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Vertebral Examination Techniques for Clinical Scoliosis in the Radiology Department of Muhammadiyah Ahmad Dahlan Hospital Kediri City

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ABSTRACT

The vertebral column is the main pillar of the body's bones that supports the head, upper extremities, and chest cavity. The vertebral column is divided into five regions, including the cervical vertebral column, thoracic vertebral column, lumbar vertebral column, sacral vertebral column, and coccygeal vertebral column (Budidarmawan, 2020). One of the abnormalities or pathologies in the thoracolumbar vertebral column is caused by congenital factors. The pathology that can arise is scoliosis. Scoliosis is a deformity of the spine to the lateral side that is excessive in the vertebra. Scoliosis is often experienced by children aged 10-14 years, especially girls. The purpose of this study was to determine the technique of examining the Thoracolumbar Vertebrae with clinical scoliosis in the Radiology Installation of Muhammadiyah Ahmad Dahlan Hospital, Kediri City. This study used a descriptive method with a case study approach. The study was conducted from January 15, 2024, to February 10, 2024, at Muhammadiyah Ahmad Dahlan Hospital, Kediri City. The results showed that scoliosis examinations at Muhammadiyah Ahmad Dahlan Hospital, Kediri City were performed with PA, lateral, right bending, and left bending projections, using a Computed Radiography (CR) machine, with a 35 x 43 cm cassette, marker, 100 cm FFD, horizontal central ray perpendicular to the cassette, and no special preparation. The conclusion of this study is that the projections used in scoliosis examinations at Muhammadiyah Ahmad Dahlan Hospital, Kediri City use 4 projections because they can clearly show the anatomy of the vertebrae to establish a diagnosis and can reduce the occurrence of magnification, and without special preparation. Patients are only asked to remove objects that can interfere with the results of the radiograph image to anticipate the presence of artifacts in the x-ray results.

Keywords: left bending, right bending, scoliosis, vertebra, x-ray

BACKGROUND

The vertebral column is the main pillar of the body's bones that supports the head, upper extremities, and chest cavity. The vertebral column functions to channel the body's weight to the lower extremities and to serve as a conduit that protects the spinal nerves as well as encasing the meninges. The vertebral column is divided into five regions, namely the cervical vertebrae, thoracic vertebrae, lumbar vertebrae, sacral vertebrae, and coccygeal vertebrae (Budidarmawan, 2020).

There are 12 thoracic vertebrae, each connected to a pair of ribs. Since all vertebra bones are located at the posterior and dorsal parts (Lampignano and Kendrick, 2018). In the

thoracic vertebrae of the body, the size increases from the first to the 12th vertebra. They vary in shape with the superior thoracic body resembling the cervical body and the upper inferior thoracic body resembling the lumbar section. The bodies from thoracic 3 to thoracic 9 are approximately triangular in shape (Long, 2016). Lumbar vertebra is the largest. The difference is very large compared to other vertebrae and has a kidney-like shape. Its spinous process is broad and shaped like a small axe. Its transverse processes are long and slender. The fifth vertebra forms a joint with the sacrum at the lumbosacral joint (Pearce, 2014).

One of the abnormalities or pathologies in the thoracolumbar spine is caused by congenital factors as well as other factors. The pathology that can occur includes scoliosis. Scoliosis is an abnormal curvature of the spine to the lateral side that is excessive in the vertebrae. Scoliosis is often experienced by children aged 10-14 years, especially girls. Scoliosis can cause complications or malfunctions in the heart and respiratory system. The effects of scoliosis will be clearly visible if this disease attacks the lumbar region and causes the pelvis to tilt, impacting the lower extremities so that the sufferer limps or cannot maintain balance while walking (Lampignano & Kendrick, 2018).

In order to detect the presence of scoliosis abnormalities, it is necessary to conduct radiological examinations of the thoracolumbar vertebrae. Based on the background description of the problem above, the author is interested in researching how to perform radiological examinations of the thoracolumbar vertebrae in cases of clinically diagnosed scoliosis at the radiology installation of Muhammadiyah Ahmad Dahlan Hospital in Kediri City.

METHODS

This research uses a descriptive method with a case study approach. The research was conducted from January 15, 2024 to February 10, 2024. The research site is Muhammadiyah Ahmad Dahlan Hospital in Kediri City. The researcher conducted observations during thoracolumbar vertebrae examinations with clinical scoliosis. Then the researcher collected data and analyzed it.

RESULTS

The thoracolumbar vertebral radiography examination procedure is a clinical radiographic examination for scoliosis using PA, lateral, right-bending, and left-bending projections.

