



Urethrography Procedure In Clinical Cases Of Urethral Stricture At The Radiology Department Of Rsd K.R.M.T Wongsonegoro Semarang

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ABSTRACT

Abstract: Background: Urethral stricture is the narrowing of the urethral lumen that can impede urine flow, necessitating radiological examination to determine the location and characteristics of the narrowing. Urethrography is a radiological examination capable of visualizing the urethra using a contrast medium. At the Radiology Department of RSD (Regional Hospital) K.R.M.T Wongsonegoro Semarang, the procedure utilizes an IV cannula tip (needleless abocath) as a contrast administration device. This study aims to determine the urethrography procedure in clinical cases of urethral stricture and the rationale behind using an IV cannula tip for contrast injection. Method: This qualitative study employed a case study approach, conducted from February to June 2026 at the Radiology Department of RSD K.R.M.T Wongsonegoro Semarang. Research subjects comprised three radiographers and one radiologist, while the object of the study was the urethrography procedure for clinical urethral stricture. Data were gathered through observation, interviews, and documentation, then analyzed using a qualitative descriptive approach through transcription, reduction, categorization, theoretical comparison, and conclusion drawing. Results: The examination began with patient preparation, equipment and materials setup, and a plain pelvic radiograph in the Anteroposterior (AP) projection. This was followed by the retrograde administration of contrast medium using a needleless IV cannula (abocath) tip, and subsequent imaging in the Right Posterior Oblique (RPO) and Left Posterior Oblique (LPO) projections. A mixture of 20 mL iodine contrast medium and 20 mL 0.9% NaCl (1:1 ratio) was prepared, with 20 cc used for each of the RPO and LPO projections until the urethral lumen was optimally filled (full filling), thereby clearly visualizing the location and degree of the stricture. A 20G/22G IV cannula tip, lubricated with jelly, was inserted approximately 1-2 cm. The IV cannula tip was selected because its short and flexible design reduced the risk of kinking, avoided interfering with the visualization of the anterior urethra, and improved patient comfort. Conclusion: Urethrography in clinical cases of urethral stricture utilizes AP, RPO, and LPO projections with iodine contrast medium diluted in 0.9% NaCl at a 1:1 ratio. The use of a needleless IV cannula tip supports optimal visualization of the anterior urethra, minimizes the risk of kinking, and improves patient comfort. Contrast usage can be adjusted according to patient condition and diagnostic requirements

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1. INTRODUCTION

Urethral stricture is a narrowing of the urethral lumen due to the formation of scar tissue or fibrosis that can hinder the flow of urine. This condition can be caused by trauma, infection, inflammatory processes, or medical procedures involving the urethra. Complaints that can arise include weakened urine discharge, difficulty urinating, pain during urination, and urinary retention (Lazzeri et al., 2016). Anatomically, the male urethra is divided into the anterior urethra and posterior urethra so that the location of the narrowing needs to be known to determine the patient's condition and management (Wulandari, 2022).

Urethral strictures are more commonly found in men and their prevalence increases with age. The prevalence of urethral stricture is estimated to be around 229–627 cases per 100,000 men. In Indonesia, (Ayoob et al., 2020) *a multicenter study* at 38 hospitals during the 2019–2023 period found 3,055 urethral stricture patients, with 99.3% of them being men and the most common stricture locations are found in the bulbar urethra. This condition shows that urethral strictures are quite common in health services and require examinations that can provide an overview of the location and characteristics of urethral narrowing. (Daniswara et al., 2026)

Urethrography or *retrograde urethrography* (RUG) is one of the radiological examinations used to evaluate the urethra. The examination is carried out by inserting contrast media retrograde through the urethra, then taking a radiograph to see the urethral lumen. This examination can provide information about the location, length, and degree of stricture, thus assisting doctors in determining the patient's condition and management (Dola et al., 2017). The clarity of the resulting image is not only influenced by the contrast media, but also by the way contrast media and projections are inserted during the examination.

The selection of projections also affects the image of the urethra obtained. According to Bontrager (2018), the urethrographic examination uses plain AP projection, post-contrast AP, and RPO to reveal the urethra and reduce the superimposition of pelvic structures. However, Bukhori (2023) research applied AP, RPO, LPO, and lateral projections, while Riyanti et al. (2024) used LPO projection on urethrographic examination with BPH clinical.

Research on urethrography with clinical urethral stricture has also been conducted in several health facilities. Dahyadi et al. (2024) discussed the *retrograde urethrography* procedure in patients with suspected urethrological stricture at Dr. Soeroto Ngawi Hospital, while Fauzi et al. (2024) discussed urethrographic examination in patients with clinical urethral stricture at dr. R. Soetijono Blora Hospital. Although the use of abocath and LPO has been found in previous studies, their application can differ from one hospital to another, both from the selection of tools and the series of projections used.

In the urethrographic examination at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, contrast media was inserted using a 20 cc syringe paired with the tip of the abocath without a needle. The use of abocath in this study has a different context from the research of Fauzi et al. (2024), so the reasons for its selection and application need to be seen in accordance with the procedures that run at the research site.

Differences are also found in the series of projections. The examination began with a plain photo of the pelvis of the AP projection, then continued with *a post-contrast examination* using RPO and LPO projections. This means that there was an addition of LPO to the procedures applied at RSD K.R.M.T Wongsonegoro Semarang compared to the series of projections on the theory used as a reference.

The difference between theory and practice is the main basis for this study. On the tool side, the study discussed the use of abocath tips to insert contrast media in patients with urethral stricture, including the reasons for its selection over the use of other tools. On the projection side, the study discussed the addition of LPO after the RPO applied at RSD K.R.M.T Wongsonegoro Semarang. Fauzi et al. (2024) have indeed reported the use of abocath in cases of urethral stricture, and Riyanti et al. (2024) have used LPO in urethrhographic examinations, but no discussion has been found that specifically describes the use of abocath and the addition of LPO in one examination procedure in patients with clinical urethral stricture at RSD K.R.M.T Wongsonegoro Semarang.

