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Case Study of *Appendicogram Examination Technique* With Clinical *Appendicitis* at The Radiology Installation of RSU Aisyiyah Ponorogo

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ABSTRACT
Abstract: **Background:** *Appendicitis* is an inflammation of the appendix that requires a precise diagnosis to determine patient management. An appendicogram is still used as a supporting examination to assist in the evaluation of the appendix. However, there are differences between the theory (Bontrager, K. L., & Lampignano, J. P., 2018) and the practice of using radiographic projections in appendicogram examinations at the Radiology Unit of Aisyiyah Ponorogo Hospital, so a study of the examination techniques used is necessary. Therefore, this study aims to determine the appendicogram examination technique in cases of appendicitis and the reasons for using AP, Oblique, and Left Lateral Decubitus (LLD) projections at the Radiology Unit of Aisyiyah Ponorogo Hospital. **Methods:** This study used a descriptive qualitative method with a case study approach. The study was conducted at the Radiology Unit of Aisyiyah Ponorogo General Hospital from December 2025 to May 2026. Informants consisted of three radiographers and one radiology specialist. Informants were selected using purposive sampling based on their direct involvement in appendicogram examinations. Data were collected through observation, interviews, and documentation, then analyzed using thematic qualitative data analysis and conclusions were drawn. **Results:** An *appendicogram* was performed using barium sulfate contrast media orally and using anteroposterior (AP), *oblique*, and *left lateral decubitus* (LLD) projections. The main findings of the study indicated that the use of the oblique projection helped reduce the superposition of abdominal anatomical structures, while the LLD projection improved visualization of the appendix by utilizing the influence of gravity on the distribution of the contrast media. **Conclusions:** The use of a combination of AP, Oblique, and LLD projections can improve visualization of the appendix by reducing superposition of abdominal anatomy and exploiting the influence of gravity on the distribution of contrast media

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1. INTRODUCTION

Traditional System digestion is Organ systems that function to receive food, digest it, absorb nutrients, and excrete metabolic waste in the form of feces. This system is composed of the main digestive tract that includes the mouth, *esophagus*, stomach, small intestine, colon,*rectum,* and anus. The colon is the last part of the digestive tract that functions to absorb water and electrolytes and form feces before being expelled from the body. In the proximal part of the colon, namely *Squirt*, there is a small tubular organ known as *appendix* (Yani & Lampung, 2024). Existence

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appendix as part of the digestive system makes it potentially subject to various disorders, one of which is inflammation known as *appendicitis,* which is included in acute abdominal diseases and requires immediate treatment.

Appendicitis is one of the most common acute abdominal diseases and requires prompt diagnosis and treatment to prevent further complications. This disease occurs due to inflammation in the *appendix* which is generally caused by lumen obstruction, thus triggering infection and inflammation (Nurlaili, 2024). Clinical manifestations *appendicitis* It is usually abdominal pain that starts in the area around the navel and then moves to the lower right quadrant, accompanied by nausea, vomiting, and fever.

Radiology is one of the fields of health services that plays a role in helping to enforce diagnoses through the use of radiation and medical imaging technology. One of the radiographic examinations that can be used to help with the evaluation *appendicitis* is *appendicogram*, i.e. examination using contrast media to show a radiographic picture of the appendix (Bontrager, K. L., & Lampignano, J. P., 2018) (Ardiyanto et al., 2024).

Allah SWT says in QS. Ash-Shu'ara verse 80:
"And when I was sick, He was the one who healed me."
The verse explains that healing comes from Allah SWT, while humans are commanded to make efforts in seeking treatment and establishing the diagnosis of diseases. One form of this effort is the use of radiology technology to help determine the right diagnosis so that patients can get appropriate management.

Based on the author's observations during the Field Work Practice (PKL) at the Radiology Installation of Aisyiyah Ponorogo Hospital, the examination *appendicogram* in case *appendicitis* It is carried out regularly with a frequency of at least one case every month. In December 2025, the author discovered a discrepancy between the theories (Bontrager, K. L., & Lampignano, J. P., 2018). And the clinical practices applied in those hospitals. According to (Bontrager, K. L., & Lampignano, J. P., 2018) Examination *appendicogram* done using projection *Anteroposterior* (AP), *Right Posterior Oblique* (RPO), and *Left Posterior Oblique* (LPO). However, in clinical practice at Aisyiyah Ponorogo Hospital, the projections used are *Anteroposterior* (AP), Oblique RPO dan *Left Lateral Decubitus* (LLD). LLD projection is always used at every examination *appendicogram* With Clinical *appendicitis* because it is considered to be able to clarify the visualization of the region *ileocaecal* and *appendix* so as to support the enforcement of the diagnosis.

