Lab Experiment # 9

Magnification and Geometric Unsharpness

Direct Radiography

Purpose

This experiment is designed to demonstrate the effect of the OID and SID on geometric unsharpness and magnification as well as how each affects sharpness of detail and radiographic quality.

Learning Objectives

After completing this lab, you should be able to:

1. Use the laboratory equipment properly.
2. Set up the control console and ceiling tube mount correctly.
3. Function effectively in group work.
4. Perform the experiment independently.
5. Evaluate the effects of OID and SID on magnification.
6. Calculate the magnification factor for changes in OID and SID.
7. Describe the relationship between OID, SID, and sharpness of detail.
8. Summarize the OID and SIDs relationships to radiographic quality.
9. Predict the effect of the changes in OID and SID on magnification factor, and radiographic quality.

Materials Needed

➢ **35cm x 43 cm FPD image receptor**
➢ 2 x 2-1/2 inch resolution test pattern
➢ Set of radiolucent foam blocks
➢ Lead rubber sheets

Pre-Lab Discussion

Geometric Unsharpness

$$GU = FS \times \frac{OID}{SOD}$$
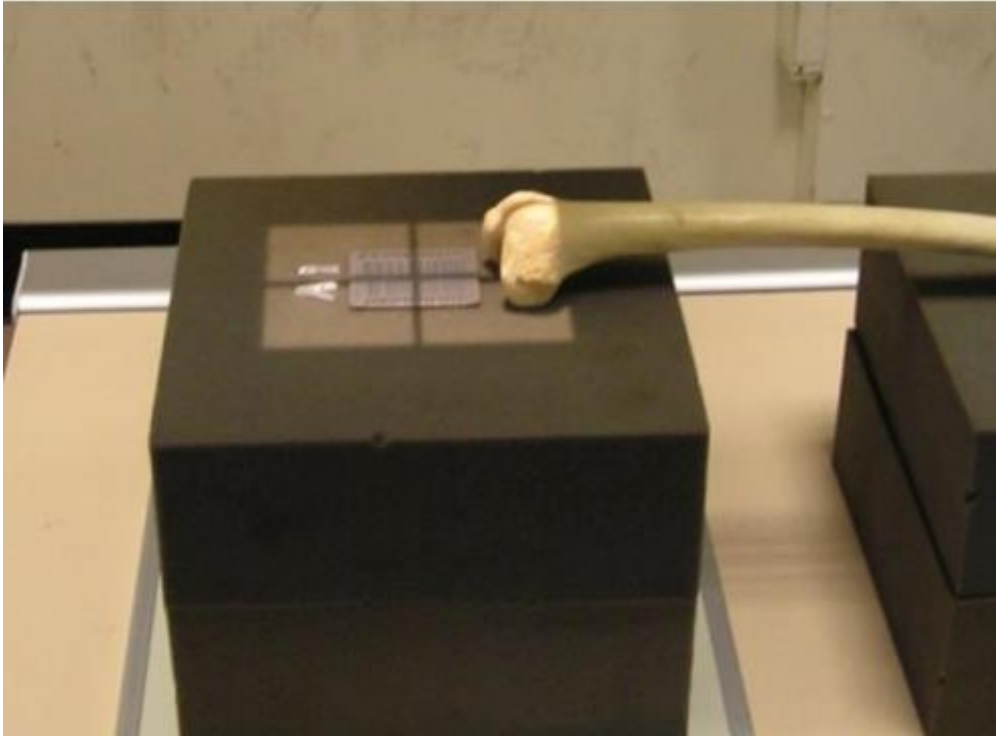
Magnification Factor

$$MF = \frac{SID}{SOD}$$

Calculating Object Size

$$Object\ Size = \frac{Image\ Size}{MF}$$

Experimental Setup
(Distal Natural Femur Bone)

Setup for one of the exposures (two foam blocks)

Experimental Procedure for Part 1

Effect of OID on Geometric Unsharpness and Magnification
(Distal Natural Femur Bone)

Instructions for Exposure 1

1. Place a FPD in the bucky assembly.

2. For exposure 1, place the **resolution test pattern in the center** of the image receptor **on the top of the radiographic table (OID 4 ")**

3. Place the distal end of the femur to the right of the resolution test pattern, in the AP position, with its long axis **centered** to the long axis of the IR.

4. For exposure 2, place the resolution test pattern in the center of the image receptor on the top of the radiographic table and one foam block. Calculate OID.

5. For exposure 3, place the resolution test pattern in the center of the image receptor on the top of the radiographic table and two foam blocks. Calculate OID.

6. For exposure 4, place the resolution test pattern in the center of the image receptor on the top of the radiographic table and three foam blocks. Calculate OID.

7. Direct the central ray **perpendicular** through the **center** of the resolution test pattern.

8. Collimate the x-ray beam to a **5-inch x 7-inch field of view** to include the resolution test pattern and distal end of the femur in the x-ray beam.

9. Expose the digital image receptor using the technique on the worksheet provided.

Technique Worksheet

Effect of OID on Geometric Unsharpness and Magnification
(Distal Natural Femur Bone)

Technical Factors

	mA	Time	mAs	kVp	EI TEI DI	Image Receptor	Focal Spot	OID	SID
									inches
1			0.5	60		**FPD**	Small	**4**	40
2				60		**FPD**	Small	**1** block	40
									inches
3				60		**FPD**	Small	**2** blocks	40
4				60		**FPD**	Small	**3** blocks	40

Data Collection Worksheet

Effect of OID on Geometric Unsharpness and Magnification

Round off all answers to three (3) decimal places where possible.

	Results for Exposure # 1	**Results for Exposure # 2**	**Results for Exposure # 3**

Data Provided

	Exposure # 1	Exposure # 2	Exposure # 3
Small FS Size	mm	mm	mm
SID	inches	inches	inches
OID	4 inches	? inches	? inches
SOD	inches	inches	inches

	Results for Exposure # 4

Data Provided

	Exposure # 4
Small FS Size	mm
SID	inches
OID	? inches
SOD	inches

Calculations

Geometric Unsharpness	mm		mm		mm
Magnification Factor					
Resolution tool width	cm		cm		cm

Geometric Unsharpness	mm
Magnification Factor	
Resolution tool width	cm

*Resolution tool width = Image size measured using the DR workstation

Homework Questions
You Analysis and Conclusions

Answer the homework questions on a separate sheet of paper; the assignment should be completed <u>before the start of the next scheduled lab</u>. Include homework assignments 2-13 in your Lab Portfolio for this semester; the submission due date is listed on the Lab Schedule.

Part 1 - Effect of OID on Geometric Unsharpness and Magnification

1. Compare exposures 1, 2 ,3 and 4.
   Which digital image recorded the **LEAST** geometric unsharpness?

2. Compare exposures 1, 2 ,3 and 4.
   Which digital image recorded the **GREATEST** magnification factor?

3. *Describe* how the **geometric unsharpness** was affected by increasing the **OID**.

4. *Describe* how the **magnification** was affected by increasing the **OID**.

5. *Compose* an imaginary scenario that could occur in a hospital, clinic, or doctor's office where you would be required to use what you learned today about the importance of **OID** to complete a radiographic examination.