The purpose of this manual is to standardize the examination procedures among the clinical centers participating in the MrOS study. It is intended to support both technologists and radiologists in their respective responsibilities by spelling out technical details and radiological aspects that may otherwise be left vague and inconsistent.

It is expected that all radiologists and technologists contributing to this study already have an in-depth knowledge and some experience in their respective fields. This manual can by no means be regarded as a training course in taking spinal x-rays. This manual simply points out details pertaining to this specific study that otherwise are likely to differ between centers. There is no claim that the proposed techniques are the only ones to yield acceptable results. Rather, this manual provides guidelines to make the results of all participating centers *consistent* and *comparable*.

2. X-RAY IMAGING TECHNIQUE AND EXAMINATION PROCEDURE

Lateral spine films (thoracic and lumbar) will be taken at baseline and Visit 2. These films will be used to assess the incidence of spinal fractures. Since fracture incidence represents an outcome in this study, quality assurance for this area is very important.

High quality plain film radiography requires competent and consistent quality assurance. This manual contains information that will help to obtain optimum image quality. Quality assurance guidelines for three major areas are covered:

- technical specifications of the imaging technique
- details of the examination procedure
- quality control criteria to assess the image quality

Each of these procedures is of equal importance. To obtain consistent results, the technologist performing the examination must be aware of possible sources of error that may affect the quality and reproducibility of the spine films.

For this study, both lateral thoracic and lateral lumbar spine films will be taken. In the following sections each type of exam will be covered separately with respect to equipment specifications and examination procedures. Certification and criteria for image quality will be outlined in separate sections, and examples of good and poor image quality will be given. A summary of the x-ray protocol is given in Appendix A and should be posted by the x-ray machine being used for the study

For *Visit 2*, the primary aim will be to reproduce the original measurement technique as closely as possible. Obtain a copy of the participant's Baseline MrOS X-ray Form Clinic Worksheet (Appendix B) and use the same techniques as closely as possible. Record the follow-up imaging parameters in the space provided next to the baseline parameters and keep a copy for future visits.

The MrOS Coordinating Center will review the quality of the radiographs during the study and will notify the clinical centers if problems with image quality are found. Possible sources of error and possible solutions will be suggested, but responsibility for the resolution of technical problems rests with the radiology facility and the clinical center.

During the study, questions regarding x-ray procedures should be directed to the MrOS Coordinating Center. In addition, "problem cases" where the operator is unsure of the results of the quality of the image should be identified.

Questions regarding this manual or radiographic techniques should be directed to, and films should be shipped to:

Clara Yeung, Radiology Coordinator
MrOS Radiology Coordinating Center
185 Berry St., Lobby 4, Suite 5700
San Francisco, CA 94107
Phone: (415) 514-8174
FAX: (415) 514-8150
cyeung@psg.ucsf.edu

2.1 Thoracic Spine Measurements

Lateral Projection

Imaging Technique

• Imaging system	Bucky screen technique
• Focus size	less than or equal to1.3 mm
• Total filtering value	greater than or equal to 2.5 mm A1-equivalent value (half layer)
• Scattering grid	r = 12 to 1 at 40 inches
• Film/Screen speed	400
• Film/Focus Distance	40 inches **(not variable!)**
• Imaging voltage	60-70 kVp
• Exposure Time	Breathing technique; approximately 2 second exposure (phototiming is **not** to be done on this view)

Film Size

7″ x 17″ lengthwise is recommended. Larger size film (i.e. 14″ x 17″) is acceptable if this is more convenient, provided that collimation is carried out as specified below.

Positioning

- Place participant on the table in the lateral position (left lateral if possible to reduce magnification of overlying heart shadow) with legs flexed for comfort and support.
- Place support under participant's head.
- Place both arms at right angles to anterior surface of body (if arms are raised higher, scapulae may superimpose upper thoracic vertebral bodies), and flex elbows for comfort.
- Place supports between knees and ankles and under knee next to table (for support and to aid in maintaining lateral position).
- Place lead shield over lower part of the participant to protect gonads.
- Place support under mid lumbar region to position long axis of spine parallel to table. Double check the horizontal position of the thoracic spine by feeling the spine with your hand.
- Adjust body to lateral position (shoulders, hips, knees, and ankles superimposed).
- Align midaxillary (coronal) plane of body to midline of table.
- To assure lateral position, stand at head of table and look down the participant's back and hips to make certain that there is vertical superimposition of shoulders and hips.

Central Ray

- Direct the central ray to level of 7th thoracic vertebra (T7). T7 is about two finger widths (1 in, 2.5 cm) below the tip of the scapulae when arms are elevated; top of cassette should be about 2 in (5 cm) above the shoulders to include the 7th cervical vertebra.

- Center cassette (in Bucky tray) to level of 7th thoracic vertebral body.

Collimation

- Adjust collimation: 1 cm or more collimation must be seen when using 7" x 17" film, with collimation directed to the spine to exclude as much unneeded anatomy as possible.

- When using larger size film, the size of the irradiated area should be kept to a minimum (approximately the same size as on the smaller size films).

Participant Instructions

- Have the participant breathe quietly for exposure (this allows blurring of the overlying ribs and lung detail by motion). This requires complete immobilization of the participant and a long exposure time. Therefore, phototiming is **not** possible on this view; manual technique is required.

Special Considerations

- Include T2 (if possible) to T12 (required). In large participants T2, and T3 in extreme cases, may need to be excluded.

- Include T12 on both the thoracic and lumbar images.

- Close collimation and placing the lead sheet on the table behind the thoracic vertebra aids in reducing radiation dose and scattered radiation.

- Simultaneous over and under-exposure in different parts of a film may indicate that the voltage setting is too low for the participant.

2.2 Lumbar Spine Measurements

Lateral projection

Imaging Technique

• Imaging system	Bucky screen technique
• Focus size	less than or equal to1.3 mm
• Total filtering value	greater than or equal to 2.5 mm A1-equivalent value (half layer)
• Scattering grid	r = 12 to 1 at 40 inches
• Film/Screen speed	400
• Film/Focus Distance	40 inches **(not variable!)**
• Imaging voltage	80 - 90 kVp
• Exposure Time	
manual	less than 1 sec
automated	central photocell

Film Size

11″ x 14″ lengthwise is recommended. Larger size film (i.e. 14″ x 17″) is acceptable if this is more convenient, provided that collimation is carried out as specified below.

Positioning

- Place participant on the table in lateral position (left lateral if possible) with legs flexed for comfort and support.
- Place support under participant's head.
- Place supports between knees and ankles and under knee next to table (for support and to aid in maintaining lateral position).
- Place lead shield over lower part of the participant to protect gonads
- Place radiolucent support under mid-lumbar region to position long axis of spine parallel to the table.
- If necessary, place an additional support under the lumbar region to position the vertebrae parallel to the table (prevent sagging of the spine). Double-check the horizontal position of the spine by feeling the spine with your hand.
- Adjust body to lateral position (shoulders, hips, knees, and ankles superimposed).
- Align midaxillary (coronal) plane of body to midline of table.
- To assure lateral position, stand at head of table and look down the participant's back and hips to make certain that there is vertical superimposition of shoulders and hips.

Central Ray

- Direct the central ray to level of 3rd lumbar vertebra (L3). L3 is about two finger widths above the iliac crest.
- Center cassette (in Bucky tray) to level of 3rd lumbar vertebral body.

Collimation

- Adjust collimation: 1 cm or more collimation must be seen on the roentgen film, with collimation directed to the spine to exclude as much unneeded anatomy as possible.
- When using larger size film, the size of the irradiated area should be kept to a minimum (approximately the same size as on the smaller size films).

Participant Instructions

- Have participant suspend respiration for exposure (after expiration to remove lungs from the field of view).

Special Considerations

- Include T12 to S1.
- T12 must be included on both the thoracic and the lumbar images.
- Close collimation and placing the lead shield on the table behind the lumbar spine aids in reducing radiation dose and scattered radiation.

Film quality assurance

In the case that the radiograph obtained does not meet basic quality standards, an additional x-ray should be taken immediately, while the participant is still at the radiology facility. If an image taken in the left lateral position with all the above support devises still shows rotated vertebrae, repeat the positioning in the right lateral. Both films should be sent to the Coordinating Center. Be sure to put the correct right or left lead marker on each film. Indicate in the Comments section of the CLINIC WORKSHEET that both sides were imaged and repeat this at follow-up visits.

2.3 Identification, Logging, and Shipment of Films

Identification

The x-ray films should include the participant's MrOS ID Number, Acrostic, date of x-ray, and clinic name imaged on the film. Do not use any permanent markers on the film. If using stickers or labels please be careful not to obscure the film image.

Each set of films should be contained in a paper jacket, which should be labeled with the participant's MrOS ID Number and Acrostic.

