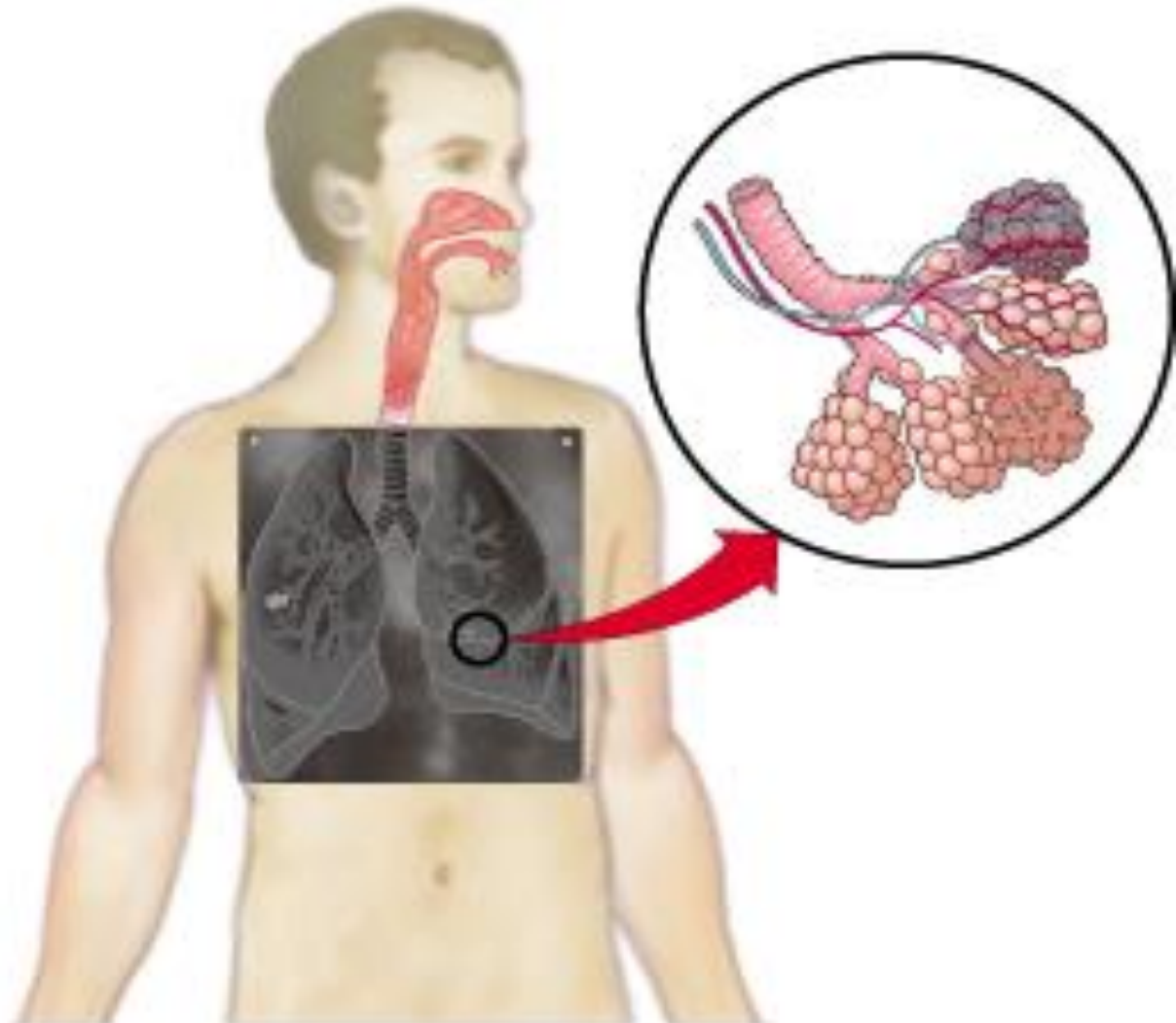


# Diagnostic Imaging and Surgery



# Objectives

**After studying this chapter, you will be able to:**

- **List the types of diagnostic imaging**
- **List the types of surgery and some important surgical tools**
- **Define the combining forms and suffixes used in building words that relate to diagnostic imaging and surgery**
- **Identify the meaning of related abbreviations**