This difference is important because the choice of tools when inserting contrast media and adding projections can be related to the patient's condition and the need to get a more complete picture of the urethra. Therefore, this study was conducted to find out the procedure for urethragraphic examination in patients with clinical urethral stricture and the reasons for using *abocath* as a contrast media insertion tool at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang.

LITERATURE REVIEW

A. Anatomy and Physiology of the Urinary System

The urinary system includes organs that play a role in reproductive function and the urinary system. The urinary system, also known as the excretory system, is a collection of organs that function to produce, store and remove urine from the body (B. b. Purnomo, 2016). The urinary system is an organ that plays a role in the formation of urine and the structure that channels it from the kidneys to the body. This system consists of two kidneys, two ureters, one bladder (vesica urinaria), and one urethra. The kidneys function to produce urine, the ureters channel urine from the renal pelvis to the bladder through peristaltic movements, the bladder holds urine received from the ureters, while the urethra plays a role in removing urine from the bladder to the outside of the body (Long et al., 2016).

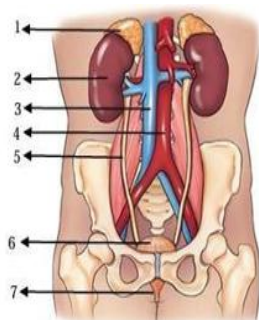


Image caption:

1. Right Suprarenal Gland
2. Right Kidney
3. Inferior Vena Cava
4. Aorta
5. Right Ureter
6. Vesica Urinary
7. Urethra

Gambar 1. Anatomi Sistem Urinaria
(Kenneth L. B. and Lampignano, 2018).

1. Kidney

The kidneys are the main excretory organs in the body that filter blood to remove toxic metabolic remnants and unneeded substances through the urine. This organ is shaped like a dark red bean and is paired in number, located above the abdominal cavity on the left and right sides of the spine, and is located in the *retroperitoneal area* with a slightly inclined position (Long et al., 2016). The right kidney is located below the diaphragm and at the back of the liver, while the left kidney is located under the diaphragm and behind the spleen. Both kidneys extend from the 12th thoracic vertebra to the 3rd lumbar vertebra, with the left kidney slightly higher than the right kidney. The lateral part of the kidney is convex, while the medial part is concave and forms a gap called the hilum renalis, which is connected to a space in the kidney called the renal sinuses. Through this hilum, the ureters, blood vessels, lymphatic vessels, and nerve fibers enter the renal sinuses. At the top of each kidney there are adrenal glands (Long et al., 2016).

Kidney function according to Purnomo (2016), is as follows:

- a. Filters and removes metabolic waste substances and toxins in the blood.
- b. Regulates the balance of calcium and vitamin ions in the body.
- c. Organs to regulate water content in the body.

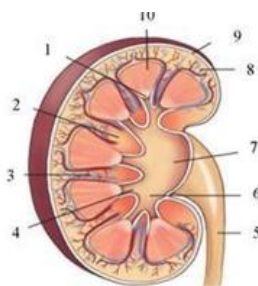


Image caption:

1. Renal Papilla
2. Renal Column
3. Renal Calyx
4. Minor Calyx
5. Ureter
6. Major Calyx
7. Renal Pelvis
8. Cortex
9. Fibrous Capsule
10. Medulla Renal

Figure 2. Kidney Structure
(Kenneth L. B. and Lampignano, 2018).

The size and weight of the kidneys can vary depending on gender, age, and the presence of the kidneys on the other hand. Generally, the kidneys in men are larger than those in women. Based on the results of the clinical autopsy, the average size of an adult's kidneys is about 11.5 cm long, 6 cm, and 3.5 cm wide, with a weight ranging from 120 to 170 grams or about 0.4% of the total body weight (B. b. Purnomo, 2016).

2. Ureter

The ureter is a tubular or pipe-shaped muscle duct that connects the kidneys to the bladder. This duct is an extension of the renal pelvis that extends from the renal hilus and empties into the urinary bladder through gentle peristaltic movements. There are two ureters, located on the right and left sides, respectively, that drain urine from the kidneys to the bladder. The length of the ureters varies between 28 to 34 cm with a diameter of about 1 mm to almost 1 cm, and generally the right ureter is slightly shorter than the left ureter (Kenneth L. B. and Lampignano, 2018).

3. Vesika Urinaria

The urinary bladder or bladder is a muscular organ that is shaped like a membrane sac and functions to temporarily hold urine before it is expelled from the body. It resembles a pear and is located at the upper back of the pubic symphysis in the pelvic cavity. The bladder has the ability to expand and deflate like a rubber balloon according to the volume of urine it holds (Kenneth L. B. and Lampignano, 2018).

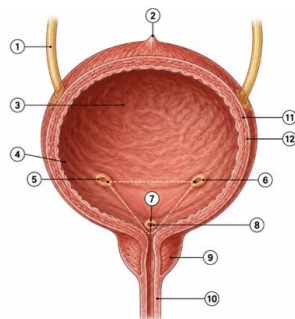


Image caption:

1. Ureter
2. Apex Vesicae
3. Corpus Vesicae
4. Fundus (Basis vesicae)
5. Ostium ureteris left
6. Ostium ureteris dextra
7. Trigonum vesicae
8. Ostium Urethrae Internum
9. Collum vesicae (Bladder neck)
10. Urethra

Figure 3. Structure of Urinary Bladder
(Kenneth L. B. and Lampignano, 2018).

