COURSE: Radiographic Procedures III (RAD 228)
SEMESTER: Fall 2012
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WEEK # 1

I. ESOPHAGUS SERIES
A. OBJECTIVES
1. Identify the anatomy of the esophagus system on diagrams and radiographs.
2. Describe the function and physiology of the esophagus.
3. Describe patient preparation for procedures of the esophagus.
4. Identify clinical indications for procedure performance.
5. Identify contrast media used, list pertinent questions to ask the patient before procedure is performed.
6. Identify reactions which may result from contrast media and indicate actions the radiographer must take when a patient reaction occurs.
7. Describe the routine positions employed for radiography of the esophagus and demonstrate procedure in the lab.

B. GENERAL EXAM REQUIREMENTS
1. Ask patient if prep was followed, gather evidence.
2. Obtain clinical history, pregnancy possibility.
3. Explain procedure using textbook and class notes criteria.
4. 40" SID is routine.
5. 100 - 125 kvp range.
6. Patient instructions:
   A. Thick barium: two – three spoonfuls ingested followed by immediate exposure, no breathing instructions required. Use short exposure time.
   B. Thin barium: continuously drinking barium through a straw. Exposure is made after three – four swallows, no breathing instructions required. Use short exposure time.
7. Shield all individuals.
8. The recumbent position ensures complete filling of the esophagus as compared to the erect position.

C. ROUTINE PROCEDURES ESOPHAGUS
1. AP 14 x 17 lw
A. Patient supine, arms abducted, elbows flexed, head supported, legs extended.
B. Place top of image receptor (IR) 2" above the shoulders.
C. Direct CR perpendicular @ 3" below jugular notch or 1" below sternal angle and MSP to the level of T<sub>5-6</sub>
D. Collimate to IR lengthwise, 5" – 6" collimation crosswise.
E. Place marker in collimation at top of IR.
F. Turn head to the side to facilitate drinking barium. Support cup.
   NOTE: A PA projection will increase recorded detail. CR enters T<sub>5-6</sub> that lies @ 5-6" below the vertebra prominens.
2. **RAO** 14 X 17 lw
   A. Rotate body to form a 35 - 40 degree obliquity, head supported.
   B. Right arm down, left arm flexed holding barium cup.
   C. Flex knee of elevated side for added support.
   D. Place top of IR 2" above the shoulders.
   E. Direct CR perpendicular to level of T₅ - T₆ and 1" - 2" lateral to the spine toward the elevated side.
   F. Collimate to IR lengthwise, 5" - 6" crosswise collimation.
   G. Place marker in collimation at top of IR.

3. **LAO** 14 X 17 lw
   A. Rotate body to form a 35 - 40 degree obliquity, head supported.
   B. Left arm down, right arm flexed holding barium cup.
   C. Flex knee of elevated side for added support.
   D. Place top of IR 2" above the shoulders.
   E. Direct CR perpendicular to level of T₅ - T₆ and 1" - 2" lateral to the spine toward the elevated side.
   F. Collimate to IR lengthwise, 5" - 6" crosswise collimation.
   G. Place marker in collimation at top of IR.

4. **RIGHT LATERAL** 14 X 17 lw
   A. Place individual in a lateral position, head supported.
   B. Flex knees for added support.
   C. Elevate arms, flex elbows, holding barium cup.
   D. Place top of IR 2" above the shoulders.
   E. Direct CR perpendicular @ 3" below jugular notch and mid-coronal plane.
   F. Collimate to IR lengthwise, 5" - 6" crosswise collimation.
   G. Place “R” marker anteriorly in collimation at top of IR.
   H. **Optional Swimmers Lateral:** Permits better visualization of the upper esophageal segment without superimposition of the shoulders. Maintain hips and pelvis lateral, rotate left shoulder posteriorly placing left arm behind the back. Right arm bent to support barium cup.
WEEK #2

I. UPPER GASTROINTESTINAL SERIES
   A. OBJECTIVES
      1. Identify the anatomy of the upper gastrointestinal (GI) system on diagrams and radiographs.
      2. Describe the function and physiology of the GI system.
      3. Describe patient preparation for procedures of the GI system.
      4. Identify clinical indications for procedure performance.
      5. Identify contrast media used, list pertinent questions to ask the patient before procedure is performed.
      6. Identify reactions which may result from contrast media and indicate actions the radiographer must take when a patient reaction occurs.
      7. Describe the routine positions employed for radiography of the GI system and demonstrate procedure in the lab.