However, based on the results of observations during field work practice at the Radiology Installation of Aisyiyah Ponorogo Hospital, *the appendicogram* examination does not use a plain photo, because before the *appendicogram* examination, usually the patient has taken a BOF/ultrasound photo so there is no need to repeat the plain photo of the abdomen, but only uses AP, *Oblique*, and *Left Lateral Decubitus projections* (LLD). These differences show that there is a problem in the form of incompatibility in the type of projection used, so it is necessary to further study the reasons for the selection of projections in the field and their impact on the quality of radiography results. One of the projections used is *Left Lateral Decubitus* (LLD), which has an important role in improving the quality of *appendix* visualization. Therefore, this study aims to find out the *appendicogram* examination technique in *appendicitis* cases as well as the reasons for using AP, *Oblique*, and *Left Lateral Decubitus* (LLD) projections.

2. LITERATURE REVIEW

Digestive System

The digestive system is an organ system in the human body that functions to receive food, process it through the digestive process, absorb nutrients, and remove metabolic waste in the form of feces. The main digestive tract is composed of several organs, namely the mouth, esophagus, stomach, small intestine, colon, rectum and anus which work continuously. The colon serves as the final part of the digestive tract which has the main function of absorbing water and electrolytes as well as the formation of feces before they are expelled from the body. In the early part of the colon, precisely in the cecum, there is a small tubular organ called the appendix (Yani & Lampung, 2024).

Anatomy and Physiology Appendix

The appendix or worm tuber is a small tubular organ attached to the cervix of the colon and is located in the lower right quadrant of the abdomen. The length of the appendix can vary from individual to individual and has different anatomical positions, such as retrosecical, pelvic, or subcaecal. (Yani & Lampung, 2024).

Physiologically, the appendix has a fairly abundant content of lymphoid tissue, especially in children and young adults, which function in the mucosal immune defense through the production of immunoglobulin A (IgA) to fight microorganisms in the gastrointestinal tract. In addition to playing a role in the immune system, the appendix is also

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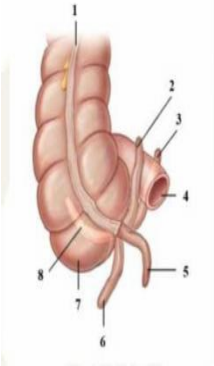
thought to function as a storage place for the intestinal microbiota that helps maintain the balance of normal flora and supports the recovery of bacteria well after disturbances in the digestive tract.



Remarks

1. *Taenia coli*
2. *Pre- ileal*
3. *Post ileal*
4. *Ileum*
5. *Pelvic*
6. *Subcecal*
7. *Cecum*
8. *Retrocal*

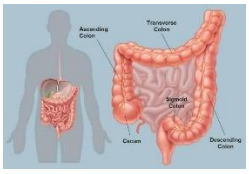


Figure 1 Anatomi Appendix (Layli, 2024)

Appendix vermiformis is a long, narrow worm-shaped tube extending from *secum* Terms *vermiform* means "like a worm *Appendix* usually attached to the *posteromedial* cecum and generally extends towards the pelvis however, it can also pass behind *secum (*John P. Lampignano, 2018)

The appendix consists of four layers of the same wall as the rest of the intestine, namely the mucosal layer, la

A Very Important Mushroom *muskularis*, layer *submukosa*, and layers *Serosa*, only the submucosal layer has a large amount of tissue *limfe*, which is thought to have a similar function *tonsils* (Nansih, 2024).

Pathology *of appendicitis*

Appendicitis is inflammation in the *appendix* which is generally caused by lumen obstruction *appendix*. The obstruction causes increased intralumen pressure, bacterial growth, and impaired blood flow resulting in an inflammatory process (Yani & Lampung, 2024).

Symptoms that are often found include lower right quadrant abdominal pain, nausea, vomiting, decreased appetite, and fever. When not handled properly, *appendicitis* can progress to perforation and peritonitis so that it requires a precise and rapid diagnosis (Yani & Lampung, 2024).

1. Media accounts

Contrast media is a material used in radiological examinations to clarify the visualization of the structure of the organs of the body, both anatomically and physiologically, especially when plain radiographic examinations are not able to distinguish the organ from the surrounding tissues due to the minimal difference in density (John P. Lampignano, 2018). In the field of radiology, contrast media is classified into two types, namely negative contrast media and positive contrast media. Negative contrast media produces an image *Radiolusen* and generally have a low atomic number, like air. In contrast, positive contrast media produces radiopak images because they have high atomic numbers, e.g. barium and iodine (Angella et al.,2022)

a. Non-Iodinated *Contrast Media* (Barium Sulfate)

Barium sulfate is a non-*iodinated* which is in the form of a white powder and is insoluble in water. For use in the examination, barium sulfate is mixed with water and other additives to form a contrast media suspension. This medium is used specifically on the examination of the gastrointestinal tract and can be administered through the oral or rectal route (enema). After the examination is complete, barium sulfate will be excreted from the body through feces. The characteristics of barium sulfate include: Suaib et al. (2024)

1) It is a compound of $BaSO_4$ that is insoluble in water.
2) Uses stabilizing ingredients to prevent settling and flavoring can be added to oral administration.
3) It can be given orally or through a rectal enema.
4) Excreted through feces.

b. Iodinated Contrast Media (Iodine-Contained)

Contrast based media *Iodine* can be bonded to organic compounds in the form of *No-Ionic* or in the form of compounds *Ionic*. Contrast media *Ionic* It is a type of contrast media that was first developed and is still used today in certain types of examinations. However, the contrast media *Ionic* It is known to have a higher risk of side effects compared to non-ionic contrast media. Non-ionic contrast media bound to organic compounds tends to cause milder side effects because they do not undergo the process of dissociation into charged molecules.

