EVALUATING RADIOGRAPHS

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By

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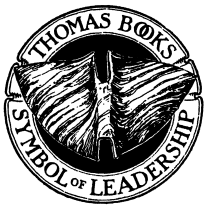

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To
Margaret Nielsen Carroll
Jason
Melissa
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Tyson

PREFACE

This textbook does not contain very many good radiographs! And for a good reason: Positioning textbooks generally present ideal radiographs to illustrate the products of correct positioning. These are of little help, however, in determining the corrective actions needed to ensure that *repeated* radiographs are done right.

Because of the great number of variables with which they must cope, all radiographers have to repeat exposures occasionally in daily practice. Yet, no radiograph should have to be repeated more than one time. On observing the original image, the radiographer should be able to assess all of the needed adjustments in both technique and positioning in order to produce an optimum view when the exposure is repeated. For example, on a single view the density may need to be darker, certain artifacts removed, rotation of the body part corrected and perhaps a little less angulation of the x-ray beam employed.

An incomplete education has produced many technologists with an ability to recognize when a spine position (for example) is rotated, but not *which way* it is rotated and *how much,* or with the ability to see when the x-ray beam angle for a sunrise view of the knee is off, but not whether it is angled *too much* or *not enough.* What value is there in recognizing that something is wrong about a radiographic image if one cannot accurately determine the type and amount of adjustment needed to correct it?

Don Q. Paris published a wonderful book in 1983, *Craniographic Positioning with Comparison Studies,* the first to address this issue, but limited the scope of the text to skull positions only. It is a daunting task to attempt to address fully the evaluation of all aspects of the radiographic image, including not only all anatomical areas of interest but also the technical quality of the image. To make the amount of information manageable for both the student and the author, this text (1) excludes nonroutine or rare procedures and views, (2) only demonstrates *incorrect* positions for most procedures, using correct positions only on those very

challenging and rare cases such as mastoid series or SI joints, and (3) focuses primarily upon reliable skeletal criteria and combines procedures which share criteria where ever possible. For example, the amount of rotation in the pelvis can be determined by the bony structures whether it is for a cystogram, IVP, sacrum, pelvis, or barium enema. Therefore, the appearance of soft tissue organs in contrast studies (which is highly variable) is covered only briefly.

Section II of this book may be best used by laying it alongside your positioning manual for comparison with correctly positioned views. The author has made every effort to keep the text clear, concise, and to the point, and would appreciate any suggestions for future editions.

The capability to evaluate radiographs is fundamental to each technologist's performance and to keeping patient dose from unnecessary retakes at a minimum. It is hoped that this text will contribute substantially to that goal.

QBC

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I am grateful for the professional support of Eileen F. Piwetz and Charles J. Engbretson throughout my educational career, and for my earliest role model of professionalism in health care, Sherri Uzelac, R.T.

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GENERAL CONSIDERATIONS

Chapter 1

IDENTIFICATION, ASSESSMENT AND LABELLING

Careful identification of the patient and labelling of the radiograph seem to be such simple tasks that they may not be taken seriously by many students and radiographers. Yet the consequences of an error in this regard can be among the most profound in the practice of radiography. Consider the following: Approximately 500 radiology patients die each year due to allergic reactions to contrast agents used for intravenous urography and other procedures. Suppose the wrong patient was brought into the radiographic room for such a procedure, and this patient was highly allergic? Such mistakes can and do happen. One radiographer called for a "Mr. Johnson" and performed a complete IVP series. Afterward it was discovered that there had been two patients in the waiting area with the surname "Johnson." The IVP patient was still waiting, and the wrong patient, who had endured the injection and procedure, had not been assertive enough to fully question the radiographer's proceeding.

This is only one of many examples of improper identification which could lead to serious injury and malpractice lawsuits. Further, when any medical case with a radiologic component goes to court, radiographs may be required as evidence, at which time any stickers or writing made on a radiograph after exposure will be called into question, especially if they contradict original information "flashed" or radiographically exposed onto the film. The same emphasis must be placed on proper "right" and "left" marker placement and other labelling on the radiograph pertinent to diagnosis.

As radiologists are in less direct contact with patients, they rely increasingly upon the technologist to acquire pertinent clinical histories which are essential to proper diagnosis. It is natural that the technologist should obtain and note this information, because the condition of the patient directly bears upon the projections that the radiographer may decide to take, and upon anticipated adjustments in radiographic technique that may prevent repeated exposures.

As an integral member of the radiological health care team, the

radiographer must assume professional responsibility for careful identification and assessment of each patient and for proper identification and labelling of each radiograph.