   B. GENERAL EXAM REQUIREMENTS
      1. Ask patient if prep was followed, gather evidence.
      2. Obtain clinical history, pregnancy possibility.
      3. Explain procedure using textbook and class notes criteria.
      4. 40” SID is routine.
      5. Collimate to demonstrate a border on four sides when possible using a 10"X12" IR or to area of interest on larger IR. Collimation should not exceed 11"X14" when using 14"X17" IR except as noted for AP.
      6. 100 - 125 kvp single contrast, 90 – 100 kvp dual contrast.
      7. Ensure complete filling of the stomach with contrast agent.
      8. Shield all individuals.

   C. ROUTINE PROCEDURES UGI
      1. RAO 10 X 12 or 14 X 17 lw
         A. Rotate body to form a 40 - 70 degree obliquity, head supported.
            1. STHENIC : 45 - 55 DEGREES
            2. ASTHENIC : 40 DEGREES
            3. HYPERSTHENIC: 70 DEGREES
         B. Right arm down, left arm flexed holding barium cup.
         C. Flex knee of elevated side for added support.
         D. Direct CR perpendicular to L1 at the level of the duodenal bulb. This may be localized @1 - 2” above the lower rib margin and midway between the spine and left lateral border of the abdomen.
         ALTERNATIVE METHOD: Bisecting the inferior angle of the scapula and iliac crest may be used to localize the longitudinal location of the duodenal bulb.
         E. Place left marker in collimation at top of IR.
         F. Suspend respiration at end of exhalation.
2. **RIGHT LATERAL** 10 X 12 or 14 X 17 lw
   A. Place individual in a right lateral position, head supported.
   B. Flex knees for added support.
   C. Elevate arms, flex elbows.
   D. Direct CR perpendicular to L1 at the level of the duodenal bulb. This may be localized midway between the xiphoid tip and lower lateral margin of ribs and 1-1.5” anterior to the mid-coronal plane. The alternative method described above may also be used.
   E. Place right marker anterior in collimation at top of IR.
   F. Suspend respiration at end of exhalation.

3. **AP** 14 X 17 lw
   A. Patient supine, legs extended.
   B. Place bottom of IR at the level of the iliac crest.
   C. Direct CR perpendicular to the level of L1. This is localized midway between the xiphoid tip and lower left rib margin and midway between the MSP and left lateral rib margin.
   D. Collimate to film size lengthwise, 1” border on lateral sides as possible.
   E. Place left marker in collimation on left lateral side.
   F. Suspend respiration after exhalation.
   G. Alternative: AP partial Trendelenburg (30° - 39°) may be performed to completely fill the fundus on asthenic patients. AP full Trendelenburg (40°) demonstrates hiatal hernia.

4. **LPO** 10 X 12 or 14 X 17 lw
   A. Rotate body to form a 30 - 60 degree obliquity, head supported.
     1. STHENIC : 45 DEGREES
     2. ASTHENIC : 30 DEGREES
     3. HYPERSTHENIC: 60 DEGREES
   B. Left arm down, right arm flexed and placed across chest.
   C. Flex knee of elevated side for added support. Use sponge support as needed.
   D. Direct CR perpendicular to level of L1. This may be localized midway between the xiphoid tip and lower margin of the ribs. The longitudinal ray is directed midway between the midline of the body and left lateral border of the abdomen.
   E. Place left marker in collimation at top of IR.
   F. Suspend respiration at end of exhalation.
5. **PA** 10 X 12 or 14 x 17 lw
   A. Patient prone, arms up with elbows flexed, head supported.
   B. Extend legs and provide support under ankles as needed.
   C. Direct CR perpendicular to the level of L1. This may be localized @ 1 ½ “ above the left lower rib margin and 1” left of the vertebral column, or use the alternative method.
   D. Place “L” marker in collimation at bottom of IR.
   E. Suspend respiration after exhalation.

**NOTE:** Hypersthenic Patients: A PA axial may be performed on to demonstrate the greater and lesser curvatures of the stomach, pylorus and duodenal bulb without superimposition. A 35 – 45 degree cephalic angle is used.