4. Urethra

The urethra is a channel that functions to drain urine from the bladder (urinary vesicles) to the outside of the body. Anatomically, the urethra is divided into two parts, namely the posterior urethra and the anterior urethra.

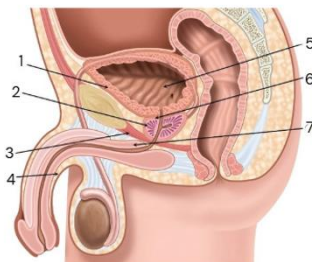


Image caption:

1. Bladder wall
2. Prostate gland
3. Pubic bones
4. Uretra bagain penis
5. Bladder
6. Uretra bagain prostat
7. Uretra bagain membran

Figure 4. Anatomy of the Male Urethra
(Kenneth L. B. and Lampignano, 2018).

In men, in addition to playing a role in the process of urine excretion, the urethra also functions to channel semen. This duct is equipped with two control muscles, namely the internal urethral sphincter, which is located

at the border between the bladder and the urethra and is composed of smooth muscles controlled by the sympathetic nervous system that function to open when the bladder is full and the external urethral sphincter, which is composed of lined muscles and controlled by the somatic nervous system so that it can be controlled consciously. When a person wants to urinate, the external sphincter will open, while when holding urine, this muscle closes. The length of the urethra in women ranges from 3–5 cm, while in adult men it reaches about 23–25 cm (B. b. Purnomo, 2016).

B. Pathology of the urethra

Urethral stricture is a condition characterized by narrowing of the urethral canal due to the formation of scar tissue (*fibrosis*) so that the lumen of the urethra becomes narrower and inhibits the flow of urine from the bladder to the outside of the body (Purnomo, 2016). This narrowing occurs due to pathological changes in the urethral tissue that can be caused by various factors, such as chronic inflammation, trauma to the urethra, urinary tract infections and sexually transmitted infections, as well as medical measures, such as the insertion of a catheter or other urological procedures that have the potential to cause injury to the urethral mucosa. The damage to the tissue triggers an excessive healing process so that scar tissue is formed which reduces the elasticity of the urethra and causes the urethral lumen to narrow. The degree of narrowing can vary, ranging from mild to severe, depending on the area and location of the scar tissue formed.

Narrowing of the urethra due to stricture can cause various complaints, such as weak urine flow, difficulty starting urination, pain when urinating (dysuria), branched urine emission, increased urine frequency, and urine retention in more severe conditions. If not treated properly, urethral stricture can cause complications in the form of recurrent urinary tract infections, urinary tract stones, enlarged bladder due to residual urine, urinary reflux into the upper urinary tract, and even impaired kidney function due to continuous urine back pressure (Lazzeri et al., 2016). Therefore, supporting examinations are needed to confirm the diagnosis, know the location, length, and degree of urethral narrowing. One of the most widely used examinations is urethrography because it is able to provide a clear picture of the urethral anatomy, so that it can help doctors in establishing a diagnosis and determining appropriate management (Purnomo, 2016).

C. Urethrographic Examination Procedure

1. Purpose of the examination

Urethrography has long been the standard procedure for assessing the condition of the anterior and posterior urethra. Strictures are generally more commonly found in the anterior urethra, and urethrography is the primary imaging method used to evaluate the area, not only in detecting narrowing, but also various other abnormalities such as diverticula, fistulas, and tumors (Dola et al., 2017).

2. Indications and Contraindications of Urethrographic Examination

a. Indications for Urethrographic Examination

According to (Lampignano, 2018) the indications for Urethrographic Examination are:

- 1) Stricture uretra.
- 2) Urethral trauma.
- 3) Ruptur uretra.
- 4) Fistula uretra.
- 5) Divertikulum uretra.
- 6) Kelainan kongenital uretra.
- 7) Tumor uretra.
- 8) Postoperative evaluation of the urethra.
- 9) Recurrent urethral infections.
- 10) Suspected mixia disorder is caused by a urethral abnormality.

b. Contraindications of Urethrographic Examination

According to (Lampignano, 2018) the Contraindications of Urethrographic Examination are:

- 1) Allergy to contrast media containing iodine.
- 2) An acute urinary tract or urethral infection that has not been treated.
- 3) Heavy active urethral bleeding.
- 4) Severe urethral trauma with suspected complete injury (until initial evaluation is performed).
- 5) Patients with unstable general conditions (*unstable hemodynamics*).
- 6) History of severe hypersensitivity reactions to contrast media.



c. Inspection Procedure

1) Patient Preparation

No special preparation is required for a urethrhographic examination in men, but urination is attempted to empty the urinary bladder (Lampignano, 2018).

2) Preparation of Tools and Materials:

According to Lampignano (2018), the preparation of tools and materials for the urethrographic examination includes several components, namely radiology equipment consisting of X-ray planes, fluoroscopy, tapes and films measuring 35x43 cm, and grids. The sterile equipment needed includes a 20 cc syringe, alcohol cotton, gauze, Foley catheters, physiological solutions, contrast media, glycerin, handscoon, and antihistamines. Meanwhile, the non-sterile equipment used includes bents, and markers.

3) *Informed consent*

Informed consent or approval of medical measures is an agreement given by the patient or his immediate family after obtaining a complete explanation of the medical action to be performed. The provision of *informed consent* aims to make the patient know and understand the action to be taken before giving consent, so that the patient's decision is given consciously and without coercion. In radiology services, *informed consent* is especially important for examinations involving certain actions or the use of contrast media, because patients need to obtain information about the examination procedures and actions to be taken (Permenkes RI No. 290/Menkes/Per/III/2008).