1. Patient Preparation
   There is no special preparation required for a thoracolumbar scoliosis examination. The patient is asked to remove their upper clothing and any objects that could interfere with the radiograph and change into their gown. An explanation of the procedure and the examination process is also crucial in patient preparation prior to the examination (Lampignano & Kendrick, 2018).
2. Preparation of Tools and Materials
   The equipment required includes an X-ray machine with a bucky stand, cassette, and R/L markers (Lampignano & Kendrick, 2018).
3. Thoracolumbar Examination Projections
   a. PA Projection
      1) Purpose: To determine the degree and severity of scoliosis.
      2) Patient position: Erect, facing a bucky stand.
      3) Object position: Position the subject.
      4) Adjust the body's MSP to the center of the cassette.
      5) Allow the patient's arms to hang at the sides.

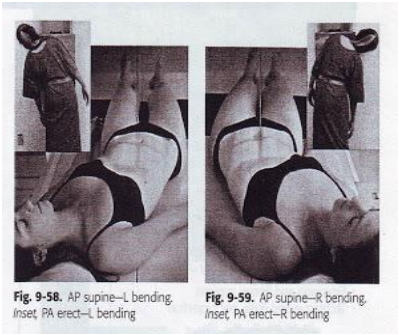
6) Ensure there is no rotation of the thorax and pelvis.
7) Lower border 1-2 inches below the iliac crest.
8) Beam adjustment: Horizontal beam perpendicular to the cassette.
9) Thoracic aiming point 6
10) FFD (Focus film distance) 102-153°C.
11) Exposure: Hold your breath while exhaling.
12) Radiographic Criteria
    - ✓ Thoracolumbar vertebrae are visible 1-2 inches below the iliac crest.
    - ✓ No rotation is observed, with the spinous processes midline and symmetrical between the iliac wings.
    - ✓ Clearly visible margins and trabecular bone boundaries of the thoracic and lumbar vertebrae, with no movement.

(Figure 1.1 PA Projection Scoliosis)

b. Lateral Projection
1) Purpose: To assess the pathology of spondylosisthesis and the degree of kyphosis or lordosis.
2) Patient Position: Lateral erect.
3) Subject Position: Position the upper extremities (MCP) straight with mid-flexion.
4) Position the arms forward with elbows flexed.
5) Ensure there is no rotation of the thorax and pelvis.
6) Lower border 1-2 inches below the iliac crest.
7) Beam Position: Horizontal beam axis perpendicular to the cassette.
8) Thoracic aiming point 6
9) FFD (focus film distance) 102-153 cm.
10) Radiographic criteria
    - ✓ Thoracic and lumbar vertebrae are visible, extending 1-2 inches below the iliac crest.
    - ✓ Clearly shows the edges and trabecular bone boundaries of the thoracic and lumbar vertebrae, with no movement.

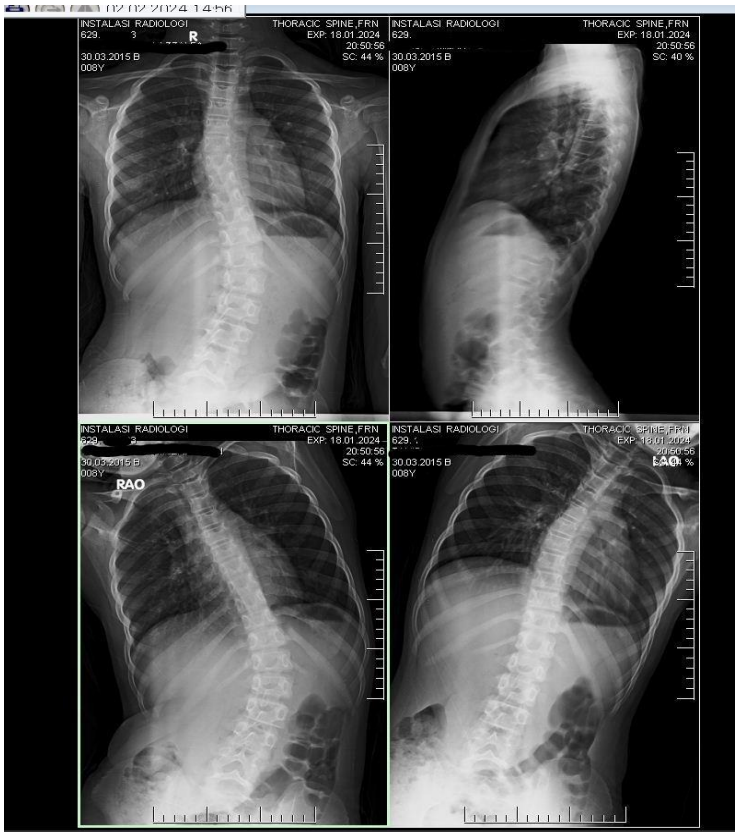
(Figure 1.2 Lateral Projection Scoliosis)