# Diagnostic Imaging and Radiation Therapy

## Imaging

- **The production of visual output using:**
  - **x-rays**
  - **sound waves**
  - **magnetic fields**

## Diagnostic Imaging

- **The use of imaging to diagnose problems in the interior of a part of the body without surgery**

## Three Major Types of Imaging

• **x-rays**

• **ultrasonography**

• **magnetic resonance imaging**

# Diagnostic Imaging and Radiation Therapy

## X-Ray Technology

- **High-energy electromagnetic radiation**
- **Three types of radioactive particles:**
  - **gamma rays** (most penetrating power)
  - **alpha rays** (least penetrating power)
  - **beta rays** (falls in the middle)
- **Shows images in black, white and gray**

- **Shows abnormalities such as:**
  - **broken bones**
  - **internal anomalies**
  - **dental abnormalities**



# Diagnostic Imaging and Radiation Therapy

## X-Ray Technology (cont'd)

### Substances of the body may be:

- **Radiolucent**

- allows x-rays to pass through quickly (ex. air)
- appear black on x-ray images

- **Radiopaque**

- blocks or absorbs x-rays (ex. bone)
- appear white on x-ray images



- **Substances in-between**

- have varying degrees of absorbability or resistance to x-rays (ex. fat)
- appear gray on x-ray images

# Diagnostic Imaging and Radiation Therapy



## Dangers of X-ray

- **Long-term, unprotected exposure to x-rays can cause cancer**
- **X-rays **ionize** to destroy cancer cells, but normal cells and surrounding tissue will also be damaged**
- **X-rays cannot penetrate lead so lead aprons and vests are used**

**Radiologic technologists commonly use lead aprons or vests when working.**

# Diagnostic Imaging and Radiation Therapy

## Computer-Guided X-rays

### Tomography

- Creates three-dimensional images

### Computed Tomography

- Shows slices of an image or body part

### Positron Emission Tomography

- Shows the distribution of substances in tissue

### Fluoroscopy

- Allows observation of a body part in motion



# Diagnostic Imaging and Radiation Therapy

## Enhancing X-ray Clarity

Two substances used to enhance the clarity of x-ray images are barium and iodine.

### Barium

#### PROCEDURES

- barium swallow
- barium enema

### Iodine

#### PROCEDURES

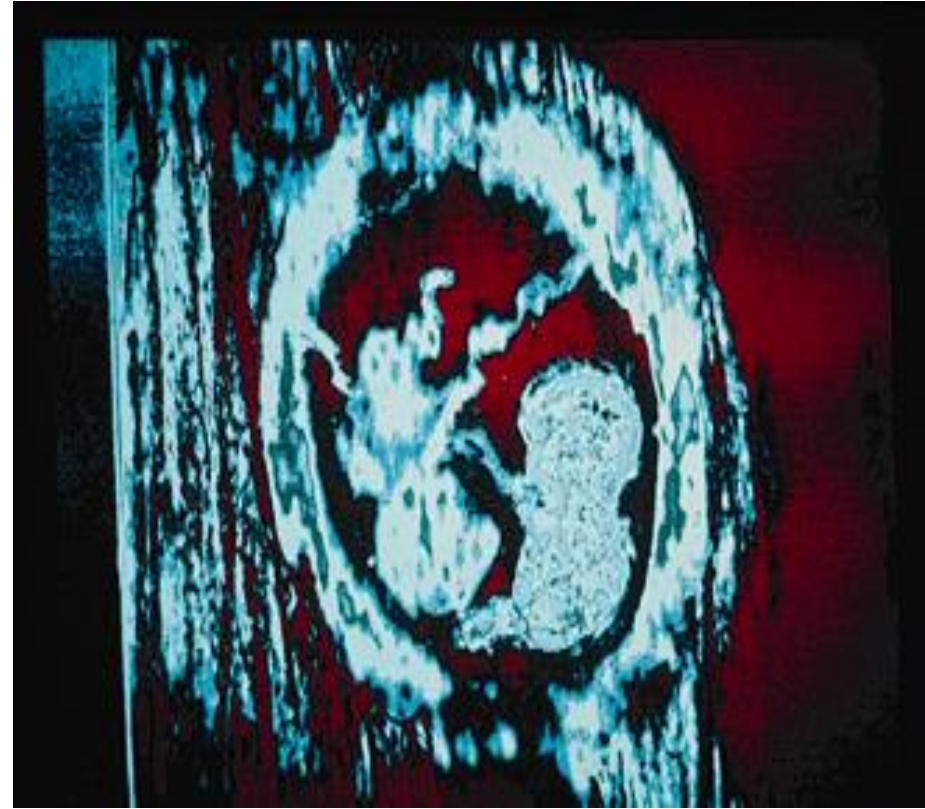
- angiography
- arthrography
- cholecystography