**Infants:** A 20 – 25 degree cephalic angle is used for infants to separate the body and pylorus.

II. **SMALL BOWEL SERIES**

**A. OBJECTIVES**
1. Identify the anatomy of the small bowel (SB) on diagrams and radiographs.
2. Describe the function and physiology of the SB.
3. Describe patient preparation for procedures of the SB.
4. Identify clinical indications for procedure performance.
5. Identify contrast media used, list pertinent questions to ask the patient before procedure is performed.
6. Identify reactions which may result from contrast media and indicate actions the radiographer must take when a patient reaction occurs.
7. Describe the routine positions employed for radiography of the SB and demonstrate procedure in the lab.

**B. GENERAL EXAM REQUIREMENTS**
1. Ask patient if prep was followed, gather evidence.
2. Obtain clinical history, pregnancy possibility.
3. Explain procedure using textbook and class notes criteria.
4. 40” SID is routine.
5. 100 - 125 kvp range SB series.
6. Shield males for SB, impractical for females.

**C. ROUTINE PROCEDURES SMALL BOWEL**

1. **PA** 14 x 17 lw
   -- An AP projection may be performed to accommodate the patient but demonstrates less geometric recorded detail.
   A. Patient prone, arms up with elbows flexed, head supported.
   B. Extend legs and provide support under ankles as needed.
   Direct CR perpendicular 2” above the iliac crest and MSP – **15 or 30 min** depending on habitus.

**NOTE:** The initial radiograph must include the fundus of the stomach.

C. Direct CR perpendicular to the iliac crest and MSP 60 min and longer.
D. Collimate to IR lengthwise, 1” border on lateral sides as possible.
E. Place left marker in collimation at bottom of IR.
F. Suspend respiration after exhalation
WEEK # 3

I. BARIUM ENEMA – SINGLE CONTRAST

A. OBJECTIVES
1. Identify the anatomy of the large bowel on diagrams and radiographs.
2. Describe the function and physiology of the large bowel.
3. Describe patient preparation for procedures of the large bowel.
4. Identify clinical indications for procedure performance.
5. Identify contrast media used, list pertinent questions to ask the patient before procedure is performed.
6. Identify reactions which may result from contrast media and indicate actions the radiographer must take when a patient reaction occurs.
7. Describe the routine positions employed for radiography of the large bowel and demonstrate procedure in the lab.

B. GENERAL EXAM REQUIREMENTS
1. Ask patient if prep was followed, gather evidence.
2. Obtain clinical history, pregnancy possibility.
3. Explain procedure using textbook and class notes criteria.
4. 40" SID is routine.
5. 100 - 125 kvp range barium, 80 - 90 kvp water soluble contrast.
6. Shield males provided it does cover pertinent anatomy, impractical for females except for AP upper colon as noted below.

C. ROUTINE PROCEDURES

1. AP (SCOUT AND SERIES) 14 x 17 lw
   A. Patient supine, arms abducted, elbows flexed, head supported.
   B. Extend legs.
   C. Direct CR perpendicular to iliac crest and MSP.
   D. Collimate to IR lengthwise, 1” border on lateral sides as possible.
   E. Place marker in collimation at bottom of IR.
   F. Suspend respiration after exhalation.
   **NOTE:** Include symphysis pubis to left colic flexure. An AP upper colon may be required, refer to criteria below.

2. AP UPPER COLON 14 X 17 cw
   A. Same position as AP changes noted.
   B. CR directed perpendicular midway between the iliac crest and xiphoid process and MSP.
   C. Collimation should not exceed 11” X 14” unless required by body habitus.
   D. Shield all individuals as tolerable.
3. **AP AXIAL**  10” X 12” lw
A. Same position as AP changes noted.
B. Direct CR 35 degrees cephalic to the approximate level or 2” below the ASIS and to the MSP.
C. Collimate to IR lengthwise, 1” border on lateral sides as possible.
D. Place marker in collimation at bottom of IR.
E. Suspend respiration after exhalation.

**NOTE:** A PA axial may be obtained with the CR directed 35 degrees caudad. The CR exits at the level of the ASIS and MSP.