c. AP (PA) Right and Left Bending Projections
   1) Purpose: To assess vertebral space when moved.
   2) Patient Position: The patient is in an erect or recumbent position, AP or PA, with both arms at the sides.
   3) Subject Position: Position the MSP on the CR and midline on the grid.
   4) Avoid tarsal and pelvic rotation if possible.
   5) Place the lower border 3-5 cm below the iliac crest.
   6) With the pelvis as the fulcrum, flex laterally on one side.
   7) If recumbent, move both tarsals and legs to maximum lateral flexion.
   8) Beam Position: Horizontal beam axis perpendicular to the cassette.
   9) Thoracic aiming point 6
   10) FFD (Focal Film Distance) 102-153 cm.
   11) Radiographic criteria
      ✓ AP view of the thoracic and lumbar vertebrae, with the patient in lateral flexion at least 2.5 cm below the iliac crest.



(Figure 1.2 Right and Left Bending Projection Scoliosis)

4. Radiography Image of Scoliosis



(Figure 1.4 Radiography Image of Scoliosis in Radiology Installation of Muhammadiyah Ahmad Dahlan Hospital in Kediri City)

Based on Figure 1.4, it can be seen that scoliosis with a main curve in the thoracolumbar and a postural curve in the main thoracic. The main thoracic curve from th5 to th19 with an apex at th7 with a Cobb angle of 20°, post bending 0°. The thoracolumbar curve from th10 to L2 with an apex at L1 with a Cobb angle of 36°, post bending 12°. Risser cannot be evaluated because there is no AP Pelvis photo.

DISCUSSION

The procedure for examining thoracolumbar vertebrae at the Radiology Installation of Muhammadiyah Ahmad Dahlan Hospital in Kediri City, the patient came on January 18 to the Radiology Installation of Muhammadiyah Ahmad Dahlan Hospital carrying a barcode from the orthopaedic clinic containing the patient's name, date of birth, and medical record number. After the staff received the barcode from the patient, they checked the examination request on the computer. For patient An, T, the exam request listed in the ERM is for scoliosis series X-ray. After verifying the data, the photo request for An. T will be approved by the radiology staff. Next, the radiology staff will input data into the CR by entering the medical record number, name, gender, date of birth of the patient, and the type of examination to be performed. Then, the radiology staff prepares the equipment for the scoliosis series examination. There is no special preparation for the scoliosis series examination. Patients are only asked to remove objects that may interfere with the results of radiographic images to prevent artifacts in the X-ray results.

At the Radiology Installation of Muhammadiyah Ahmad Dahlan Hospital in Kediri City, thoracolumbar vertebra radiography examinations for scoliosis cases are performed using 4 projections, namely AP/Lat, right bending, and left bending. According to the

radiographer, the AP/Lat projection, right bending, and left bending are used with the patient in an erect position because this projection is routinely performed for scoliosis examinations, and this projection can clearly show the vertebrae while minimizing magnification.

The disadvantages of the AP/Lateral projections, right and left bending, include the amount of radiation exposure to the patient, especially in the organs that are sensitive to radiation. The reason for using AP/Lateral projections, right bending, and left bending at the Muhammadiyah Ahmad Dahlan Radiology Installation in Kediri City is that these projections clearly show the anatomy and abnormalities in scoliosis, as well as make it easier to observe the movement of the vertebral column and measure the Cobb angle, thus enabling a diagnosis to be established.

CONCLUSION

The procedure for thoracolumbar vertebra radiographic examination in scoliosis clinical settings at the Radiology Installation of Ahmad Dahlan Hospital in Kediri does not require any special preparation; the patient is simply asked to change into a patient gown and remove any items that may cause artifacts, along with ensuring good communication regarding the procedure with the patient or their family. The equipment used includes an X-ray machine, 35 x 43 cm film, markers, and Computed Radiography (CR). In the scoliosis series X-ray examination conducted at the Radiology Installation of Ahmad Dahlan Hospital in Kediri, AP, Lateral, right bending, and left bending projections are used. From the thoracolumbar X-ray examination, the anatomical structure and pathophysiology can be clearly observed.

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