4) Contrast Media

According to (Lampignano, 2018), the contrast medium used is the ionic type. This type of contrast media has a higher osmolality than non-ionic contrast media, so its use has a greater risk of causing allergic reactions. This contrast medium is composed of the element opak and other chemical components that form a single complex molecule. Generally, the main component comes from a carboxyl group in the form of benzoic acid combined with other additives. In addition, ionic contrast media also contains cations, which are salts that are usually in the form of sodium, meglumin, or a combination of both to increase the solubility of the contrast medium.

5) Contrast Media Insertion Techniques

The administration of contrast media is sometimes done using a special tool called a *Brodney clamp*. A special catheter is inserted into the distal urethra, then the contrast medium is injected through the device. The amount of contrast media used must be sufficient to fill the entire urethral canal before taking an image (expose) (Lampignano, 2018). A urethrography examination is carried out with the help of fluoroscopy, where contrast media is inserted through a Foley catheter. During the process, fluoroscopy is used to monitor the flow of injected contrast media as much as 10–20 ml, then one image (photo spot) is taken for documentation (Dola et al., 2017).

6) Examination Techniques

The techniques of urethrographic examination, according to Lampignano, are as follows:

a) Plain Photo of the Posterior *Antero Projection* Pelvis (AP)

The goal is to see the patient's preparation, find out the accuracy of the patient's position, and determine the next exposure factor.

- (1) Patient Position: The patient sleeps on his back or supine position on the examination table. Place both hands at the sides of the body. Both legs are straight with an internal rotation of the leg of 15-20 degrees.
- (2) Object Position : MSP of the patient's body perpendicular to the examination table.



Figure 5. AP (Anteriorposterior) Projection

(Kenneth L, B. and Lampignano, 2018).

- (3) Cassette Size : 35 x 43 cm
- (4) *Central Point*: Vertical perpendicular to the tape.
- (5) *Central Ray* : Body MSP 5 cm Superior symphis pubis.
- (6) FFD : 100 cm
- (7) Exposure : When the expiratory holds the breath
- (8) Radiograph Criteria: Visible anatomical structures include the pelvis, L5 vertebrae, sacrum and coxigicus, head and neck of the femur, and trochanter major. The trochanter minor should be invisible, while the trochanter major should be symmetrical. The absence of rotation is evidenced by the symmetrical appearance of the iliac crista and the two obturatum foramen. The collimation should cover the entire pelvic area with clear visualization. Optimal exposure allows for the clear appearance of L5, the sacrum, the edge of the head of the femur, and the acetabulum, while the trabecular pattern of the proximal femur as well as the pelvic structure is sharp.



Figure 6. AP Projection Radiography *Pre-Contrast*
(Kenneth L, B. and Lampignano, 2018).

b) AP Photo Post Contrast

AP Post Contrast photo is a routine projection of urethrography that must be done.

- (1) Patient Position: The patient sleeps on his back or supine position on the examination table. Place both hands at the side of the body. Both legs are straight.
- (2) Object Position : MSP of the patient's body perpendicular to the examination table.
- (3) Cassette Size: 35 x 43 cm
- (4) *Central Point* : Vertically perpendicular to the tape.
- (5) *Central Ray* : MSP body 5 cm Superior symphis pubis.
- (6) FFD : 100 cm
- (7) Exposure : When the expiratory holds the breath
- (8) Radiography Criteria: Anatomy is shown, among others, the urethra with a well-visualized contrast of the male urethra containing contrast media



Figure 7. Post contrast AP Projection Radiography
(Kenneth L, B. and Lampignano, 2018).



c) Photo Post Contrast RPO (*Right Posterior Oblique*)

The purpose of oblique projection is to see the entire urethra and urinary vesicles not superposition with the pubic symphysis.

- (1) Patient Position: The patient from the supine position then the patient's body is set at an angle or oblique 30 degrees to the right
- (2) Object Position: Pubic symphysis in the middle tape. Placing the urethra laterally over the right thigh.



Figure 8. RPO Projection (*Right Posterior Oblique*)

(Kenneth L. B. and Lampignano, 2018).

- (3) Cassette Size : 35 x 43 cm
- (4) Central Point : 5 cm distal and 5 m from ASIS.
- (5) Central Ray : MSP body 5 cm Superior symphysis pubis.
- (6) FFD : 100 cm
- (7) Exposure : When the expiratory holds the breath
- (8) Radiography Criteria: The visible anatomical structure covering the urethra with a clearly visible contrast medium, showing a good visualization of the contrast-filled male urethral canal.



Figure 9. Radiography of post-contrast RPO projection

(Kenneth L. B. and Lampignano, 2018).

METHOD

This study uses a qualitative method with a case study approach. The research was carried out at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang from February 2026 to June 2026. The research subjects consisted of three radiographers and one radiology specialist. The object of the research was a urethrographic examination procedure with clinical urethral stricture at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang. Data collection was carried out through direct observation, interviews, and documentation. Data was analyzed narratively through the process of transcription, data reduction, data grouping, comparison with theory, and drawing conclusions. This research has received approval from the Ethics Committee of 'Aisyiyah University of Yogyakarta Number 5387/KEP-UNISA/IV/2026.

The research began with a literature study on the procedure of urethrography examination in patients with clinical urethral stricture at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, including patient preparation, preparation of tools and materials, contrast media input techniques, selection of radiographic projections, and radiograph results produced. Furthermore, the researcher formulated the problem and prepared a qualitative research design with a case study approach. The next stage was data collection through direct observation of the implementation of the examination, interviews with three radiographers and one radiology specialist, and documentation of radiograph results. The data that had been collected was then transcribed, reduced, grouped, and analyzed qualitatively by comparing the research results with theories contained in the literature. The results of the



analysis were used to draw conclusions and provide advice related to the procedure of urethral examination in patients with clinical urethral stricture at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang.