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Contrast media solution that is *hyperosmolar* can cause a variety of side effects, especially since it contains a number of atoms *Iodine* which is more in each of its molecules. The higher the content *iodine,* then the ability *Athenueasis* X-rays will also increase, resulting in a more contrasting radiography image (Angella et al., 2022).

Contrast based media *Iodine* It is water-soluble and relatively safe to use in radiological examinations. This contrast material is generally available in the form of a colorless, clear liquid solution. The concentration of iodine contrast media is usually expressed in milligrams *Iodine* per milliliter (mg I/ml). Modern oxidized contrast media is used extensively on a wide range of radiological examinations in almost all parts of the body. The giving is most often done in a *intravenous*, but under certain conditions it can also be given in a *intraarterial, intrathecal* (on the spine), as well as *Intraabdomen* according to the purpose of the inspection On the inspection *appendicogram*, the contrast medium used is barium sulfate because it is suitable for the examination of the gastrointestinal tract. (Angella et al., 2022)

Appendix Radiography Examination with Indications *of Appendicitis*

Radiological examinations act as supporting examinations to help establish the diagnosis *appendicitis*. Various modalities can be used, such as radiography *Conventional, Ultrasonography* (USG), *CT Scan*, and radiographic examination of the gastrointestinal tract using contrast media (Salim et al., 2022).

One of the radiographic examinations of the gastrointestinal tract that can be used is *appendicogram.* This examination aims to evaluate lumen filling *appendix* and help provide additional information in diagnosis enforcement *appendicitis* (Ardiyanto et al., 2024).

Appendicogram

Appendicogram is a radiographic examination of the gastrointestinal tract that uses barium sulfate contrast media to evaluate the lumen *appendix.* The examination was carried out by giving contrast media orally, then a radiograph was taken after the contrast media reached the secum area and *appendix*. This check can help assess lumen filling *appendix* and provide additional information in the evaluation *appendicitis*, especially in health facilities that still use the method as a supporting examination (Ardiyanto et al., 2024).

Appendicogram Examination Technique

Inspection *appendicogram* is done after the contrast media reaches the secum area and *appendix*. Radiograph taking generally uses projection *Anteroposterior* (AP), Oblique, and additional projections as per the needs of the examination (Bontrager, K. L., & Lampignano J. P. 2018).

1. Appendicogram Radiography Examination Technique
   a. Indications for *appendicogram examination*
      1) *Acute appendicitis*
      2) *Appendicitis* kronik
      3) Foreign objects
      4) Tumor
   b. Contraindications to *appendicogram* examination are *perforations*
   c. Patient Preparation
      a) Orally
         There is no special preparation, only the patient is asked to drink barium contrast media, 12 hours before the examination, the patient does not need to fast, can eat and drink.
      b) Anally
         According to John P. Lampignano, (2018)
         The patient's preparation for an *appendicogram* examination is the same as an examination of the colon*, colon in loop.*
         a.) Two days before the examination, patients are recommended to eat soft foods low in fiber.
         b.) The day before the examination, at 15.00 the patient takes the first laxative, communicate to the patient the purpose of giving laxatives, if you feel like defecating, do not hold it back
         c.) The evening before the examination (at 7 pm) drink. the second laxative. After that, fasting patients should not talk much and smoke.
         d.) In the morning before the examination (at 5 am) the patient was given a capsule dulkolak per anus.
         e.) The patient fasted until an examination was carried out.
   d. Preparation of tools and materials
      According to Layli (2024), Preparation of tools and materials in inspection *appendicogram* includes several things as follows.
      1) Orally

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a.) X-Ray Aircraft with *Fluoroscopy*
b.) Kaset, grid
c.) BaSO4/Cooking Water Contrast Material
d.) Patient clothes

2) Anally
a.) Standar irrigator
b.) Irrigator set or barium pouch with *cannula recti*
c.) Clamp
d.) Cleaning Cloth
e.) Gloves
f.) Jelly

2. Contrast media insertion technique
a. Orally
A 50 mg barium contrast medium is mixed with warm water for one glass (approx. 250 ml) then drunk 12 hours before the examination
b. Anally
The preparation of contrast media is the same as the preparation of colon *examination in loop.* The method of inserting contrast media is also the same as the colon in loop examination.

