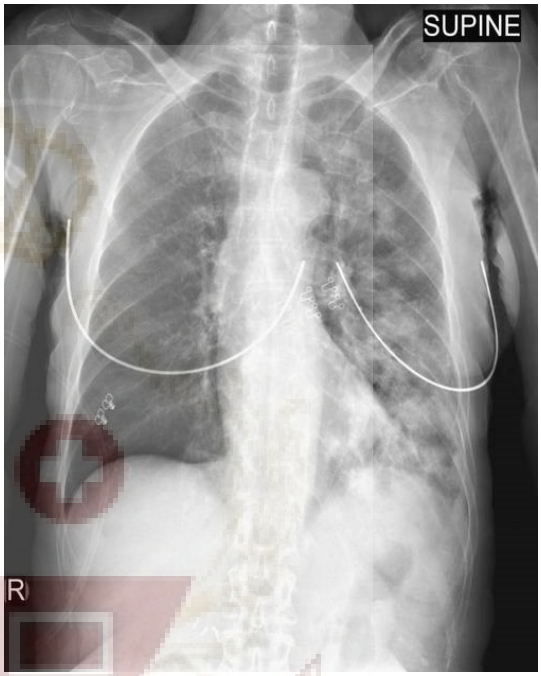
© Edenbrook College

Pneumonia

Pneumonia is a lung infection resulting from a bacterial or viral infection. Lung tissue that is normally air-filled is instead filled with fluid, causing an additive density on X-ray. The area of consolidation (opacification of the lung tissue) can be very small or take up most of the lung field. An increase in mA will provide enough density to the radiograph without burning out fine lung markings. A good inspiration is essential to aerate the bronchioles.



Pneumonia



Aspiration pneumonia

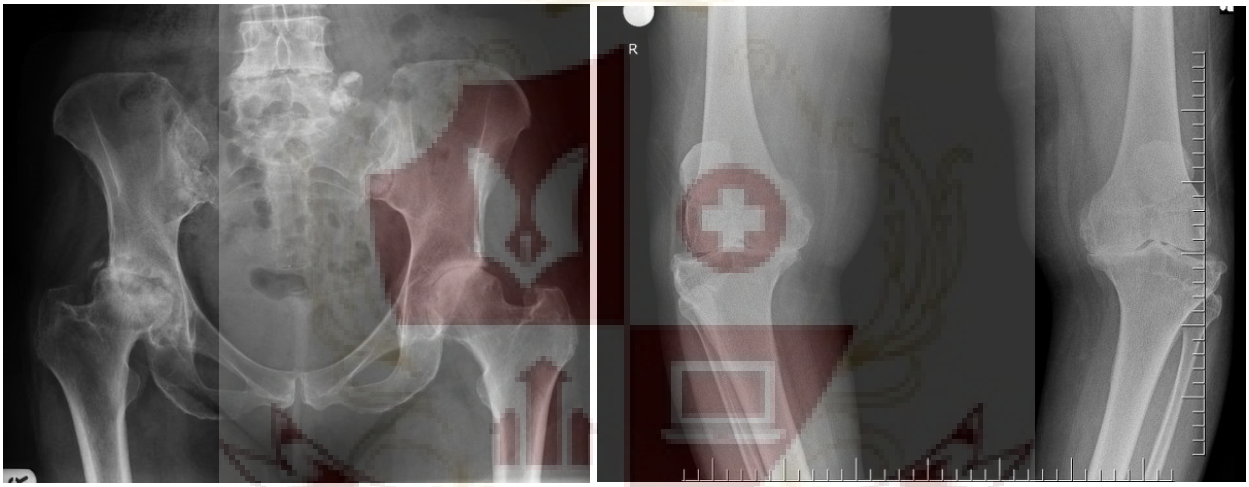
In the case of aspiration pneumonia, the consolidation seen on the image is a result of chemical trauma to the lung tissue, especially if the aspirated fluids are gastric secretions. An increase in technical factors is also required in this instance.

© Edenbrook College

Osteoarthritis

Also known as degenerative joint disease or OA. It can affect any joint in the body but is often found in weightbearing joints or those with a large range of motion. Hands, feet, hips, knees, and shoulders are all frequent sites. It is very common that it affects the joints asymmetrically (one side more than the other). The normal joint space decreases in size and the surfaces of the joint become rough. Osteophytes will appear on the joint surfaces, further increasing the degeneration of the joint as time passes.

OA can severely limit the range of motion of a joint and your patient may need additional time or sponge support to obtain the required positions. As this is an additive pathology, you can expect to have to increase both kVp and mAs to get the best radiographic density and contrast on your images.



Osteoporosis

Osteoporosis is caused by deterioration of bone tissue which leads to low bone mass. Previously thought to predominantly affect women, we now know that both men and women are at risk for osteoporosis and the resulting fractures. It can be caused by menopause as well as certain medications, medical conditions, or by being non-weight-bearing. The outer cortical layer of bone becomes weak and this results in fractures. When this bone loss becomes pronounced enough it can be seen on plain radiographs.