Results

Based on the results of data collection that has been carried out regarding the procedure of urethrographic radiography examination in patients with clinical urethral stricture at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, the following research results were obtained:

1. Case Exposure

a. Patient Identity

Table 1. Patient Identity

Name	Mr. L
Age	53 years old
Gender	Male
Address	Kebon Subur IV No. 15
No Medical Records	3XXXXX
Inspection Date	03-02-2026
Sending Physician	dr. HXXXX HXXXX
Diagnosis	Uretra Stricture
Inspection	Urerhrographs

b. Patient History

A male patient with the initials Mr. L came to the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang based on a referral letter from a urologist dated February 3, 2026 with a clinical urethral stricture. The patient complained of difficulty urinating and a feeling of incompleteness when urinating. To help establish the diagnosis and find out the location of the narrowing of the urethra, the patient then underwent a urethrographic examination with contrast media at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang.

2. Urethrography Examination Procedure with Urethral Stricture Clinic at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang

a. Patient Preparation

Based on the results of observations and interviews conducted at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, it was found that urethrographic examinations in patients with clinical urethral stricture do not require special preparations such as fasting or the administration of laxatives. Patient preparation is adjusted to the patient's condition before the examination is carried out. Patients from polyclinics are recommended to empty their bladder first, while patients from wards generally have used a urinary catheter so that they do not need to urinate independently.

This is in accordance with the informant's statement:

"The patient only needs to come directly to the radiology unit, but before the examination starts, the patient is asked to urinate first to empty the bladder so that the contrast medium does not mix with the patient's urine." (I/3, Radiographer 2).

The statement was supported by another informant who stated:

"If the patient is sent from the polyclinic, it is recommended to urinate first before the action. Meanwhile, if the patient comes from the ward, there is usually a urine bag installed." (I/2, Radiographer 1).

b. Tools and materials

Based on the results of the study, it is also known that the tools and materials used in the examination include:



1) DR X-ray aircraft



Figure 10. Philips Brand Sinar x DR Aircraft (Radiology Installation, RSD K.R.M.T Wongsonegoro Semarang 2026)

2) *Imaging plate size 35x43 cm*



Figure 11. *Imaging plate size 35x43 cm* (Radiology Installation, RSD K.R.M.T Wongsonegoro Semarang 2026)

3) *Computer console*



Figure 12. *Computer console* (Radiology Installation, RSD K.R.M.T Wongsonegoro Semarang 2026)

4) Iodin *Water soluble* 20cc, NaCl 20cc, Abocath, Spuit 20cc, Handscoon, Mangkok dan Sendok

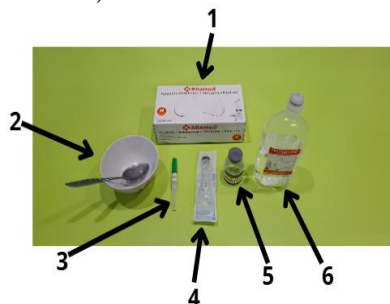


Image caption:

1. Handscoon
2. Bowls and Spoons
3. Abocath
4. Squirt 20cc
5. Iodin *Water soluble* 20cc
6. NaCl 20cc

Figure 13. Iodine *Water Soluble* 20cc, NaCl 20cc, Abocath, Syringe 20cc, Handscoon, Bowl and Spoon (Radiology Installation, RSD K.R.M.T Wongsonegoro Semarang 2026)

- 5) Bent
- 6) Jelly
- 7) Patient Clothes
- 8) Checkout
- 9) Apron

Contrast media insertion device. Using the abocath tip without a modified needle. Based on the results of the interview, the use of the abocath tip was chosen because it was more comfortable for the patient and could reduce pain during the examination procedure. This is in accordance with the informant's statement:

"The tip of the abocath is not too long, so the possibility of bending inside is smaller. If the catheter is too long, the insertion is too long so that we cannot evaluate the *anterior pars urethra*." (I/1, Radiology Specialist).

"Abocath is smaller in size, elastic, and when inserted has been shown to be effective in reducing pain in the patient's urethral canal." (I/2, Radiographer 1).

c. Contrast media insertion

The results of the study also showed that the contrast media used was *water soluble iodinated contrast media* mixed with NaCl or aquabides using a 1:1 ratio. The use of this comparison aims to ensure that the consistency of the contrast media is not too concentrated or too dilute so that it can produce an optimal radiography image. This is in accordance with the informant's statement:

"A 1:1 ratio is used so that the fluid is not too diluted and the image is good enough that the urethral canal can be clearly seen." (I/2, Radiographer 1).

"A 1:1 ratio was chosen so that the contrast medium is not too concentrated and not too diluted." (I/3, Radiographer 2).

d. Urethrographic examination techniques

The examination began with taking a plain photo of the projection pelvis of AP (*Anteroposterior*) as a preliminary photo. After that, contrast media was inserted and continued with *post-contrast* radiograph taking using AP, *Right Posterior Oblique* (RPO), and *Left Posterior Oblique* (LPO) projection.

Based on the results of the interview, the use of the projection aims to show the anatomy of the urethra more clearly and reduce the superimposition of the pelvic structure so that the location of strictures can be optimally evaluated. This is in accordance with the informant's statement:

"Plain AP, then after contrast AP, right oblique (RPO), and left oblique (LPO)." (I/1, Radiology Specialist)

The informant also explained that the use of right and left oblique projections is able to provide more complete diagnostic information about the location of strictures and other abnormalities in the urethra.