# Diagnostic Imaging and Radiation Therapy

## Ultrasonography

- **Non-invasive** method of examination
- The use of sound waves to produce images
- Used to monitor fetal development during pregnancy
- **Echocardiography** is a test used to diagnose cardiovascular diseases and disorders of many other organs
- **Doppler** is used on blood vessels



# Diagnostic Imaging and Radiation Therapy

## Radiation Therapy

The specialty of those who treat abnormal body tissue with high doses of x-rays or **radionuclides** such as cobalt.

- **Irradiation** of cells is used in treating diseases such as cancer

- Radiation is measured in **rads**, which in turn is measured in **grays (gy)**

**Radiosensitive  
Tissue**

= ↓ **gy's**

**Radioresistant  
Tissue**

= ↑ **gy's**

# Diagnostic Imaging and Radiation Therapy

## Techniques Used In Administering Radiation

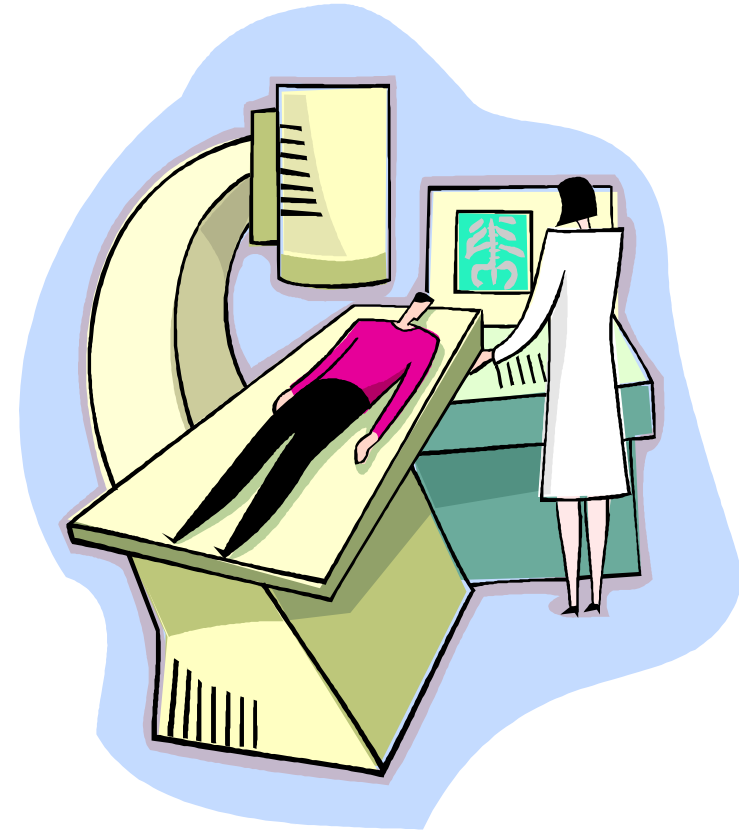
- **Linear accelerator**
  - machine that delivers radioactive particles in a straight line
- **Betatron**
  - a circular machine that delivers radioactive substances
- **Stereotactic Frame**
  - device placed around a patient so that the beam of radiation goes to a specific spot in the brain