e. Examination procedure
1. Plain AP Projection
a) Purpose
To assess the presence of *gas appendicolithis* in the *appendix, appendical ileum* (*sentinel loop*) with *water fluid level*, soft tissue mass in the lower right quadrant of the abdomen, *deformity* of the cecum border, blurring/loss of *the properitoneal line feat* on the right, abscess, and others.
b) Patient preparation
Remove all metal, plastic, and objects that could cause other artifacts from the patient.
c) Patient position
The patient sleeps supine on the examination table.
d) Object position
Make sure the patient's *mid saggital plane* (*MSP*) is in the middle of the tape. Both arms next to the body should not be attached to the body to avoid exposure. For comfort, place the braces at the knees and on the head with a pillow.
e) Central ray
Perpendicular to the cassette plane
f) Central point
The middle of the cassette is *cristailiaka* high so that *the symphysis pubis* is not cut
g) FFD
The distance between the tube and *the image receptor* is 100 cm.
h) Tape size
Using 35x43 cm or 30x40 cm with grid.
i) Exposure during breathless erection
j) Criterion radiographer
1) The entire intestine is visible including *the left colic flexure* , and *rectum*.
2) *The os vertabrae* is located in the middle, so the *ascendense colon and the* descendense *colon* are also included
3) This position provides detailed information about the condition of the abdomen for further examination The following is an overview of the radiography results of the examination of *the anteroposterior* projection appendicogram *in figure 2.2 below.*

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Image 2 Radiographs *Appendicogram* AP Polos (Layli, 2024).

2. Post contrast AP projection

a.) Patient position

The patient sleeps supine on the examination table.

b.) Object position

Make sure the patient's *mid saggital plane* (*MSP*) is in the middle of the tape. Both arms next to the body should not be attached to the body to avoid exposure. For comfort, place a brace on the knees and on the head with a pillow.

c.) *Central ray*

Perpendicular to the plane of the tape.

d.) *Central point*

The middle of the cassettes is *cristailiaka* so that *the symphysis. pubis* is not cut.

e.) FFD

The distance between the *tube* and *the image receiver* is 100 cm

f.) Tape size

Using 35x43 cm or 30x40 cm with grid.

g.) Exposure during breathless erection

h.) Criterion radiographer

1) *The transverse colon* must preferably be filled with barium. In the PA position and filled with air in the AP position with *the double contrast technique.*

2) The entire area of the intestine should be visible including *the left* flexura.

3) *The vertebrae column* is in the middle so the picture includes *the colon asenden* and the *colon desenden.*

The following is an overview of the radiography results of the post-contrast *Anteroposterior* (*AP)* projection *appendicogram* in figure 2.3 below.

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Figure 2.3 Radigraphers *Appendicogram* AP Post Contrast Projections (Alves et al., 2025)

3. Post Contrast RPO Projections
   a.) Patient Position
   Sleeping supine on the examination table
   b.) Object position
   The right arm is placed behind the patient's body, the left arm is crossed over the patient's chest, the patient is rotated 35-45 degrees from the examination table with the right *hip joint* as a support. The left leg is flexed for fixation. The center line of the body is in the middle of the tape/grid.
   c.) *Central Ray*
   Stand perpendicular to the tape.
   d.) *Central Point*
   The aiming point is 5 cm laterally from the middle of the body as high as *the crista iliaca.*
   e.) FFD
   The distance between the tube and *the image receptor* is 100 cm.
   f.) Tape size
   Using 35x43 cm or 30x40 cm with
   g.) Criterion radiographer
      1) *The appendicogram* is positive when the entire *appendix* is filled with barium (normal).
      2) *The appendicogram* is negative when *the appendix* is not filled with barium (*appendicitis*).
      3) *Partial appendicogram* when only part of *the appendix* is filled with barium (possibly *appendicitis*).

      The following is an overview of the radiography results of the *RPO projection appendicogram appendicogram* in Figure 2.4 below.

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Image 4 Radiograph Images *Appendicogram* RPO projections, LPO (Alves et al., 2025)

3. RESEARCH METHODS

The type of research used is qualitative research with a case study approach to examine projections on *appendicogram examination techniques* with clinical *appendicitis* at the Radiology Installation of Aisyiyah Ponorogo Hospital. The research was carried out at the Radiology Installation of Aisyiyah Hospital Ponorogo from December 2025 to May 2026. The research subjects consisted of three radiographers and one radiologist. The selection of subjects was carried out using *purposive sampling techniques*, which is based on the criteria of informants who are directly involved in the implementation and interpretation of *the appendicogram examination* at the Radiology Installation of Aisyiyah Ponorogo Hospital.

Data collection was carried out through observation, interviews, documentation, and literature studies. Observations were made to directly observe the implementation of *appendicogram examinations,* while interviews were conducted with radiographers and radiologists to obtain information about the examination procedure and the reasons for using AP, *Oblique,* and *Left Lateral Decubitus projections* (LLD). Documentation is used as supporting data in the form of radiographs and documents related to the examination. The validity of the data was carried out through triangulation of sources by comparing the results of observations, interviews, and documentation. Data collection is carried out until data saturation is achieved, which is when the information obtained has shown similarities and no new information is found relevant to the focus of the research.

The data analysis in this study uses thematic data analysis. The data obtained from observations, interviews, and documentation were then grouped based on themes that were in accordance with the focus of the research, presented systematically, and then conclusions were drawn. This research has obtained ethical clearance with the number 2401 / KEP-UNISA / V / 2026.