"You can know the location of the stricture, then if there is a rupture or extravasation of contrast, it can also be seen. If there is a diverticle, it is sometimes seen on the right oblique or left oblique." (I/1, Radiology Specialist)

1) Photo by the Pelvis (AP) *Anteroposterior*

A plain photo of the pelvis is taken before the contrast examination is inserted with the aim of seeing the patient's preparation, knowing the accuracy of the patient's position, and determining the next exposure factor.

- a) Patient Position: The patient is supine or sleeps on his back on the examination table
- b) Object Position: The patient's body is arranged until the *Mid Sagittal Plane* is in the center of the examination table and make sure there is no rotation.
- c) CP : 5cm above the pubic symptomatic
- d) CR : Vertical perpendicular
- e) SID: 100 cm



f) Radiography Results :



Results of Radiography of Projection Plain AP (Radiology Installation, RSD K.R.M.T Wongsonegoro Semarang 2026)

2) Projection (RPO) *Right Posterior Oblique*

Photo The purpose of oblique projection is to see the entire urethra and urinary vesicles not superposition with the pubic symphysis.

- a) Patient Position: The patient from the supine position then the patient's body is set at an angle or obliquely 30 degrees to the right.
- b) Object Position : Symphosis pubis in the middle cassette tape. Placing the urethra laterally over the right thigh.
- c) CP : 5cm above the pubic symptomatic
- d) CR : Vertical perpendicular
- e) SID: 100 cm
- f) Radiography Results :



Radiography Results of Post Contrast RPO Projection (Radiology Installation, RSD K.R.M.T Wongsonegoro Semarang 2026)

3) Projection (LPO) *Left Posterior Oblique*

A plain photo of the pelvis is taken before the contrast examination is inserted for the purpose of viewing

- a) Patient Position: The patient from the supine position then the patient's body is set at an angle or oblique 30 degrees to the left.
- b) Object Position : Symphosis pubis in the middle tape. Placing the urethra laterally over the left thigh.
- c) CP : 5cm above the pubic symptomatic
- d) CR : Vertical perpendicular
- e) SID: 100 cm

f) Radiography Results :



Radiography Results of LPO Projection Post Contrast (Radiology Installation, RSD K.R.M.T Wongsonegoro Semarang 2026)

e. Expertise Results

The results of *the expertise* of the urethral radiography examination with clinical urethral strictures at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang are that the plain photo of the abdomen does not show pathological opacity. In the urethrographic examination, iodine contrast media is used which is diluted with a ratio of 1:1 and inserted into the urethra through abocath. The contrast media appears to fill the anterior urethra well, accompanied by a smooth contrast flow. The urethral wall appears regular without any *filling defects*, *additional shadows*, indentations, or contrast extravasation. When the contrast media fills the posterior urethra, there is a sense of resistance, and the contrast flow only slightly fills the posterior urethra. Based on these findings, the impression of a posterior urethral stricture was obtained.

3. Reasons for Using Abocath as a Contrast Media Input Tool in Urethrographic Examination

Based on the results of the study, the contrast media insertion technique in the urethrographic examination at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang was carried out *retrograde* using the tip of *the abocath* without a needle. Before being inserted into the external urethral meatus, the tip of *the abocath* was smeared with *lubricating jelly*. *The penis was pulled slowly, then the tip of the abocath* was inserted with a depth of about 1–2 cm. A 20 cc syringe containing a mixture of iodine and NaCl contrast media (1:1 ratio) is then connected to the base of *the abocath*.

The injection of contrast media is carried out manually. The exposure process is carried out simultaneously when the contrast media is injected, through coordination between the officer injecting the contrast in the examination room and the radiographer in the control room. During the injection, *the position of the abocath* is fixed manually using the hand by the officer who uses gloves while maintaining the position of the penis. This fixation aims to hold *the position of the abocath* and minimize the leakage of the contrast media through the urethral meatus. The injection is carried out until the contrast media fills the urethral lumen optimally (*full filling*) from the anterior urethra to the limit of urethral stricture.

The application of this technique is in line with the results of interviews with radiology specialists regarding the reasons for using *the abocath* tip:

"Yes, the advantage is that it is not too long because we cut it, yes. The tip is abocath but we cut it. So he doesn't--the possibility of bending inside is smaller. And if you use a catheter, the entrance is too long, so later we can't evaluate the urethra which is *the anterior pars*, the penile pars, the front part..." (I/1, Radiology Specialist)

In addition, the radiographer also explained the effectiveness of the size and the convenience of the tool when inserting contrast media:

"The reason we chose to use the tip of the abocath instead of the usual *folley catheter* is because when the flexible tip of the abocath is inserted into the urethra, it is not too *invasive* for the patient... *The abocath* is smaller in size, elastic, and when inserted has been shown to be effective in reducing pain in the patient's urethral canal." (I/2, Radiographer 1)



"Regarding the consideration of using a contrast volume of 20 cc, it is conditioned so that at one time we inject the contrast media, the fluid can immediately fill the urethra completely (*full-filling*). so that the contrast medium can flow in one complete stream along the urethral canal." (I/2, Radiographer 1)

Through the insertion technique using the *abocath tip*, the filling of the urethral lumen can be achieved so that the description of the location and degree of narrowing of the urethra can be visualized on the radiograph results.

DISCUSSION

1. Urethral Stricture Examination Procedure with Urethral Stricture Clinic

a. Patient Preparation

Based on the results of observations and interviews conducted at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, urethrographic examinations in patients with clinical urethral stricture do not require special preparations such as fasting or the use of laxatives. Patients from polyclinics are recommended to urinate first before the examination is carried out, while patients from the treatment room generally have used catheters and *urine bags* so that there is no need to empty the bladder independently. In addition, patients are asked to remove metal objects in the pelvic area to avoid the appearance of artifacts that can interfere with the radiography results.