MrOS X-Ray Form Clinic Worksheet (Appendix B)

Immediately after each x-ray is taken, fill in the participant's X-ray Form Clinic Worksheet. At follow-up use a photocopy of the baseline Clinic Worksheet so that imaging techniques can be compared:

- MrOS ID Number (at follow-up this is already entered but should be confirmed by the technologist)
- date of the x-ray
- Radiologic Technologist's MrOS ID Number
- imaging voltage (kVp)
- exposure time(s)
- milli-amperage [mA] for manual technique only
- machine used for x-ray
- comments

The participant's X-ray Form Clinic Worksheet is returned to the MrOS Coordinating Center along with the x-rays. Be sure to keep a copy for use at follow-up.

Shipping

Films should be inventoried, put into shipping envelopes with the MrOS X-Ray Shipping Log (Appendix C), and sent out by the staff at each MrOS clinical center. Send all films the Radiology Coordinator at the Coordinating Center.

E-mail a report to the Radiology Coordinator at the Coordinating Center indicating a new batch of x-rays has been shipped, and list these x-rays by participant ID number.

Use a second-day courier service (UPS or FedEx) for security and speed of delivery. Shipment method must be able to track shipments. Accumulated films should be shipped no less frequently than once a month.

The Coordinating Center will e-mail a confirmation of receipt.

The MrOS X-Ray Shipping Log (Appendix C) may be replace by a form created at the clinical center provided it contains all the same information and logs only the films included in the current shipment.

The Coordinating Center does not provide x-ray shipping envelopes for clinical centers. Spine films should be packed in a durable mailing envelope. The green diamond border mailers and the kraft mailers are good for shipping x-rays. Each mailing envelope should not store more than five sets of spine films. Please use durable tape to seal the envelope opening as well. Boxes may be used for large shipments.

A catalog and shipping envelopes can be ordered from Ames. The customer service number is 1-800-343-2040.

3. CERTIFICATION AND QUALITY ASSURANCE

3.1 Identification and Certification of MrOS Radiologic Technologists

- Identify a radiology QC officer at each x-ray clinic for communication regarding x-rays. This person may either be a radiologist or the head radiologic technologist and will be responsible for certifying techologists, creating and updating the List of Certified Technologists (Appendix D), and completing the MrOS X-Ray Facility Certification Form (Appendix E).

- Provide this manual to the radiology QC officer for the MrOS study.

- All technologists taking x-rays for the MrOS study should have a MrOS ID number assigned by study coordinator. Technologists assigned to the MrOS study should be experienced in taking spinal x-rays. At least 50 lateral spine x-rays taken over the course of the last year represents sufficient experience.

- All radiologic technologists, whether previously certified by the Coordinating Center or not, will need to be certified. After a thorough reading of this manual, technologists are required to pass a written exam (Appendix F), which should then be forwarded to the Coordinating Center for review.

- The first 5 lumbar and 5 thoracic spine films taken for the study by each technologist must be reviewed by the QC officer. This review should be based on:

  - MrOS imaging and positioning techniques
  - imaging quality criteria
  - examples of problematic or acceptable films (see Section 5.2)

The technologist passes this review and is certified by the QC officer if all films show that the MrOS protocol was followed and the image quality meets the image criteria defined herein. If the review shows deficiencies in technique or image quality, the technologist should read the manual and review MrOS procedures with the QC officer. Five more MrOS lumbar and thoracic spine films should be obtained and reviewed. Participants whose x-rays are judged to be of poor quality should be brought back for a repeat x-ray as soon as possible.

The QC officer should continue monitoring the quality of all MrOS films throughout the study and take appropriate action to correct any deficiencies noted.

3.2 External Audit by MrOS Coordinating Center

After successful internal certification of the technologists by the radiology QC officer, send (1) the signed X-ray Facility Certification Form (Appendix E) (2) the list of certified technologists (Appendix D) (3) the completed Technologist's Examinations and (4) all x-rays reviewed for certification to the Radiology Coordinator at the Coordinating Center.

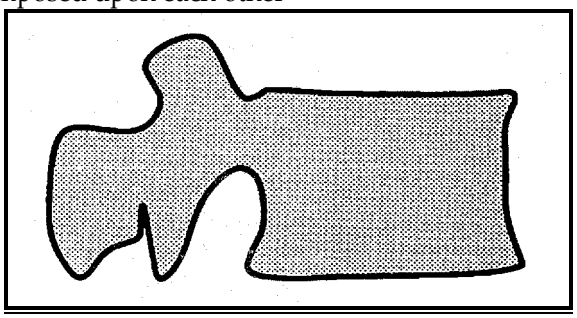
After review, the Coordinating Center will respond in writing to confirm the certification of the technologists. If problems remain, the Coordinating Center will discuss the problems with the QC officer. The Coordinating Center will continue to review the quality of films during the study and will assess the performance of each technologist throughout the study.

4. ASSESSING THE QUALITY OF LATERAL SPINE FILMS

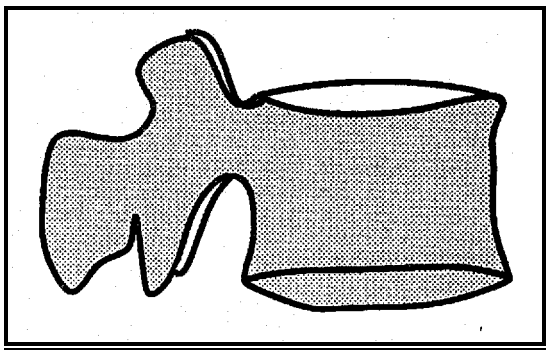
X-ray films must be of sufficient quality to allow for an accurate determination of morphometric measures such as anterior, mid, or posterior height or area of the vertebral bodies. The following criteria should be met to avoid errors caused by inappropriate projection of the vertebral contours (the spine has to be parallel to the table so that inter-vertebral spaces clearly show) or wrong technique (incorrect exposure level, short exposure times for the thoracic film):

Criteria of good image quality

- Vertebral endplate contours superimposed upon each other



optimum superposition



excessive obliquity

- Complete superposition of the posterior edges of the vertebral bodies
- Appropriate exposure (not too light or too dark) so vertebral contours and trabeculae are clearly visible
- Demonstration of the vertebral arches and inter-vertebral foramina
- Visualization of adjacent soft tissue within the collimation guidelines dictated above
- Blurred rib contours (due to breathing technique) on lateral thoracic films

5. ATLAS OF SPINE FILMS

Listed below are common sources of error and examples of how these errors lead to problematic spine images.

Common Mistakes

- Inappropriate positioning of the participant

  - spine not parallel to the table
  - spine rotated around the long axis

- Inappropriate centering of the x-ray beam (should be centered on T7 and L3 for thoracic and lumbar films, respectively)

- Exposure time too short on lateral thoracic film (resulting in sharp contours of the ribs obscuring the vertebrae)

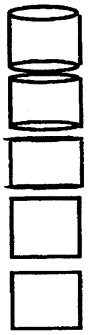
- Inappropriate exposure level

  - overexposure (film too dark)
  - underexposure (film too light)

Since certain problems observed on a spine film may have several causes (e.g., both inappropriate positioning and inappropriate centering can result in imperfect superposition of the end plates) the foregoing is grouped by how the problem appears visually, with a listing of all the potential causes.

5.1 Examples of Common Problems

- Imperfect superposition of vertebral endplate contours in superior spine

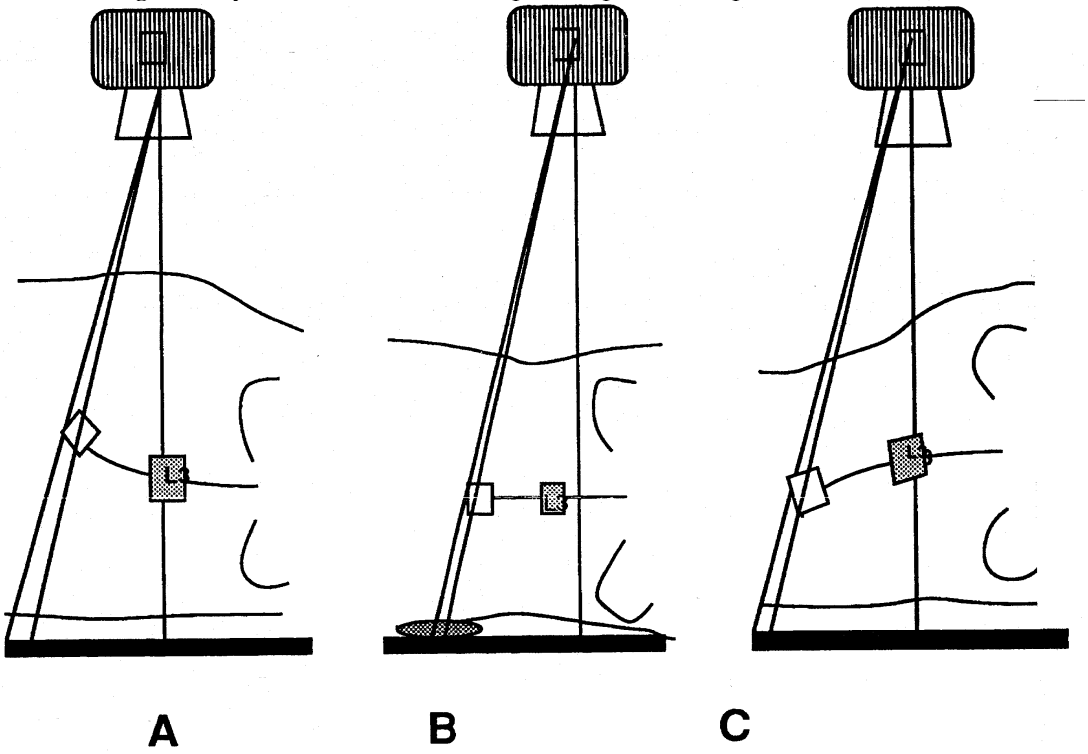


Causes

A Centering of x-ray beam is correct but superior spine is not parallel to table (curved upward)