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4. RESULTS AND DISCUSSION

In this study, data have been obtained through participatory observation and documentation on *appendicogram examination* with clinical *appendicitis* as well as through direct interviews with radiographers and radiology specialists at the radiology installation of Aisyiyah Ponorogo Hospital. In participatory observation, documentation and interviews, the authors obtained data, which are as follows:

1. Patient Identity
   Name : NY M
   Age : 63 Years
   Gender : Female
   Address : Dusun Magodadi
   No RM : 61****
   Sending Physician : dr. H.I. Sp.B., FINAC
   Diagnosis : *Appendicitis*
   Photo request : *Appendicogram*
   Date : 18 December 2025
   Inspection
2. Patient History
   Based on the results of direct observation, on Thursday, December 18, 2025, the patient came to the Radiology Installation of Aisyiyah Ponorogo Hospital with a photo request letter to perform *an appendicogram* examination. The patient is an inpatient patient.
3. Appendicogram *examination procedure* with clinical *appendicitis* in the Radiology Installation
   a. Patient Preparation
   Radiography examination *of appendicogram* with clinical *appendicitis* at the Radiology Installation of Aisyiyah Ponorogo Hospital. There is no special preparation for this examination, only that the patient is asked to drink a barium sulfate contrast medium that has been dissolved with warm water before the examination. For adult patients, the dose of barium given is about 30 grams, while for pediatric patients it is about 20 grams. After the contrast media is taken, the patient waits for 10–12 hours in adult patients or 6–8 hours in pediatric patients for the contrast media to reach the *secum* and *appendix area* so that it can be evaluated through a radiographic examination. This is in accordance with the following informant statements:

> "The patient's preparation for this *appendix examination* is that there is no special preparation, it's just that the patient drinks barium sulfate. Incidentally, the patient you took was 63 years old, meaning that the barium he drank was 30 grams and drunk before being examined. For children, it is usually 20 grams....." (I2/Radiographer 2)

   b. Preparation of Tools and Materials
   Based on the results of observations made by the researcher, the preparation of tools and materials needed for the *appendicogram radiography examination* with clinical *appendicitis* at the Radiology Installation of Aisyiyah Ponoro Hospital includes:
   1) X-ray Aircraft

Figure 5 X-ray Aircraft (Radiology Installation of RSU Aisyiyah Ponorogo)

   2) *Computed Radiography* (CR)

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Figure 6 *Computed Radiography Aircraft* (Radiology Installation of RSU Aisyiyah Ponorogo)

3) Cassette 35x43 cm

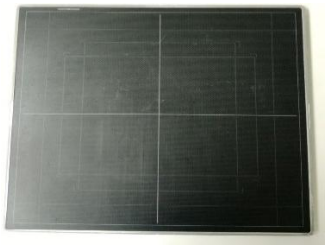

Figure 7 *Imaging plate* size 35x43 (Radiology Installation of RSU Aisyiyah Ponorogo)

4) Median Contrast

Figure 8 of barium sulfate contrast media (Radiology Installation of RSU Aisyiyah Ponorogo

5) Printer

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Figure 9 Printer (Radiology Installation of RSU Aisyiyah Ponorogo)

6) Grid

Figure 10 Grid (Radiology Installation of RSU Aisyiyah Ponorogo)

c. Input of Contrast Media

Based on the results of observations that have been made by researchers regarding the input of contrast media in the radiographic examination of the gastrointestinal tract using barium sulfate contrast media, the results were obtained that the input of contrast media was carried out orally (drinking). The contrast medium in the form of barium sulfate as much as 10-30 grams is dissolved in half to one glass of mineral water or warm water, then stirred until homogeneous and there is no deposit. In *pediatric patients*, contrast media may be mixed with honey or milk to ease the swallowing process and reduce the risk of choking. Once the solution is evenly mixed, the contrast media should be drunk immediately without letting it sit first so that there is no precipitation that can affect the quality of the radiographic image.

In adult patients, especially the elderly, a barium solution can be given with mineral water or warm water, and honey or sugar can be added as needed to improve patient comfort. The contrast media is drunk at once at one time or one sip, then the time for taking radiographic photos is calculated according to the examination protocol used.

This is in accordance with the informant's statement as follows:

> "About 10-30 grams of barium sulfate contrast media is dissolved in one glass of water, then stirred until evenly distributed and there are no deposits. After homogeneous mixing, the solution is immediately drunk at once and not left to sit first so as not to settle. In pediatric patients, it can be mixed with honey or milk to make it easier to drink. After the contrast medium is drunk, a time calculation is made for taking radiographic photos....." (I1, I2, I3/Radiographer 1, 2, 3)

d. Appendicogram *examination technique* with clinical *appendicitis* in the Radiology Installation.

Based on the results of observations and interviews that have been conducted at the Radiology Installation of Aisyiyah Ponorogo Hospital, radiography techniques in *appendicogram examination* with clinical *appendicitis* are carried out using three main projections, namely *Anteroposterior* (AP) *projection, right or left* Oblique projection, and *Left Lateral Decubicus* projection (LLD). The selection of the three projections

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aims to obtain an optimal *visualization of the appendix* and reduce the possibility of overlapping with the surrounding anatomical structures.