These findings are in line with Kenneth L. and Lampignano (2018) who stated that a urethrographic examination does not require special preparation, but patients are recommended to empty the urinary bladder before the examination is carried out. Long et al. (2016) explained that the urinary bladder functions as a temporary storage place for urine before it is excreted through the urethra, so the presence of urine in the bladder can affect the distribution of contrast media during the examination. The results of the research of Fikriyanto et al. (2024), also show that the urethrographic examination procedure begins with the patient's preparation in the form of changing clothes, removing metal objects, and urinating first to empty the urinary bladder before the examination is carried out.

The compatibility between the results of the study with the theory and previous research shows that the patient's preparation applied at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang has supported the success of the urethrographic examination. Emptying the bladder before the examination can minimize the mixing of contrast media with urine so that the visualization of the urethral lumen becomes clearer. In addition, the removal of metal objects also helps reduce radiographic artifacts so that the diagnostic information obtained becomes more optimal.

b. Preparation of Tools and Materials

Based on the results of research at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, the contrast media injection technique in the urethrography examination does not use a *conventional Foley* catheter, but uses a modification of the cannula or *abocath tip* (size 20G/22G) without a needle. The installation is carried out by applying lubricating *jelly* to the tip of the *abocath*, then inserting it into the external urethral meatus with a depth of only about 1–2 cm. The results of the interviews showed that the use of *this short abocath* was considered more flexible, not at risk of *kinking*, did not cover the anterior urethral canal (*pars penis*), and was effective in reducing the patient's pain compared to the use of *Foley catheters*.

The findings in the field show an adjustment in technical procedures when compared to the main theoretical references. According to Kenneth L. and Lampignano (2018), the administration of contrast media in urethrography generally uses a *Foley* catheter or *Brodney clamp*. The *Foley catheter* has a long urological hose shape and must be inserted far across the anterior urethra, and equipped with a fixation balloon at the end. The installation of a *Foley catheter* that is too deep risks causing superimposition (the catheter body covers the anatomical picture of the urethra *pars penis*) and increases pain due to balloon fixation on the urethral mucosa that is strained. On the other hand, the application of *abocath* at the research site is in line with the findings of Fauzi et al. (2024), who reported that *abocath* is able to increase patient comfort due to its small dimensions, and strengthened by Dahyadi et al. (2024) who use *venflon* (type IV cannula similar to *abocath*) to facilitate directional control and smooth filling of contrast media.

According to the author, the application of modification of the injection device using *the tip of the abocath* (or venflon) at RSD K.R.M.T Wongsonegoro Semarang is a step that successfully bridges the two main needs of the examination, namely patient *comfort* and diagnostic *image quality*. The use of short *abocath* eliminates the main problem with conventional *Foley catheters*, namely the closure of the penile pars urethra by the catheter tube so that the entire length of the urethra from distal to posterior can be fully visualized. In addition, because *abocath* does not use balloon fixation and is only inserted 1–2 cm on the outside, the action is *minimally invasive* so that it is effective in reducing mucosal trauma and pain in patients with urethral stricture. Thus, modification of the tip of the *abocath* can be recommended as an alternative means of injecting contrast media that is safe, comfortable, and diagnostically optimal.

c. Input of Contrast Media

Based on the results of interviews with radiographers, the contrast media used in the urethrographic examination at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang is a 20 ml Hexiol iodine contrast medium dissolved with 0.9% NaCl as much as 20 ml, resulting in a total mixture of 40 cc (1:1 ratio). The 40 cc volume mixture is prepared in a syringe to be used in a divided manner, namely 20 cc injected in the RPO projection and the remaining 20 cc in the LPO projection. This 1:1 ratio was chosen so that the consistency of the liquid is not too concentrated or too diluted, so that it is able to provide optimal visual enhancement (*enhancement*) of the urethral canal on the radiograph.

In theory, Kenneth L. and Lampignano (2018) stated that urethrography uses water-soluble iodine contrast media because it is safe for the urinary system. Wulandari (2022), added that contrast media functions to increase the density contrast between organ structures. Dilution using NaCl is in line with the research of Fauzi et al. (2024) which indicates that saline mixing helps the smooth flow of contrast. Judging from the volume of injections, there are variations between field practice and literature references. Kenneth L. and Lampignano (2018), explained that the injection begins with 5 mL and then continues until the lumen is filled. Dola et al. (2017) noted the use of a volume of 10–20 mL in fluoroscopy, while Riyanti et al. (2024) applied injections in stages ranging from 5 cc, 15 cc, to 25 cc.

According to the author, the difference in contrast volume administration techniques shows that the volume criteria in urethrography are not absolute, but flexible to adjust to the aircraft's modalities and clinical conditions. In contrast to the gradual technique (such as 15 cc in the study of Riyanti et al., 2024), the application of 20 cc volume in each RPO and LPO projection (a total of 40 cc mixed) at RSD K.R.M.T Wongsonegoro Semarang is an efficient step. This 20 cc one-thrust technique per projection has been proven to be able to achieve a condition of continuous full *filling of* the urethral lumen from distal to the stricture limit, without the need to perform repeated gradual injections that have the potential to increase patient discomfort.

d. Urethrographic Examination Techniques

Based on the results of observations and interviews with radiology specialists and radiographers, the urethrographic radiography technique in the case of urethral stricture at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang began with a plain photo of the pelvis projected with *pre-contrast AP*. The position of the supine patient with *a vertical Central Ray (CR)* perpendicular and *Central Point (CP)* on the *Mid Sagittal Plane (MSP)* 5 cm superior to the pubic symphysis. After the initial anatomical evaluation, the contrast medium was inserted *retrograde* using *abocath*, followed by post-contrast radiographs of the *Right Posterior Oblique (RPO)* and *Left Posterior Oblique (LPO)* positions with the patient's body tilted 30° and the urethra placed laterally on the thigh. The selection of this series of projections aimed to evaluate the location of the stricture, assess the presence of extravasation of the contrast media, and detect comorbidity abnormalities such as urethral diverticles.