ASSESSING THE REQUISITION AND THE PATIENT

The requisition received by the radiographer should state the exact anatomical area to be radiographed, and the suspected diagnosis or purpose of the procedure. If there is any question regarding the views desired, the radiographer or a supervisor should contact the referring department or office for clarification. For example, a requisition for "AP and Lateral Hips," without *right* and *left* hips specifically noted, should be clarified: Are two views of one hip desired, or is this a bilateral examination? Frequently the suspected diagnosis or purpose of the procedure may be absent on the written requisition, and this information must be obtained by questioning the patient.

In any case, the patient should always be briefly questioned about his or her history and condition, both as a confirmation of data on the requisition and for information that might be germane to how the procedure should be performed. Common changes made in radiographic procedures due to historical information include:

1. Any optional views that might be indicated beside the routine views normally taken
2. Any modifications in positioning that might be indicated or positioning aids that might be needed
3. Any modifications in technical factors that might be anticipated to produce the proper image density, contrast, and sharpness

One patient, for example, demonstrated the entrance wound of a sliver just behind the medial malleolus of the ankle. The radiographer elected to take an additional, nonroutine view—an external oblique which projected this sliver free of superimposition of any bones that would interfere with a confident diagnosis. Tangential views are often indicated for superficial foreign bodies such as slivers, Figure 1.

The condition of the patient is the greatest variable which the radiographer faces in producing quality radiographs. In addition to being aware of the normal variations in body habitus, tissue composition, age, bony structure, stage of respiration, presence of contrast agents, and thickness of body parts, one must also be conscious of abnormal changes

Figure 1. A nonroutine *tangential* projection (lateral oblique) of the hand demonstrating a small metal sliver (arrow) superficially lodged in the palm. A soft tissue technique of 46 kVp at the usual mAs was employed.

due to pathology or medical intervention. An example of medical intervention which alters the course of a radiologic examination is hip surgery. If a total hip prosthesis or a surgical pin has been implanted, the centering for the AP view of the bilateral hips would be modified: Instead of centering as usual to the pelvis, the AP view must be centered four to six inches lower in order to include the entire length of the hip prosthesis or surgical pin, Figure 2. Failure to gather historical information such as previous surgery before initiating the radiologic examination results in unnecessary repeats and expense, as well as increased patient exposure to radiation.

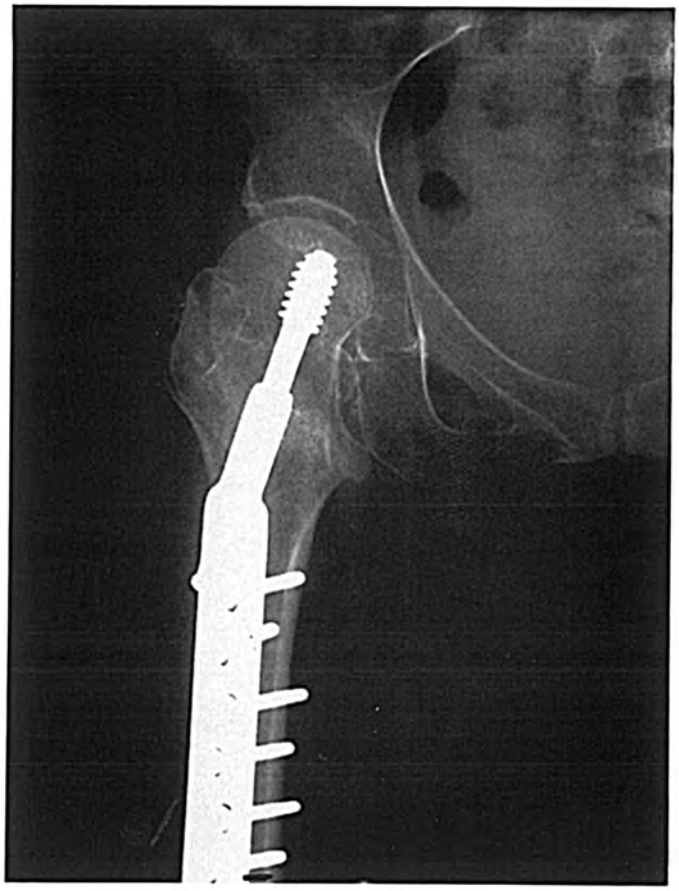

Figure 2. An AP projection of the unilateral hip clipping off the bottom of the surgical hip pin. This centering would have been acceptable for a normal hip, but a history of hip pinning indicates a modification in centering, four inches lower.

Such information can be obtained from:

1. The requisition
2. The patient when possible
3. The patient's chart

Radiographers should have at least a rudimentary ability to interpret patients' charts. Careful observation of the patient frequently provides readily apparent signs of conditions that bear on technique selection. It should be emphasized that obtaining pertinent patient history and assessing conditions that affect radiographic technique are the responsi-