4. **OBLIQUE (RPO and LPO)**  14 X 17 lw
A. Rotate body to form a 40 degree obliquity, head supported. Elevated flexure is demonstrated.
B. Flex knee of elevated side for added support.
C. Place arm of elevated side across upper chest.
D. Direct CR perpendicular to level of iliac crest and @2” medial to elevated ASIS (1” lateral to MSP toward elevated side).
E. Collimate to IR lengthwise, 1” border on lateral sides as possible.
F. Place appropriate marker in collimation at bottom of IR.
G. Suspend breathing after exhalation.

**NOTE:** The RPO position may require an additional upper colon radiograph to ensure inclusion of left colic flexure.

5. **LATERAL**  10 x 12 lw
A. Place individual in a left lateral position, head supported.
B. Flex knees for added support.
C. Elevate arms, flex elbows.
D. Direct CR perpendicular to level of ASIS and mid-coronal plane
E. Collimate to IR lengthwise, 1” border on lateral sides as possible.
F. Place left marker anterior in collimation.
G. Suspend respiration after exhalation.

6. **PA (Post Evac)**  14 X 17 lw
A. Place patient prone, provide head support.
B. Elevate arms, bend at elbows for support.
C. Flex knees, provide support under ankles as needed.
D. Direct CR perpendicular to level of iliac crest and MSP.
E. Collimate to IR lengthwise, 1” border on lateral sides as possible.
F. Place left marker upside down above blocker in light field, blocker down.
G. Suspend breathing after exhalation.
H. Reduce kvp @10 depending on patient’s ability to evacuate.

**NOTE:** This position is also used in the BE dual contrast procedure.
WEEK # 4

I. BARIUM ENEMA – DUAL CONTRAST

A. OBJECTIVES
1. Identify clinical indications for procedure performance.
2. Identify contrast media used, list pertinent questions to ask the patient before procedure is performed.
3. Identify reactions which may result from contrast media and indicate actions the radiographer must take when a patient reaction occurs.
4. Describe the routine positions employed for radiography of the large bowel and demonstrate procedure in the lab.

B. GENERAL EXAM REQUIREMENTS
1. Ask patient if prep was followed, gather evidence.
2. Obtain clinical history, pregnancy possibility.
3. Explain procedure using textbook and class notes criteria.
4. 40" SID is routine.
5. 90 – 100 kvp range.
6. Shield males provided in does not cover pertinent anatomy, impractical for females.

C. ROUTINE PROCEDURES
1. LATERAL DECUBITUS  14 X 17 grid lw
   A. Place individual in a right or left lateral position, head supported.
   B. Flex knees for added support.
   C. Elevate arms, flex elbows.
   D. Place sponge support under pelvis and abdomen.
   E. Direct CR horizontal to iliac crest and MSP.
   F. Collimate to IR lengthwise, 1” border on lateral sides as possible.
   G. Place side up marker in collimation.
   H. Suspend respiration after exhalation.

2. VENTRAL DECUBITUS  10 X 12 lw
   A. Place individual in the prone position.
   B. Elevate arms, flex elbows for comfort.
   C. Direct CR horizontal to the level of the ASIS and midcoronal plane.
   D. Collimate to film size, 1” border on all sided as possible.
   E. Place marker in light field (side closest to IR).
   F. Suspend respiration after exhalation.
3. **OBLIQUE (RAO and LAO)** 14 X 17 lw
A. Rotate body to form a 40 degree obliquity, head supported. Down side flexure is demonstrated.
B. Flex knee of elevated side for added support.
C. Place arm of elevated side up, opposite arm down.
D. Direct CR perpendicular to the iliac crest and @1” lateral to the vertebral column, toward the elevated side.
E. Collimate to film size lengthwise, 1” border on lateral sides as possible.
F. Place appropriate marker in collimation at bottom of IR to demonstrate down side flexure.
G. Suspend breathing after exhalation.
**NOTE:** The LAO position may require an additional upper colon radiograph to ensure inclusion of left colic flexure.