1.) *Anteroposterior* Projection (AP)

a) Patient Position : Supine Patient on the examination table
b) Object Position: *Mid Saggital Plane* (MSP) The patient's body is on the *midline* of the examination table. Both legs are straight and hands are placed next to the body.
c) *Central Ray* (CR) : Directed perpendicular to the cassette
d) *Central Point (CP) :* Pointing at the *umbilicus*
e) *FFD :* 100 cm
f) Cassette Size : 35x43
g) Exposure Factor: 70 Kv and 20 mAs

Figure 11 Radiography of *Anteroposterior* Projection *Appendicogram* Examination with Clinical *Appendicitis* (Radiology Installation of Aisyiyah Ponorogo Hospital)

2.) Oblique Projection

a) Patient Position : Supine Patient on the examination table
b) Object Position: The right arm is placed behind the patient's body, the left arm is crossed over the patient's chest, the patient is rotated 35-45 degrees from the examination table with the right *hip joint* as a support. The left leg is flexed for fixation. The center line of the body is in the middle of the tape/grid.
c) *Central Ray* (CR) : Directed perpendicular to the tape.
d) *Central Point* (CP): The aiming point is 5 cm laterally from the middle of the body as high as *the iliaca crista.*
e) FFD : 100 cm
f) Cassette Size : 35x43 cm
g) Exposure Factor: 70 Kv and 20 mAs.

appendix

Figure 12 Radiography of *Appendicogram* Examination of Oblique Projection *with Clinical* Appendicitis *(Radiology Installation of RSU Aisyiyah Ponorogo)*

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3.) *Projection Left Lateral Decubitus* (LLD)

a) Patient Position: The patient is in *the position of recumbent* or sleeps sideways on the left side
b) Object Position *: Mid Coronal Plane* (MCP) of the patient's body is arranged perpendicular to the examination table. The patient's legs are bent as a fixation of the patient's comfort. The patient's hands are used as head pads.
c) *Central Ray* (CR) : Directed *horizontally* against the cassette
d) *Central Point* (CP): *The central point* leads to the superior 1-2 inches of the *umbilicus.*
e) FFD : 100 cm
f) Cassette Size : 35x43 cm
g) Exposure Factor: 70 Kv and 20 mAs.

Figure 13 Radiography of *Appendicogram Examination of* Left Lateral Decubitus *(LLD) Projection with Clinical* Appendicitis *(Radiology Installation of RSU Aisyiyah Ponorogo)*

e. Expert Results

Radiography readings from radiology specialists on the *appendicogram* examination of NY patients. M as follows:

Based on the results of the radiology specialist's expertise, the results of *the appendicogram examination were obtained.* Visible contrast envelops part of the lumen of the small intestine, *caecum,* colon *ascendens* and part of the *transverse colon.* There is no picture of *the appendix* that is covered with contrast. There is *an opaque stone* on the projection of *the pelvic cavum.* Appears to be attached to the pelvic *cavity*

Effect :

Non *filling appendix. Vesicolithiasis*. Attached IUD to the *pelvic cavity*

4. The reason for the *appendicogram examination* with clinical *appendicitis* at the Radiology Installation of RSU Aisyiyah Ponorogo only uses AP, *Oblique*, and LLD projections.

Based on the results of interviews with informants, *appendicogram* examination with *appendicitis clinicians* at the Radiology Installation of Aisyiyah Ponorogo Hospital used AP projection, *right or left* oblique, and *Left Lateral Decubitus* (LLD). The three projections were chosen because they were considered to be able to provide *a more optimal visualization of the appendix* and reduce the superposition with the surrounding anatomical structures. AP projections are used as a preliminary picture to see the distribution of contrast media in the *secum* and *appendix regions*.

Furthermore, *oblique* projection is used to clarify the picture of *the appendix* by shifting overlapping structures, while LLD projection serves as an additional projection to take advantage of the influence of gravity so that *the appendix* can be seen more clearly and not covered by the small intestine, colon, or other organs. This is in accordance with the informant's statement:

"AP is used for the initial visualization of *the appendix,* then followed by the *projection of the right or left* oblique to determine a clearer picture *of the appendix*. If it still does not look optimal, LLD projection is carried out so that *the appendix* is not covered by the *colon* and can be visualized properly....." (I1/Radiographer 1)

"AP projection, *right or left oblique*, and LLD are used to evaluate whether the barium has reached the *secum* and *appendix regions.* In LLD projection, air and barium can be separated so that the contrast media filling on the *appendix* can be seen more clearly....." (I2/Radiographer 2)

"AP projections are used as an initial picture, then *oblique* and LLD projections are used as support if *the appendix* is not clearly visible. LLD projections also help to see the presence of air or possible *ileus* so that it can provide additional information for the doctor....." (I3/Radiographer 3)