B Participant is correctly positioned but centering of x-ray beam is inappropriate

C Centering of x-ray beam is correct but superior spine is not parallel to table (curved downward)



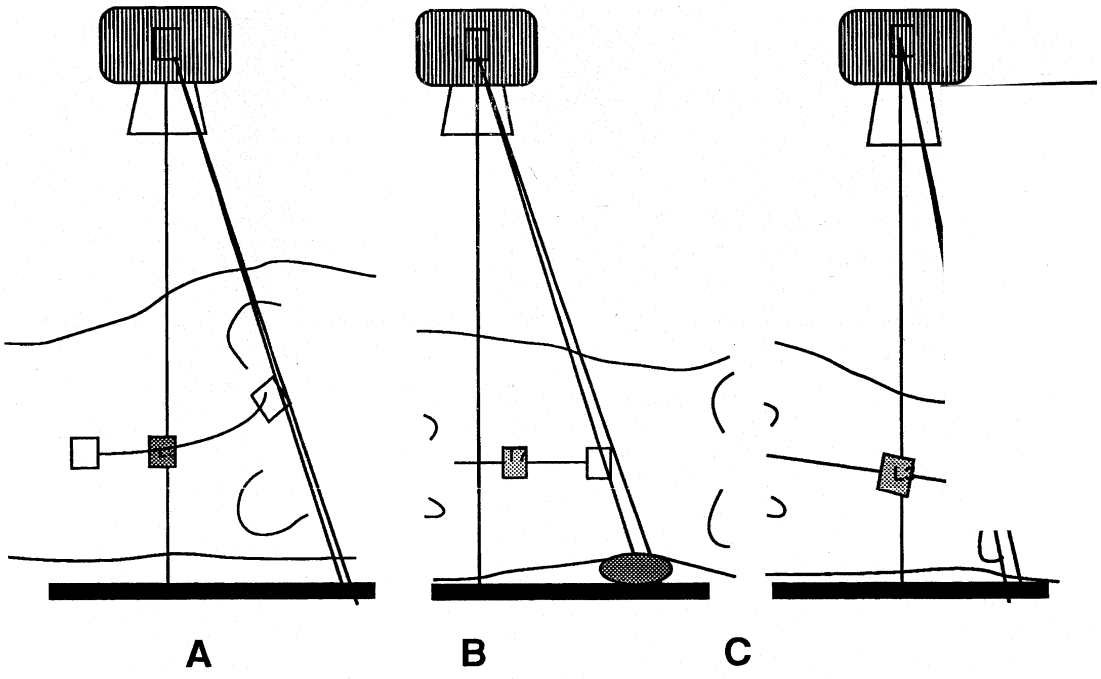
- Imperfect superposition of vertebral endplate contours in inferior spine

Causes

A Centering of x-ray beam is correct but inferior spine is not parallel to table (curved upward)

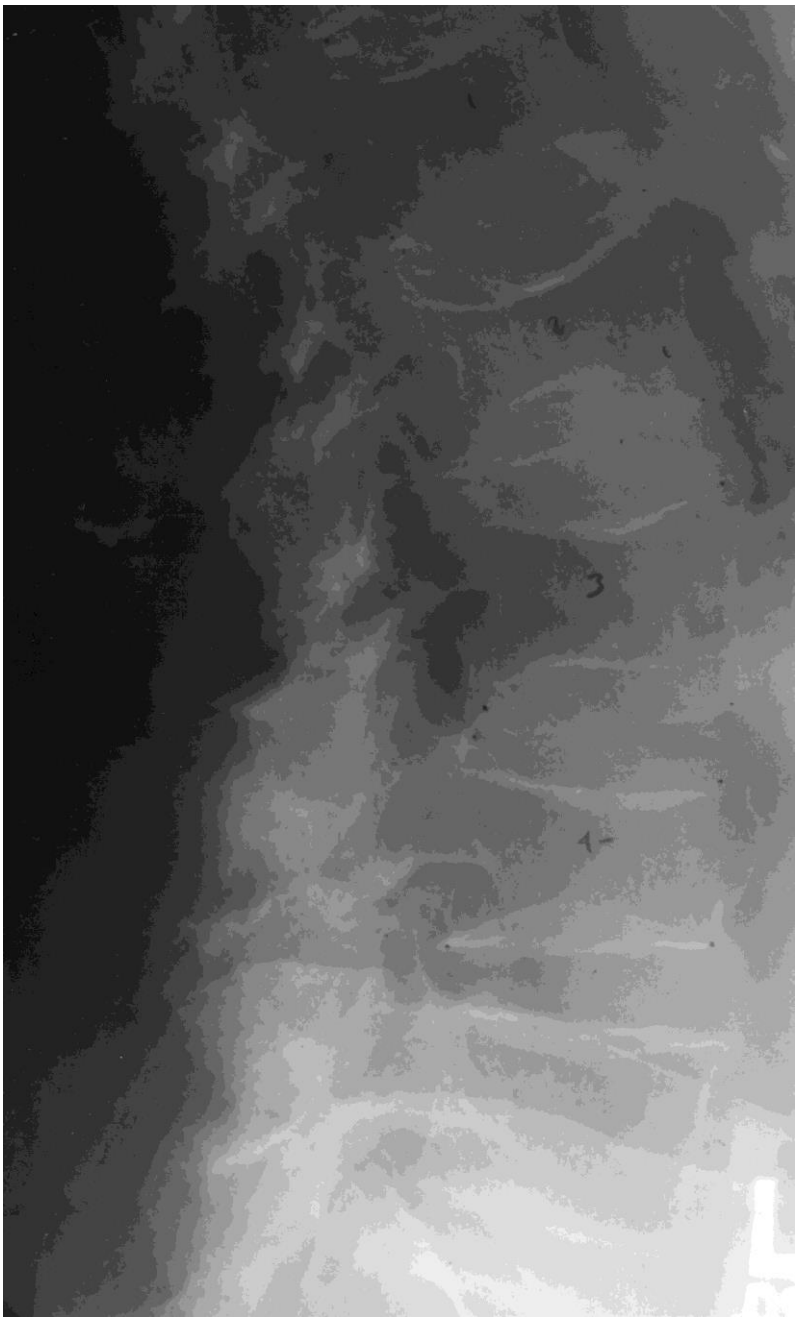
B Participant is correctly positioned but centering of x-ray beam is not appropriate

C Centering of x-ray beam is correct but inferior spine is not parallel to table (curved downward)

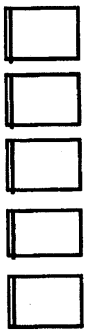


Example of imperfect superposition of vertebral endplate contours in the thoracic spine.

Example of imperfect superposition of vertebral endplate contours in the lumbar spine.