Care must be taken when moving a patient with osteoporosis. Exposure factors must be reduced to compensate for the loss in bone density. The lowest possible kVp is needed to maintain appropriate radiographic contrast in examinations of the extremities and spine.

© Edenbrook College



Low bone mass seen on in the ends of the long bones of the hand.

Fractures

The combination of lowered bone mass and loss of balance and coordination; as well as conditions such as strokes, mean that fractures are common in the geriatric population. Common fracture sites are the vertebrae, humerus, hip, pelvis, and wrist. Positioning of older patients with fractures can be difficult as the bones are often brittle and easily displaced. Cross-table projections can be used to avoid unnecessary movement.



Kyphosis

© Edenbrook College

Osteoporotic patients are prone to compression fractures of the thoracic spine. The increased pressure on the anterior border of the vertebral body mean that the vertebrae often become wedge shaped, leading to severe kyphosis. The kyphosis, in turn, leads to more compression of the anterior border of the vertebral bodies. The pain will increase with the severity of the disease. It will be difficult for these patients to sit fully upright for PA chest X-rays or to lie flat on their back for supine positioning. Allowing the patient to sit upright for chest and thoracic spine imaging can be helpful in allowing them to maintain the required positions. If a severely kyphotic patient must be supine, bolstering their head and knees with pillows and sponges can reduce discomfort. Fast exposure times may help to reduce motion on images.



Paget's Disease

© Edenbrook College

This disease of unknown etiology involves abnormal bone modeling. There is marked osteoclastic activity causing bone resorption and active osteoblastic activity resulting in calcium deposition. As the bone enlarges, it develops an irregular pattern. The bone is quite soft, and this results in bowing of the long bones. The skull and the vertebral bodies may become larger. Common sites for Paget's are the spine, pelvis, skull, and proximal long bones. This disease is more common in men and those over the age of 80.

Radiographically, the image receptor must be considered when examining patients. If bones increase in size, and are possibly bowed, larger image receptors may be required. Exposure factors, especially kVp, will have to be increased to compensate for increased calcium content.



© Edenbrook College

Diabetes Mellitus

Diabetes is a chronic metabolic disease caused by insufficient or ineffective insulin production. Long-term complications include renal disease, retinopathy, atherosclerosis, and distal neuropathy. This can cause a lack of sensation and poor proprioception. Repeated trauma will often not heal fully and may lead to secondary infection. Combined with decreased vascular supply to the area, neuropathic bone destruction follows. The most common location for this is the foot and ankle. Decreasing kVp and the use of a graduated filter can assist in improving contrast when exposure factors must penetrate the tarsal bones.



Contractures

Neuromuscular diseases, cerebrovascular accidents, trauma, and burns can result in abnormal muscle tone. If the tone increases, spasticity may follow, leaving the joints stuck in either flexion or extension, known as a contracture. The patient cannot control movement of the contracted limb and it will appear as resistance to a technologist when positioning. This is not a lack of compliance. The spasticity can be affected by pain, fear, and effort. In radiographic positioning, contractures can seem insurmountable. Contracted limbs are not easily moved. You must progress slowly and carefully.

Cross-table views may have to be done instead of forcing the limbs, being aware of the possible risk to the patient if limbs are forced.

© Edenbrook College

Glossary

Apraxia:	Inability to use objects correctly
Aspiration:	The act of inhaling something other than air into lungs
Atherosclerosis:	Deposition of yellowish plaques containing cholesterol and other lipid material, within arteries
Atrophy:	Wasting away
Cataracts:	An opacity of the lens of the eye
Cerebrovascular accidents:	A stroke
Cilia:	Tiny hair-like processes that extend from a cell surface, to move fluid or mucus.
Decubitus ulcers:	Bedsore, ulcer caused by prolonged pressure on a body part
Myocardium:	Heart muscle
Neuropathy:	Nerve damage
Osteoblast:	Cell that helps create new bone material
Osteoclast:	Cell that breaks down bone material and reabsorb it
Osteophytes:	Bone spurs
Positional vertigo:	Dizziness caused by abrupt position changes
Proprioception:	Sense of body position and self-movement
Sleeve gauze:	Elastic tubular gauze that can be placed over a patient's joints
Subluxation:	Partial dislocation
Visceral:	Relating to the internal organs

© Edenbrook College

© Edenbrook College

References

Bontrager, K.L & Lampignano (2014). *Textbook of Radiographic Positioning and Related Anatomy* (8th ed.). St. Louis, MO: Mosby Elsevier.

Osteoporosis Canada
https://osteoporosis.ca/about-the-disease/what-is-osteoporosis/

All images provided courtesy of Radiopaedia
https://radiopaedia.org/

© Edenbrook College