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In addition, based on interviews with radiologists, the use of AP, *oblique*, and LLD projections is considered sufficient to assist in the evaluation of *the appendix* in *cases of appendicitis. Oblique* and LLD projections provide a view *of the appendix* from different angles that can help ensure appendix visualization, especially if the *appendix position* varies or is difficult to see in a single projection. Therefore, the three projections were chosen because they were able to provide adequate diagnostic information in assisting in the enforcement of the diagnosis of *appendicitis.*

Discussion

1. **Appendicogram *Examination Procedure* with Clinical *Appendicitis* at the Radiology Installation of Aisyiyah Ponorogo Hospital**

a. Patient Preparation

Based on the results of observations at the Radiology Installation of Aisyiyah Ponorogo Hospital, *the appendicogram* examination does not require special preparation. Patients are only given barium sulfate contrast media according to the patient's age and condition. In addition, radiographers consider the patient's age and weight to determine the waiting time before taking a radiograph. In adult patients, the contrast medium given is 30 grams, while in pediatric patients it is around 15-20 grams.

According to Angella et al., (2022). The patient's preparation for the appendicogram examination was carried out by administering barium sulfate contrast media and determining the time of the examination so that the contrast media could reach the cecum area and *appendix* optimally. The preparation aims to obtain visualization *appendix* which is more pronounced on the radiograph.

According to the researcher, the patient's preparation for the examination *appendicogram* at Aisyiyah Ponorogo Hospital has been in accordance with the theory put forward by (Angella et al., 2022), i.e. the administration of barium sulfate contrast media before the examination to ensure the contrast reaches the area *Cecum* and *appendix* optimally. Dose adjustment based on the patient's age also supports the successful visualization *appendix* on radiogra

b. Preparation of Tools and Materials

Based on the results of observation, the preparation of tools and materials for *appendicogram examination* with clinical *appendicitis* at the Radiology Installation of Aisyiyah Ponoro Hospital includes X-ray aircraft, *Computed Radiography* (CR), 35 x 43 cm tapes, barium sulfate contrast media, printers, and grids

According to John P. Lampignano, (2018). equipment used in system inspection *gastrointestinal* consists of an X-ray plane, *image receptor* or cassettes, grids, contrast media, and radiographic image processing devices.

According to researchers of the availability of X-ray aircraft, *Computed Radiography* (CR), tape, *grid*, barium sulfate contrast media, and the printer shows that the *appendicogram* at RSU Aisyiyah Ponorogo has met the technical needs of gastrointestinal examination as explained by (John P. Lampignano, 2018)

c. Contrast Media Input

Based on the observation results, the contrast medium used was 10-30 grams of barium sulfate dissolved in half to one glass of warm water or mineral water, then stirred until homogeneous and drunk orally. In pediatric patients, contrast media can be mixed with honey or milk to make it easier to drink. After the contrast medium is drunk, a time calculation is made before taking the radiograph.

According to Suaib et al., (2024). In the appendicogram examination, barium sulfate contrast media is administered orally in order to coat the lumen of the gastrointestinal tract until it reaches the cecum and appendix, so that the structure *appendix* can be evaluated radiographically.

According to researchers, oral administration of contrast media allows barium sulfate to flow through the gastrointestinal tract until it reaches *the ileosecal* and *appendix regions*. This technique was chosen because it is able to provide optimal lumen coating so that it is easier to evaluate the *filling of the appendix* in the radiograph results.

d. *Appendicogram Examination Technique*

The use of AP, *Oblique*, and LLD projections shows that *appendicogram* examination is not only aimed at obtaining an anatomical picture, but also improving the accuracy of *appendix visualization*. AP projections serve as an initial overview of the distribution of contrast media, while *Oblique projections* help reduce the superposition of abdominal structures that can cover the *appendix*. The addition of LLD projections shows that there are efforts to optimize *appendix* visualization through the use of the influence of gravity on air distribution and contrast media. Thus, the combination of the three projections has the potential to increase the diagnostic value of the examination compared to using only one projection.

According to Ardiyanto et al., (2024) Examination *Appendicographs* in case *appendicitis* carried out using AP projections and *Oblique* to obtain visualizations *appendix* optimal and reduces *superposisi* Structure anatomy abdomen.

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According to (2018), *appendicogram* examination is generally carried out using AP projection, postcontrast AP, and *oblique* projection to show the filling of contrast media in the *appendix* and evaluate the possibility of abnormalities.

According to Angella et al., (2022). The use of additional projections can be done if the image *appendix* It is not yet clear on the standard projections.

According to the study, the use of AP and *oblique projections* has been in accordance with (Bontrager, K. L., & Lampignano, J. P., 2018) to evaluate the distribution of contrast media in the *secum* and *appendix* regions. In addition, *Left Lateral Decubitus* (LLD) projection was added as a modification of techniques adapted to clinical needs to improve the visualization *of the appendix* if it does not appear optimal in the standard projection.