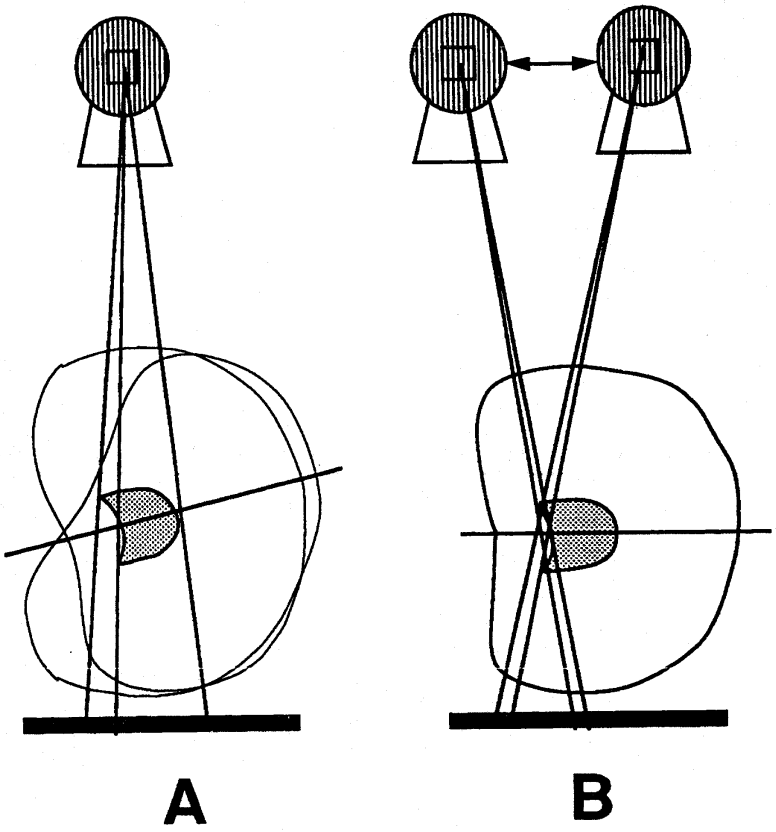
- Imperfect superposition of posterior edges of the vertebral bodies



Causes

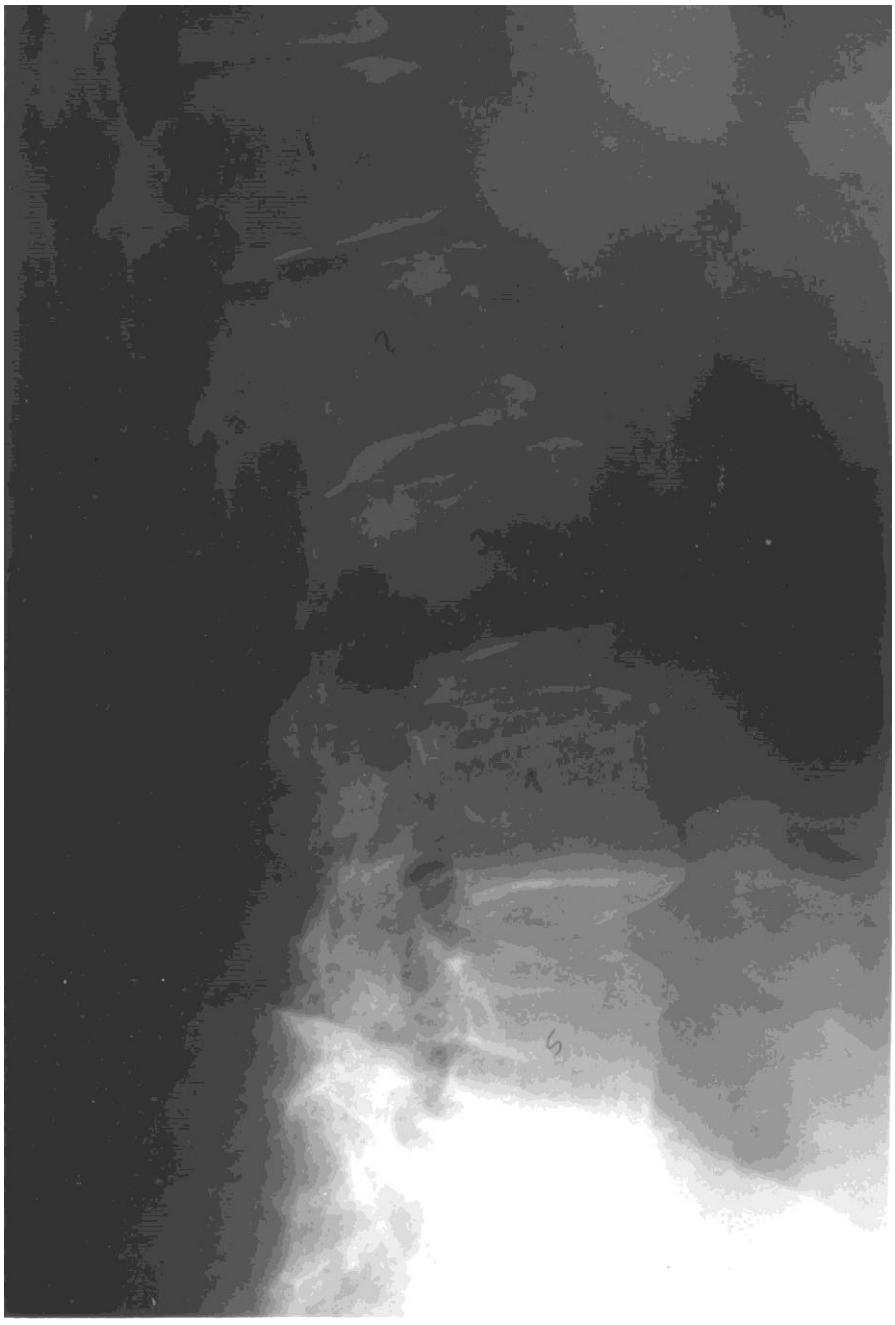
A Centering of x-ray beam is correct but participant is not positioned squarely on the side

B Participant is correctly positioned but centering of x-ray beam is inappropriate



Example of an imperfect superposition of posterior edges of vertebral bodies in the thoracic spine.

Example of an imperfect superposition of posterior edges of vertebral bodies in the lumbar spine.



Example of too short an exposure time on the lateral thoracic films resulting in sharp contours of the ribs obscuring the contours of the vertebrae.

Exposure Problem: Film is too dark; the penetration is too high to see the vertebral contours.

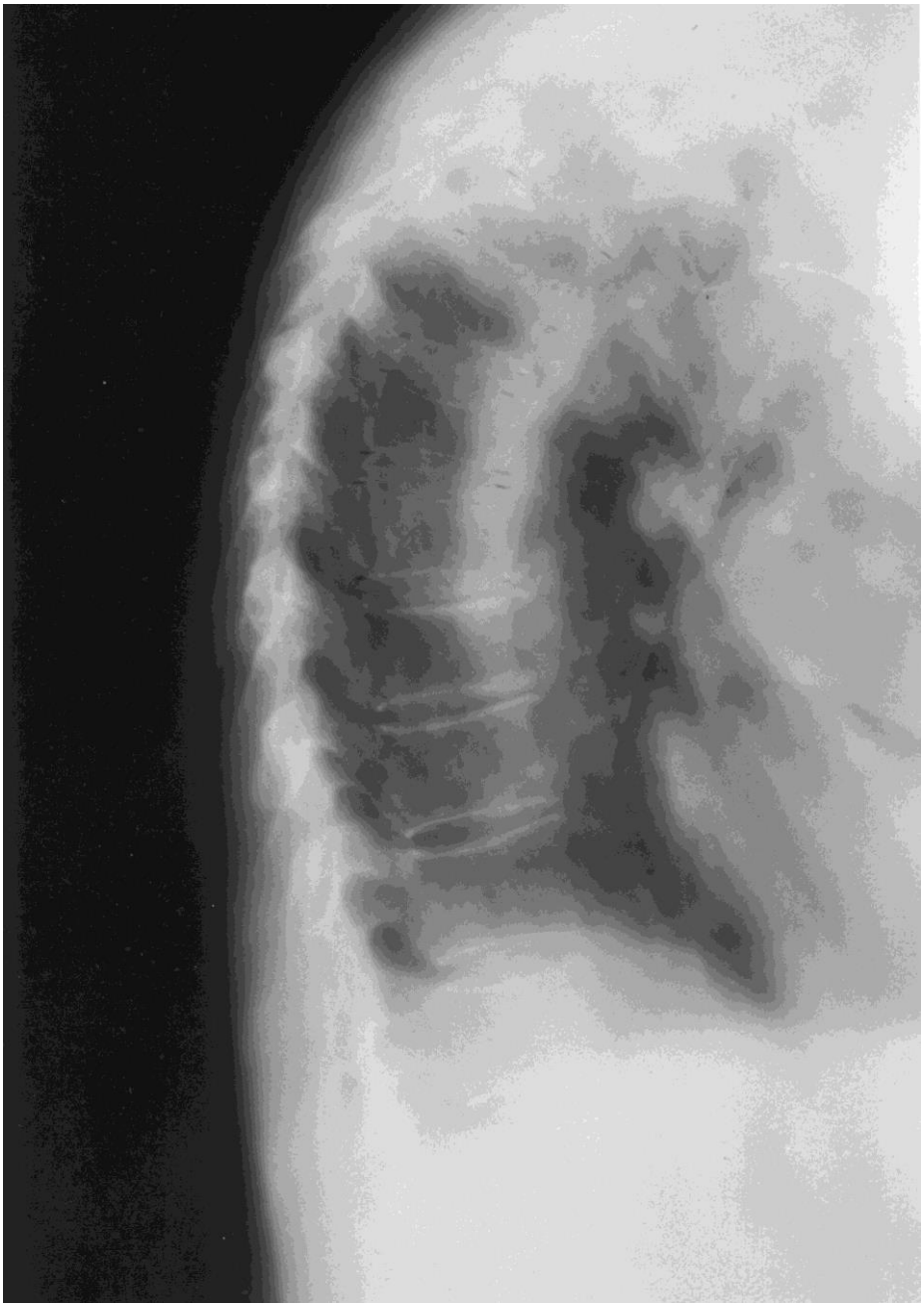
Example of an inappropriate exposure level - overexposure on the lateral Thoracic spine film.