Kenneth L. and Lampignano (2018), explained that standard urethrographic examination begins with a plain photograph of the projection of the pelvis of AP which is followed by oblique projection (RPO) after the contrast medium is inserted. The use of oblique projection aims to reduce the superimposition of the urethra with the structure of the pelvic bone and pubic symphysis. Research by Riyanti et al. (2024), shows the use of oblique projection to evaluate the contrast distribution gradually, while Dahyadi et al. (2024) and



Putri (2023), report the use of plain AP projection, post-contrast AP, and post-contrast RPO to visualize the location of urethral narrowing until the contrast medium reaches the urinary vesicles

According to the authors, the use of plain AP projection, RPO, and the addition of post-contrast LPO at the research site is a form of modification of radiography techniques that are tailored to diagnostic needs in the field. Although the reference theory (Lampignano, 2018), only requires RPO, the addition of LPO projection provides a visualization of the urethra from two opposite lateral angles (*dual-side oblique evaluation*). This is very important because some abnormalities such as diverticulus or urethral fistula ducts are sometimes not visible in RPO but are clearly visualized in LPO. Thus, the combination of AP, RPO, and LPO shooting techniques does not replace existing theories, but rather becomes a form of adjustment of technical procedures to produce more detailed urethral diagnostic images.

2. Reasons for Using *Abocath* as a Contrast Media Input Tool in Urethrographic Examination

The use of the *abocath* tip as a contrast media insertion tool in the urethrography examination is based on the results of research at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, the contrast media insertion technique in the urethrography examination does not use a *Foley* catheter or *Brodney clamp*, but uses a modification of the cannula or *abocath* tip (size 20 or 22 G) without a needle. The installation is carried out by applying lubricating *jelly* to the tip of the *abocath*, then inserted into the external urethral meatus with a depth of about 1–2 cm when the penis is pulled slowly. The contrast media is then injected manually. Based on the results of interviews with radiologists, the selection of the tip of the *abocath* is based on its short shape so that the risk of *kinking* in the urethral canal is smaller and does not hinder the evaluation of the anatomical picture of the anterior urethra (pars penis). From the point of view of the technical implementer, the radiographer added that the elastic and small size of the *abocath* material has been proven to be effective in reducing the pain and discomfort felt by patients during the injection process.

The findings in the field show that there are variations in techniques when compared to the main theoretical references. Conventionally, Kenneth L. and Lampignano (2018) and Dola et al. (2017), explain that the administration of contrast media in urethrographic examinations generally uses *Foley* catheters or special equipment such as *Brodney clamps*. The use of *Foley catheters* with balloon pumping in the distal urethral area is at risk of causing mucosal trauma and can mask the visualization of the anterior urethral structure. On the other hand, the application of the *abocath* tip in this study is in line with the research of Fauzi et al. (2024) who reported that *abocath* is able to improve patient comfort due to its small and flexible dimensions. This is also strengthened by the findings of Dahyadi et al. (2024), who use a flexible injection device (venflon) to facilitate directional control and smooth distribution of contrast media into the urethral lumen.

According to the author, the application of modification of the injection technique using the tip of the *abocath* at RSD K.R.M.T Wongsonegoro Semarang is a step to adjust medical procedures that are rational and efficient. The use of *abocath* without a needle has succeeded in bridging the two main needs of the examination, namely the aspect of patient *comfort* and the clarity of diagnostic *image quality*. Technically, the short shape of the *abocath* eliminates the visualization barrier in the urethra of the penile pars which is often covered by conventional catheter tubes. Although fixation is done manually by the officer using gloves to prevent contrast *reflux*, this technique is proven to deliver the liquid until it reaches a *full filling* state.

However, the study still has limitations in the number of samples evaluated. Therefore, for the development of further studies, it is recommended to involve a larger number of patient subjects and test variations in the volume of different contrast media. This is important to strengthen the generalization of the data and provide recommendations for more comprehensive and detailed urethrographic examination procedures in the future.

CONCLUSION

Based on the results of the study on the procedure of urethral examination in the urethral stricture clinic at the Radiology Installation of RSD K.R.M.T Wongsonegoro Semarang, it can be concluded that:

1. The examination procedure begins with the patient's preparation through the provision of *informed consent*, education about the examination procedure, and the removal of objects that can interfere with imaging in the pelvic area. The preparation of tools and materials includes an X-ray plane, digital detector, iodine contrast media mixed with NaCl in a ratio of 1:1, syringes, *abocaths*, penis clamps, and other supporting equipment. The examination is carried out using AP projection before the administration of contrast media, then continued with RPO and LPO projections.



2. The use of the *needleless abocath* tip as a means of inserting contrast media was chosen because of its short and flexible shape so that it does not close the visualization of the anterior urethra (penile pars), prevents the risk of *kinking*, and significantly improves comfort and reduces pain in patients

SUGGESTIONS

Based on the results of the study, it is recommended that the use of contrast media in urethrography examinations be adjusted to the patient's condition and diagnostic needs so that the visualization of the urethra can be obtained optimally. In addition, the use of AP, RPO, and LPO projections as well as contrast media insertion techniques using the *abocath* tip can be considered as an alternative procedure to improve the quality of diagnostic information and patient comfort. Further research is suggested to involve a larger number of subjects and compare the use of variations in the volume of contrast media in order to obtain more detailed procedure recommendations.

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