2. The reason for the *appendicogram* examination is only using AP, *Oblique* and *Left Lateral Decubitus* (LLD) projections at the Radiology Installation of Aisyiyah Ponorogo Hospital

Based on the results of the interviews, the use of AP, *Oblique* and LLD projections aims to improve the visualization of *the appendix*. AP projections are used as an initial description of the distribution of contrast media. Oblique projection helps reduce the superposition of anatomical structures so that *the appendix* is easier to observe. Meanwhile, LLD projection utilizes the influence of gravity to separate the air and contrast media, so that the *appendix* filling can be seen more clearly.

According to Rollins et al., (2023) The use of additional projections in the radiographic examination of the gastrointestinal tract aims to reduce the superposition of anatomical structures as well as improve the visualization of the examined organs. The use of multiple projections also helps to obtain more complete diagnostic information compared to the use of a single projection.

According to John P. Lampignano, (2018). AP projections serve as a basic projection used to see the distribution of contrast media on the abdomen as a whole. However, this projection often happens *superposisi* between *appendix* with small intestine, *colon*, as well as other soft tissue structures so that the *appendix* It is not always clearly visible. Therefore, additional projections such as *Oblique* to provide different angles of view and help separate the overlapping anatomical structures.

Rollins et al., (2023). Explain that changes in the patient's position and the use of additional projections are an important part of the examination *gastrointestinal* Because it can show structures that were previously covered by other organs and provide a different perspective on the area being evaluated.

According to Ardiyanto et al. (2024), use of additional projections on the examination *appendicogram* is very important because the position *appendix* may vary from person to individual. In some cases, *appendix* can be located *retrosekal, pelvis,* or *Subhepatic* So it is difficult to visualize with just one projection. Therefore, the use of multiple projections can increase the likelihood of visualization *appendix* and help obtain more accurate diagnostic information.

Left Lateral Decubitus *(LLD) projection has several advantages, namely being able to reduce the superposition of the small intestine and* colon *in the* ileosecal *region* and help the distribution of contrast media due to the influence of gravity. This condition allows the lumen of *the appendix* to be seen more clearly compared to the normal *supine position*. However, this projection also has limitations because it requires the patient's cooperation to maintain an oblique position during the examination. In elderly patients, patients with severe abdominal pain , or patients with weak general conditions, this position can cause discomfort and potentially give rise to movement artifacts that affect the quality of the radiograph.

Although *appendicogram* can be used to help with evaluation *appendicitis,* The current development of radiology technology has caused the use of these examinations to decrease. Modalities *Ultrasonographs* (ultrasound) and *Computed Tomography* (CT Scan) is more widely used because it has a higher sensitivity and specificity of CT *Scan* has a sensitivity of about 94-98% and a specificity of 95-97% in diagnosis *appendicitis,* while ultrasound has a sensitivity ranging from 78–88% depending on the operator's experience, in detecting inflammation *appendix.* Nevertheless, *appendicogram* can still be used as a supporting examination at certain health facilities and provide information about lumen filling *appendix* through contrast media (Kim et al., 2023).

According to the researcher, the combination of AP, *Oblique*, and LLD projections complements each other in displaying the *appendix picture*. AP projections serve as an initial representation of the distribution of contrast media, *Oblique* projections help reduce anatomical superposition, while LLD projections improve *appendix visualization* through the influence of gravity. The combination of these three projections provides more comprehensive diagnostic information in the evaluation of *appendicitis*.

This study has limitations because it only uses one case of patients with clinical *appendicitis who underwent an appendicogram examination* at the Radiology Installation of Aisyiyah Ponorogo Hospital. Therefore, the results of the study cannot be generalized to all cases *of appendicitis* or to all health care facilities. However, this study can provide

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an in-depth overview of the *appendicogram examination procedure* and the reasons for the use of AP, *Oblique*, and *Left Lateral Decubitus* (LLD) projections in *appendicitis* cases at the study site.

5. CONCLUSION

Based on the results of the research on *appendicogram examination techniques* with clinical *appendicitis* at the Radiology Installation of Aisyiyah Ponorogo Hospital, it can be concluded as follows:

1. Appendicogram *examination* in *appendicitis cases* at the Radiology Installation of Aisyiyah Ponorogo Hospital was carried out through patient preparation, oral administration of barium sulfate contrast media, and radiograph taking using AP, *Oblique*, and *Left Lateral Decubitus (*LLD) projections.
2. The use of these three projections aims to improve the visualization of *the appendix* and reduce anatomical superposition so as to help evaluate the filling of contrast media and support the enforcement of the diagnosis of *appendicitis*.

6. SUGGESTIONS

1. For Radiology Installation: Radiology Installation of RSU Aisyiyah Ponorogo is recommended to maintain the use of AP, *Oblique*, and LLD projections in the *appendicogram* examination because it is able to provide a more optimal *visualization of the appendix* than the use of one projection alone.
2. For radiographers: it is recommended to pay attention to the waiting time after the administration of contrast media so that the distribution of barium reaches *the serums* and *appendix* optimally before taking the radiograph.
3. For Further Researchers: It is recommended for more cases of *appendicitis* patients, a more diverse number of informants, as well as conducting research in more than one health care facility so that a broader picture of *appendicogram* examination techniques and the use of AP, *Oblique*, and *Left Lateral Decubitus* (LLD) projections is obtained.

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