Cause: The amperage setting or exposure time setting is too high.

Exposure Problem: Film is too light; the penetration is too low to see the vertebral contours.

Example of an inappropriate exposure level - underexposure on the Thoracic spine film.

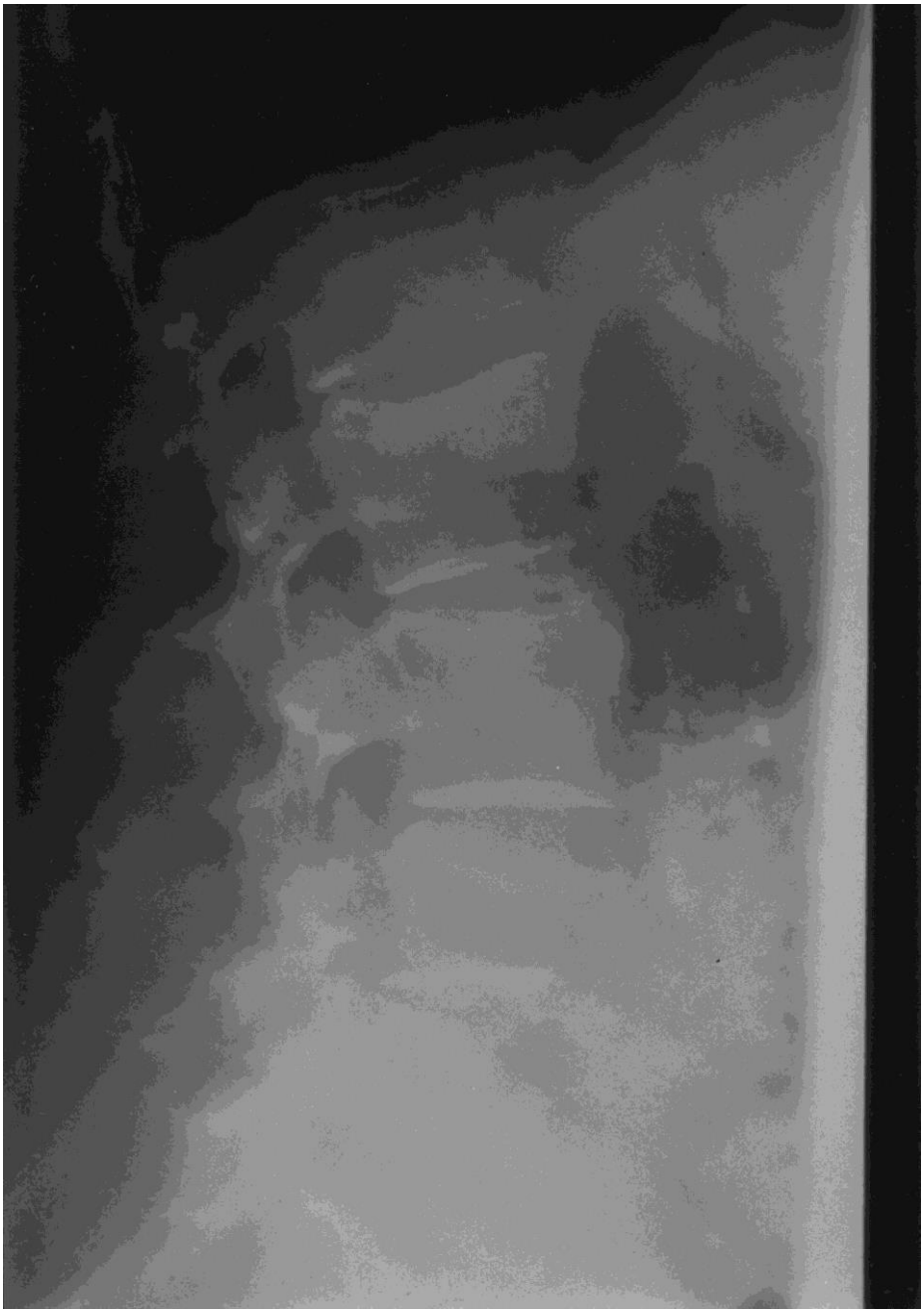
Cause: The amperage setting or exposure time setting is too low.



Exposure Problem: Film is dark in some parts and light in other parts making it difficult to see the vertebral contours.

Example of an inappropriate exposure level - underexposure and overexposure on the Lumbar spine film.

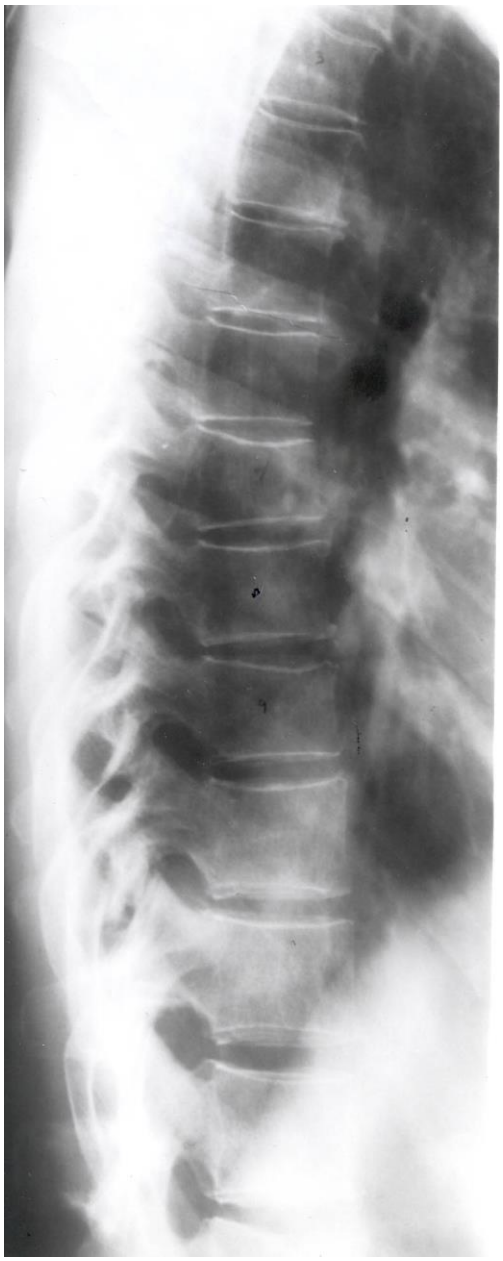
Cause: Marked overexposure and underexposure on a single film is usually a result of setting the voltage too low (too much contrast).



5.2 Examples of Different Levels of Quality for Radiologic Films

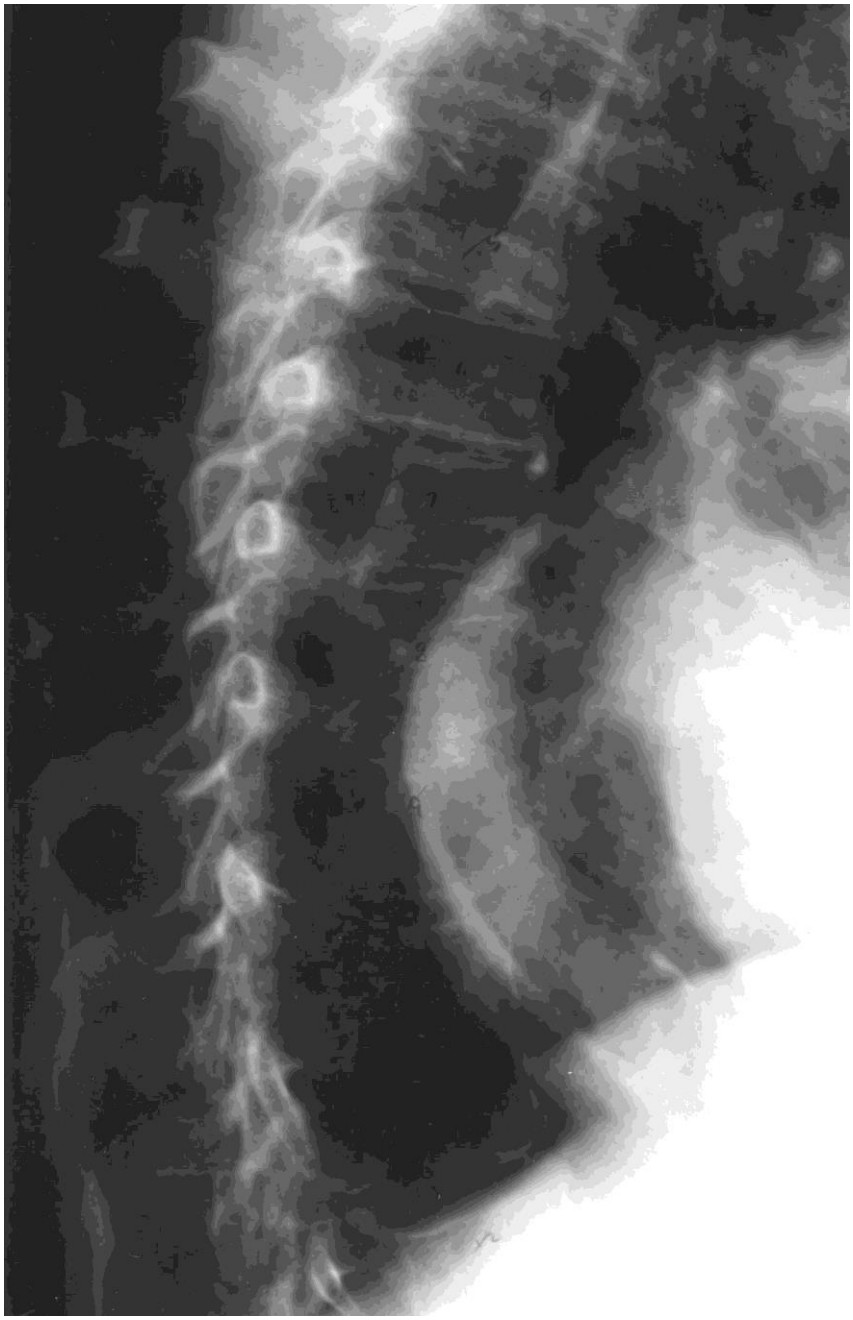
The foregoing are examples of different quality radiologic films to use for comparison purposes. The films in the following examples are classified as good, acceptable, barely acceptable and unacceptable.