4. **PA (Post Evac)** 14 X 17 lw
F. Place patient prone, provide head support.
G. Elevate arms, bend at elbows for support.
H. Flex knees, provide support under ankles as needed.
I. Direct CR perpendicular to level of iliac crest and MSP.
J. Collimate to IR size lengthwise, 1” border on lateral sides as possible.
I. Place left marker upside down above blocker in light field, blocker down.
J. Suspend breathing after exhalation.
K. Reduce kvp @10 depending on patient’s ability to evacuate.
**NOTE:** This position is also used in the BE single contrast procedure.
WEEK #5

I. URINARY SYSTEM

A. OBJECTIVES
1. Identify the anatomy of the urinary system on diagrams and radiographs.
2. Describe the function and physiology of the urinary system.
3. Describe patient preparation for procedures of the urinary system.
4. Identify clinical indications for procedure performance.
5. Identify contrast media used, list pertinent questions to ask the patient before procedure is performed.
6. Identify reactions that may result from contrast media and indicate actions the radiographer must take when a patient reaction occurs.
7. Describe the routine positions employed for radiography of the urinary system and demonstrate procedure in the lab.

B. GENERAL EXAM REQUIREMENTS
1. Ask patient if prep was followed, gather evidence.
2. Ask patient to empty bladder, strain urine if necessary.
3. Obtain clinical history, pregnancy possibility.
4. Explain examination using textbook and class notes criteria.
5. 40” SID is routine.
6. 70 - 75 kvp range.

C. ROUTINE PROCEDURES
1. AP (SCOUT AND SERIES) 14x17 lw
   A. Patient supine, arms abducted, elbows flexed, head supported.
   B. Flex knees and provide support with a sponge as needed.
   C. Direct CR perpendicular to level of iliac crest or 1” above and MSP.
   D. Collimate to IR lengthwise, 1” border on lateral sides as possible.
   E. Place marker in collimation at bottom of IR.
   F. Suspend breathing after exhalation.
   G. Include entire symphysis pubis to upper kidney border. If kidneys to bladder cannot be included due to patient size, then an AP bladder must be performed. Refer to criteria below.

2. AP NEPHROGRAM and NEPHROTOMOGRAM 10X12 or 14X17 cw
   A. Same patient position as AP, changes noted.
   B. Direct CR perpendicular to a point midway between xiphoid tip and iliac crest and MSP.
   C. Collimate to IR or 1” border as possible, no larger than 11X14 when using larger IR size.
   D. Place marker on lower outer aspect of cassette, blocker down.
   E. Suspend breathing after exhalation.
   F. Shield all patients.
   G. Explain tube movement for nephrotomogram.
3. **OBLIQUE (RPO AND LPO)** 14 X 17 lw
A. Rotate body to form a 30-degree obliquity, head supported. Elevated kidney is parallel to image receptor.
B. Provide sponge support from symphysis pubis to mid-vertebral region.
C. Flex knee of elevated side for added support.
D. Place arm of elevated side across upper chest.
E. Direct CR perpendicular to level of iliac crest and vertebral column.
F. Collimate to IR lengthwise, 1” border on lateral sides as possible.
G. Place appropriate marker in collimation at bottom of IR to identify elevated kidney.
H. Suspend breathing after exhalation.
I. Shield male patients, impractical for female patients.

4. **PA (Post Void)** 14 X 17 lw
A. Place patient prone, provide head support.
B. Elevate arms, bend at elbows for support.
C. Flex knees, provide support under ankles as needed.
D. Direct CR perpendicular to level of iliac crest and MSP.
E. Collimate to IR lengthwise, 1” border on lateral sides as possible.
F. Place left marker in collimation upside down at bottom of IR.
H. Suspend breathing after exhalation.
I. Shield male patients, impractical for female patients.
J. Position may be performed erect to demonstrate BPH, bladder prolapse or nephroptosis

5. **AP BLADDER** (Pre or Post Void) 10 X 12 lw
A. Follow positioning protocol as for AP. Note changes.
B. Extend legs fully.
C. Direct CR perpendicular to level of ASIS and MSP. Bottom of IR should be at the level of the symphysis pubis.
D. Collimate to IR lengthwise, 1” border on lateral sides as possible.
E. Place right marker on bottom of cassette in light field, blocker down.
F. Suspend breathing after exhalation.
G. Shield male patients, impractical for female patients.
H. **ALTERNATIVE:** CR may be directed 10 – 15 degrees caudad to displace the symphysis pubis below the bladder

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RAD 228 Contrast Media Radiographic Procedures