# Diagnostic Imaging and Radiation Therapy

## Other Techniques

Radiation may also be given directly by means of:

- **Brachytherapy**
  - implanting radioactive elements directly into a tumor
- **Intracavitary therapy**
  - implanting radioactive elements into an adjacent cavity



# Surgical Terms

## Types of Surgery

- **Preventive**
- **Manipulative**
- **Diagnostic**
- **Minimally Invasive**
- **Reconstructive**



## Reasons for Surgery

- **removal of tissue**
- **manipulation of tissue**
- **insertion of a device or transplanted body part or tissue**

**Mohs' surgery** is the removal of a carcinoma after **mapping** with a chemical to identify the narrowest margin of affected tissue.

# Surgical Terms

## Surgical Equipment

### Cutting and Dissecting Instruments

- scalpel
- curette
- scissors

### Clamping Devices

- forceps

The surgical environment is aseptic and all personnel must follow hospital and OSHA guidelines for Standard Precautions



### Other Instruments

- retractors
- probes
- dilators
- needles
- staples

# Combining Forms and Abbreviations

## Combining Form

## Meaning

**cine** → **movement**

**electro(o)** → **electric; electricity**

**fluor(o)** → **light; luminous**

**micr(o)** → **small; microscopic**

**radi(o)** → **radiation**

**son(o)** → **sound**

**ultra** → **beyond**

# Combining Forms and Abbreviations

## Suffix

## Meaning

**-centesis**===== **puncture**

**-clasis**===== **breaking**

**-clast**===== **breaking**

**-ectomy**===== **removal of**

**-gram**===== **a recording**

**-graph**===== **recording instrument**

**-graphy**===== **process of recording**



# Combining Forms and Abbreviations

## Suffix

## Meaning

- opsy**..... a viewing
- ostomy**..... opening
- pexy**..... fixation done surgically
- plasty**..... surgical repair
- rrhaphy**..... surgical suturing
- scope**..... instrument for observing
- tomy**..... cutting operation

# Combining Forms and Abbreviations

## Abbreviation

## Meaning

**Ba** → **barium**

**BaE** → **barium enema**

**CAT** → **computerized axial tomography**

**C-spine** → **cervical spine (film)**

**CT** → **computed tomography**

**CXR** → **chest x-ray**

**DSA** → **digital subtraction angiography**

# Combining Forms and Abbreviations

## Abbreviation

## Meaning

<b>ERCP</b>	→	<b>endoscopic retrograde cholangio-pancreatography</b>
<b>Fx</b>	→	<b>fracture</b>
<b>Gy</b>	→	<b>unit of radiation equal to 100 rads</b>
<b>IVC</b>	→	<b>intravenous cholangiography</b>
<b>IVP</b>	→	<b>intravenous pyelogram</b>
<b>IVU</b>	→	<b>intravenous urography</b>
<b>MRA</b>	→	<b>magnetic resonance angiography</b>

# Combining Forms and Abbreviations

## Abbreviation

## Meaning

<b>MRI</b>	<b>magnetic resonance imaging</b>
<b>MUGA</b>	<b>multigated acquisition scan</b>
<b>NMR</b>	<b>nuclear magnetic resonance (imaging)</b>
<b>PET</b>	<b>positron emission tomography</b>
<b>r</b>	<b>roentgen</b>
<b>Ra</b>	<b>radium</b>
<b>rad</b>	<b>radiation absorbed dose</b>



# Apply Your Knowledge

**Joan has fractured her left arm. The physician is viewing the x-rays. Which color would her bones appear on the film?**

**A. gray**

**B. white**

**C. black**

**Answer: B. white**

# Apply Your Knowledge

**Mr. Haley has recently experienced massive headaches and altered levels of awareness. His physician suspects that he might have a brain tumor.**

**Which of the following scans would show the distribution of substances in the brain tissue?**

**A. ultrasound**

**B. computed tomography**

**C. positron emission tomography**

**Answer: C. positron emission tomography**

# Apply Your Knowledge

**Which of the following has the highest penetrating ability?**

**A. alpha rays**

**B. beta rays**

**C. gamma rays**

**Answer: C. gamma rays**