A good quality lateral thoracic spine film.

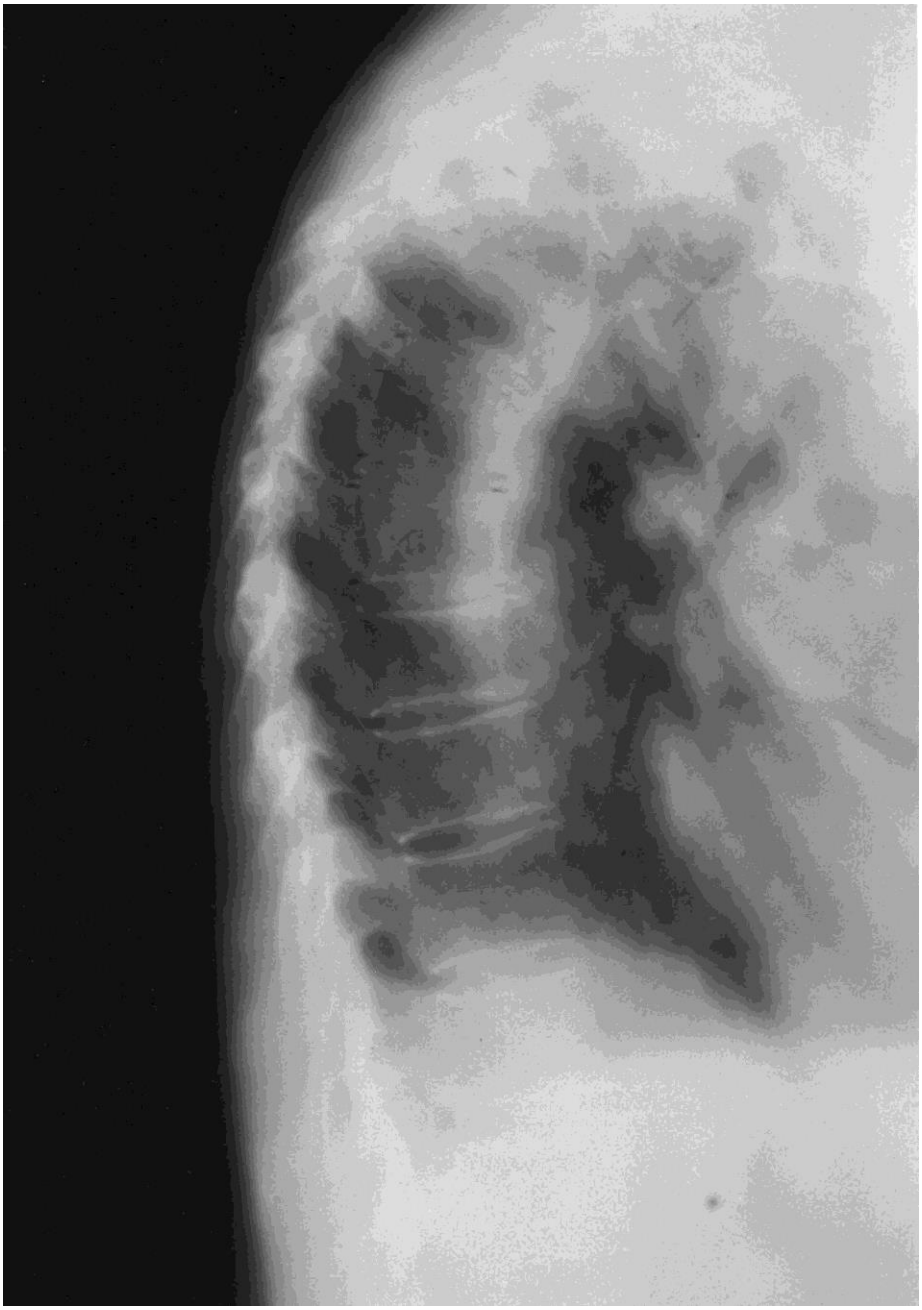


An acceptable quality lateral thoracic spine film.

A barely acceptable quality lateral thoracic spine film.

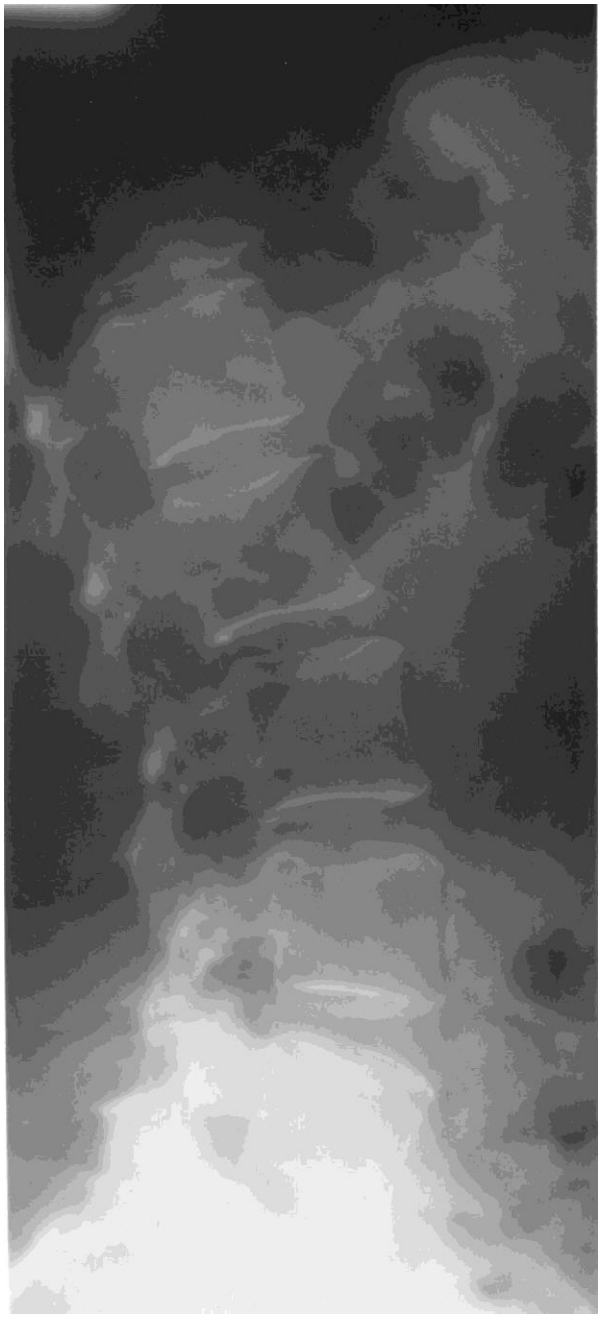


An unacceptable quality lateral thoracic spine film.

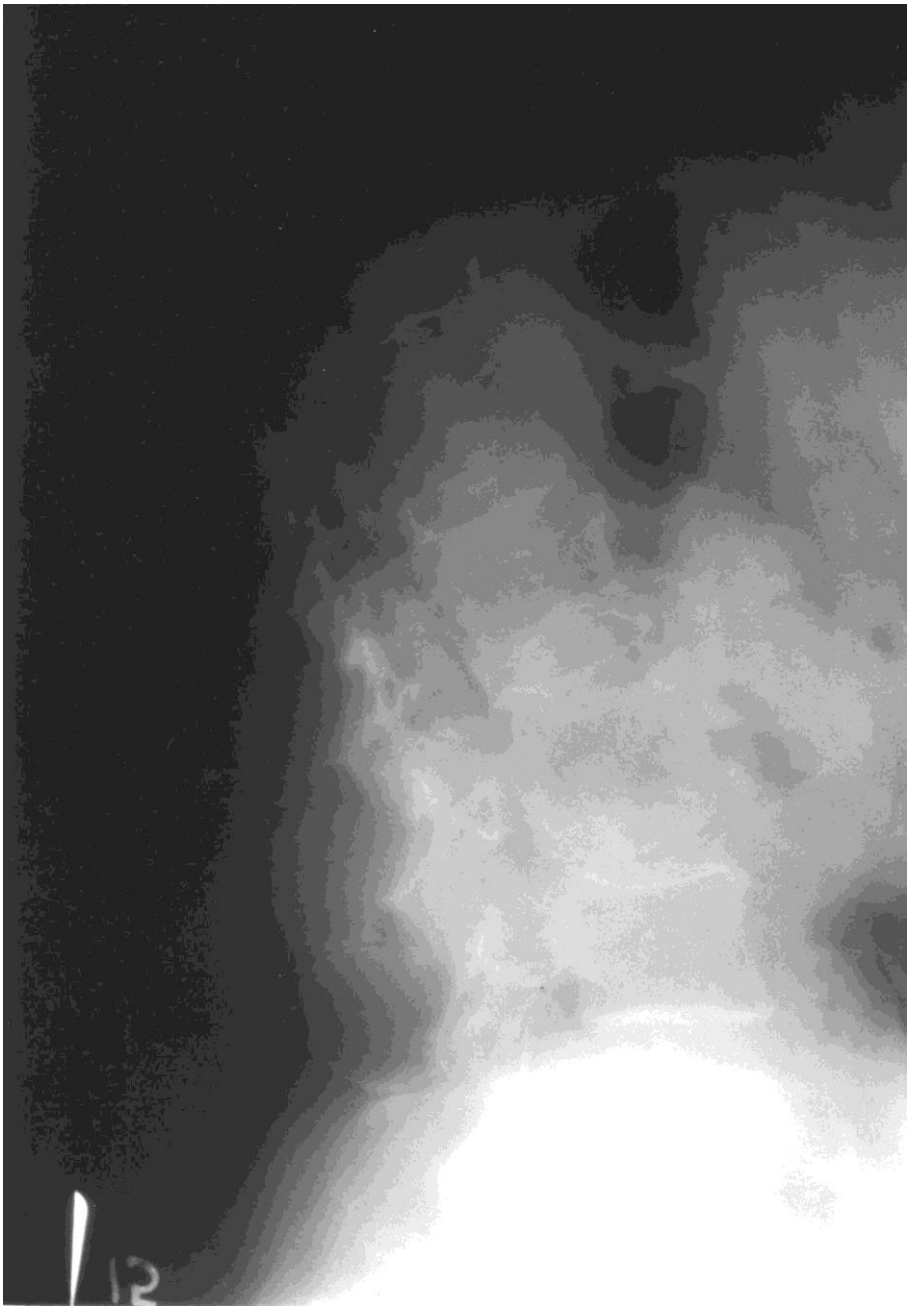


A good quality lateral lumbar spine film.

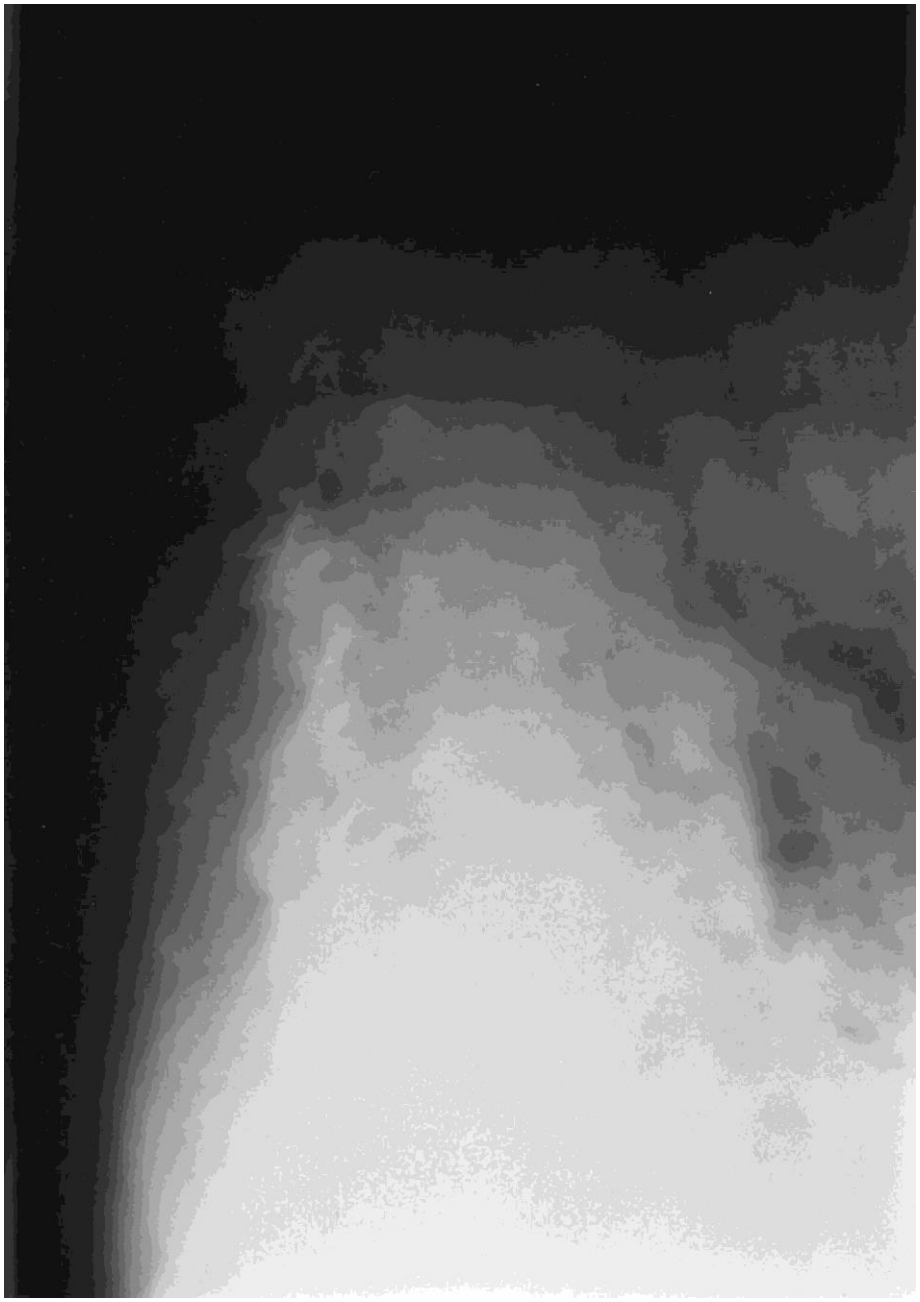
An acceptable quality lateral lumbar spine film.



A barely acceptable quality lateral lumbar spine film.



An unacceptable quality lateral lumbar spine film.



Appendix A: Short Protocol

(Please print a copy directly from the website.)

MrOS X-Ray Protocol Summary

General (for both thoracic and lumbar films)

The primary aims in terms of quality assurance are to produce the best quality baseline x-rays and then to reproduce the same quality at follow-up. Therefore, the imaging parameters recorded for each participant on the MrOS X-ray Form should be reproduced at follow-up.

Logging

1. Complete the MrOS X-Ray teleform and return to appropriate MrOS clinical center personnel.
2. Complete the MrOS X-ray ClinicWorksheet. At followup the Worksheet should be a copy of the baseline Worksheet. Return this form to the MrOS clinical center along with the x-rays.

Participant positioning

- Participant on table in (left) lateral lying position.
- Try right lateral if left lateral image shows poor superposition. Send best image.
- Place lead side marker so that it is not in a vertebral body.
- Legs flexed for comfort and support
- Support under participant's head
- Support between knees and ankles and under knee next to table
- Lead shield over lower part of the participant to protect gonads
- Support under midlumbar region to position long axis of **spine parallel to table**. Double check the horizontal position of the thoracic spine by feeling the spine with your hand.
- Shoulders, hips, knees, and ankles superimposed
- Align midaxillary (coronal) plane of body to midline of table
- To assure lateral position, stand at head of table and look down the participant's back and hips to make certain that there is vertical superimposition of shoulders and hips.

Collimation

Collimation directed to the spine to exclude as much unneeded anatomy as possible

Thoracic Spine Measurements – Lateral Projection{ TC "12.2.1 Thoracic Spine Measurements" \l 1 }

Imaging Technique

• Imaging system	Bucky screen technique
• Focus size	less than or equal to 1.3 mm
• Total filtering value	greater than or equal 2.5 mm A1-equivalent value (half layer)
• Scattering grid	r = 12 to 1 at 40 inches
• Film/Screen speed	400
• Film/Focus Distance	40 inches **(not variable!)**
• Imaging voltage	60-70 kVp
• Exposure Time	Breathing technique; approximately 2 second exposure (phototiming is **not** to be done on this view)

Film Size

7" x 17" lengthwise is recommended. Larger size film (i.e. 14" x 17") is acceptable if this is more convenient, provided that collimation is carried out as specified above.

Positioning

- Both arms at right angles to anterior surface of body
- Flex elbows for comfort

Central Ray

- Center on T7. T7 is about two finger widths (1 in, 2.5 cm) below the tip of the scapulae when arms are elevated; top of cassette should be about 2 in (5 cm) above the shoulders
- Inclusion of T2 (if possible) to **T12 (required)**.

Participant Instructions

- Have the participant breath quietly for exposure (manual technique)

Lumbar Spine Measurements – Lateral Projection{ TC "12.2.1 Thoracic Spine Measurements" \l 1 }

Imaging Technique

• Imaging system	Bucky screen technique
• Focus size	less than or equal to 1.3 mm
• Total filtering value	greater than or equal to 2.5 mm A1-equivalent value (half layer)
• Scattering grid	r = 12 to 1 at 40 inches
• Film/Screen speed	400
• Film/Focus Distance	40 inches **(not variable!)**
• Imaging voltage	80 - 90 kVp
• Exposure Time	
manual	less than 1 sec
automated	central photocell

Film Size

11" x 14" lengthwise is recommended. Larger size film (i.e. 14" x 17") is acceptable if this is more convenient, provided that collimation is carried out as specified above.

Central Ray

- Center on L3 (about two finger widths above the iliac crest).
- **Include T12 to S1**

Participant Instructions

- Have participant suspend respiration for exposure (after **expiration**)

Appendix B: Clinic Worksheet

(Please print a copy directly from website)

X-ray Clinic Worksheet

MrOS ID | Acrostic | Staff ID

General Information:	Baseline	Visit 2
Date of x-ray exam:	___/___/_____	___/___/_____
X-ray Tech (MrOS ID #):	_____	_____
X-ray Machine:	_____	_____

Thoracic Film:	Baseline	Visit 2
kVp:	_____	_____
Exposure time:	_____	_____
Milli-Aperage (manual technique only):	_____	_____

Visit 2 Comments: _____

Lumbar Film:	Baseline	Visit 2
kVp:	_____	_____
Exposure time:	_____	_____
Milli-Aperage (manual technique only):	_____	_____

Visit 2 Comments: _____

Film Shipment:	Baseline	Visit 2
Shipped to Coordinating Center:	___/___/_____	___/___/_____
Shipment includes thoracic?	O YES O NO	O YES O NO
Shipment includes lumbar?	O YES O NO	O YES O NO

Appendix C: Shipping Log

(Please print a copy directly from website)

MrOS Spine X-ray Shipment Log
Attention Clara Yeung (Fax: 415-597-9213)

Clinical Center:
O Birmingham O Minneapolis O Palo Alto O Pittsburgh O Portland O San Diego

Date of Shipment: ______________/_______________/__________________________

ID #	Acrostic	Film Type	Date of Film	Tech ID	Comments
		O Lumbar O Thoracic			
		O Lumbar O Thoracic			
		O Lumbar O Thoracic			
		O Lumbar O Thoracic			
		O Lumbar O Thoracic			
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		O Lumbar O Thoracic			
		O Lumbar O Thoracic			
		O Lumbar O Thoracic			
		O Lumbar O Thoracic			

Appendix D: List of Certified Techs

(Please print a copy directly from website)

List of Certified Technologists

I have read the MrOS Quality Assurance Manual for Conventional Spinal X-Ray Examinations and have successfully undergone a review of my first 5 sets of x-ray films by a supervising technologist or radiologist at the facility where I work. I will adhere to the protocol as stated in the above-mentioned manual as closely as possible.

	Last Name	First Name	Staff ID No	Date	Signature
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Supervising Technologist Statement:

The above-listed individuals are qualified to perform the required x-ray examinations. I have reviewed 5 lateral thoracic and 5 lateral lumbar spine films of each of the above listed technologists and found them to be of good quality. No other technologists will be involved in this study. If personnel need to be added, certification procedures outlined in the manual will be followed.

Center _____ X-Ray location _____

Last Name, First Name _____ Position _____ Phone _____

Signature _____ Date _____

Appendix E: Facility Certification

(Please print a copy directly from website)

MrOS X-Ray Facility Certification Form

Center_____ Date_____

	Yes	No	If no, specify
A. Facility Imaging Technique			
The focus size of the x-ray device(s) is/are less or equal to 1.3 mm	0	0	_____
Total filtering amounts to at least 2.5 mm A1-equivalent half value layer.	0	0	_____
The scattering grid has a ratio of 12 to 1 at 40 inches	0	0	_____
400-speed film is used at the clinic	0	0	_____
B. Technologists Imaging Technique			
The film/focus distance will be 40 inches. It is critical to maintain this distance.	0	0	_____
Exposure Level			
• lateral thoracic films will be taken at 60 - 70 kVp with long exposure (breathing technique).	0	0	_____
• lateral lumbar films will be taken at 80 - 90 kVp with =1 sec. exposure (on expiration)	0	0	_____
The kVp, exposure time (and mA for manual technique) will be recorded for each patient and film. The same settings will be used at all follow-up visits.	0	0	_____
C. Positioning			
The spine will be parallel to the table without rotation of the body to ensure optimal superposition of vertebral contours.			
• on lateral thoracic films T2 (if possible) to T12 (required) is included, with centering at T7.	0	0	_____
• on lateral lumbar films T12 to S1 is included with centering at L3	0	0	_____

Appendix F: Written Exam for Techs

(Please print a copy directly from website)

Name: _____ MrOS ID#: _____ Date: _____

MrOS X-RAY TECHNOLOGIST'S EXAMINATION FORM

1. Fill in the missing parameters for the MrOS imaging technique for baseline and follow-up lateral spine x-rays.

Thoracic Spine

Imaging System	_____
Focus Size	_____
Total Filtering	_____
Scattering Grid	_____
Film/Screen Speed	_____
Film/Focus Distance	_____
Imaging Voltage	_____
Exposure Time	_____

Lumbar Spine

Imaging System	_____
Focus Size	_____
Total Filtering	_____
Scattering Grid	_____
Film/Screen Speed	_____
Film/Focus Distance	_____
Imaging Voltage	_____
Exposure Time	Manual _____
	Automated _____

Coordinating Center Reviewed By:

_____

2. What film size is recommended for

   Thoracic Spine _____

   Lumbar Spine _____

3. Under what conditions is it OK to use a larger film size?

   _____

   _____

4. Please list the missing criteria of good image quality for MrOS.

a)_____

b)_____

c)_____

d)_____

e)_____

f) _____

5. Please fill in the blanks:

   Optimum thoracic technique includes:

   _____ lateral lying position.

   Place both arms _____

   Use supports _____

   Check the horizontal position by _____

   Check the lateral position by _____

   Center the central ray and cassette to _____

   _____ collimation should be visible.

   Include levels from T _____ to T _____.

Assure that T _____ is seen in both _____ and _____ images.

Reduce radiation scatter by _____.

6. Optimum lumbar technique includes:

Position long axis of spine _____.

Use radiolucent supports to _____.

Check the horizontal position of the spine by _____

_____.

Check the Lateral position by _____

_____.

Center the central ray and cassettes to L _____.

Reduce radiation scatter and exposure by _____

_____.

Include levels from _____ to _____.

7. True or False? *(Circle)*

The participant should always breath quietly for thoracic exposure.	T	F
Never use phototiming for thoracic exposure.	T	F
The participant should hold his breath after expiration for a Lumbar exposure.	T	F
Never use phototiming for the lumbar spine.	T	F

8. What are two common causes of imperfect superpositioning of vertebral endplate contours?

a)_____

b)_____

9. What are two common causes of imperfect superpositioning of posterior edges of a vertebral body

a)_____

b)_____

10. What is a common cause of:

a) a film being too dark to see vertebral contours?

b) a film being too light to see contours?

c) a film being simultaneously too dark and too light to see contours?

11. Should the baseline imaging parameters recorded on the Baseline X-Ray Form always be repeated exactly for the follow-up X-Ray? Please explain.

12. What information must be typed clearly on the X-Ray plate ID?

a)_____

b)_____

c)_____

d)_____

13. If stick-on labels with additional information are used, where should they be placed?

14. Who is the QC officer for the MrOS study at your X-Ray facility?

15. Has this QC officer reviewed your first five sets of MrOS X-Rays for quality?

O Yes O No O Don't Know

16. Where are the MrOS X-Ray manuals kept at your facility?

17. If a participant's follow-up X-Rays appear to be of poor quality, what should you do?

18. Is the MrOS X-Ray protocol summary (Appendix A) posted by your X-Ray machine?

O Yes O No O Don't Know