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LITERATUR REVIEW OF RADIOGRAPHIC MANAGEMENT EXAMINATION OF THE URINARY SYSTEM

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ABSTRACT

The urinary system is an organ system that produces, stores and drains urine. Disorders of the urinary system are one of the disorders that are often found in Indonesia. Radiology is usually used as a support to detect abnormalities in the urinary system. One of the examinations carried out is a radiographic examination using contrast media. There are several types of examination techniques that are often used to diagnose diseases related to the urinary system, namely blast nier overzicht intravenous pyelography (BNO-IVP), bipolar voiding urethrocystography (BVUC), retrograde urethrography, and cystography. The aim of this research is to determine the management of radiographic examinations of the urinary system, as well as to determine the reasons for the differences found between theory and previous research. This type of research is a literature review using descriptive qualitative research methods. This research used 13 research journals which were analyzed according to the research objectives. This research was conducted from March to May 2024. The results of this research show that 13 journals provide complete information regarding the management of radiographic examinations of the urinary system, including patient preparation, preparation of tools and materials, and the examination techniques carried out. Finding differences between theory and research that has been carried out, it can be concluded that the differences in patient preparation, preparation of tools and materials, as well as examination techniques have the aim of assisting doctors in maximally establishing a diagnosis.

Keywords: Urinary system, Radiographic Examination, Contrast Media

INTRODUCTION

The urinary system is an organ system that produces, stores and drains urine (Purnomo, 2012). The urinary system consists of two kidneys, two ureters, the urinary bladder and the urethra. Urinary system disorders are one of the disorders that are often found in Indonesian society. Urinary disorders consist of disorders of the kidneys, ureters, bladder and urethra. This disease attacks 4% of the entire population, with a male to female ratio of 4:1.

Radiology is usually used to support an action that will be carried out or to find out the process and results of treatment or actions that have been carried out and which have not been clinically observed (Indonesian Nuclear Energy Agency, 2020). Radiological examination is used to obtain an image of the urinary tract using x-ray film to see the shape, size and function of the kidneys, renal pelvis, ureters, as well as detecting kidney stones, tumors or cysts (Zuliani et al., 2021). Along with the development of technology and medical science, radiology has developed, namely the use of contrast

media.Contrast media is a material that can be used in radiology to reveal the image structure of a body organ (both anatomy and physiology) in radiological examinations, where with ordinary plain photographs the organ cannot be differentiated from the surrounding tissue because it has relatively the same density (Rasad, 2005) . Contrast agents are compounds used to increase the visibility of internal structures in medical diagnostic imaging. Contrast material is used in X-ray imaging to increase the attenuation power of X-rays (positive contrast material) or reduce the attenuation power of X-rays (negative contrast material based on air or gas) (Lampignano & Kedrick, 2018).

According to Lampignano & Kedrick (2018), several special examination techniques that are often used to diagnose diseases related to the urinary system are blast nier overzicht intravenous pyelography (BNO-IVP), bipolar voiding urethrocystography (BVUC), retrograde urethrography (RUG), and cystography. The examination technique depends on the clinical examination and the anatomy to be assessed.

There are differences in examination techniques between theory and several studies that have been carried out. Therefore, the author wants to know about the management of radiographic examinations of the urinary system, and wants to know the reasons for the differences between theory and research that has been carried out relating to radiographic examinations of the urinary system.

METHOD

The type of research used in this research is a literature review with descriptive qualitative research methods. Literature review is a series of activities carried out to analyze various library sources in the form of journals, publication manuscripts, or other research that is relevant and appropriate to the topic being discussed (Mardiyantoro, 2019). The time for data collection starts from March 2024 to May 2024.

The data source in this research is secondary data. Secondary data is data that comes from sources that have been put together by certain people or institutions, such as books, reading, recording, reports and research publications (Zaky, 2018). In this research, the author used data sources from several national journals related to the research topic, namely the management of radiographic examinations of the urinary system using the Google Scholar database and repository.

RESULT AND DISCUSSION

The literature that will be used in this research is based on selecting inclusion criteria with the research topic, namely radiographic examination techniques on the urinary system. The literature analyzed consisted of 13 journals, with 4 studies discussing BNO-IVP, 2 studies discussing BVUC, 2 studies discussing retrograde urethrography, and 5 studies discussing cystography.

To prepare patients for the blast nier overzicht intravenous pyelography (BNO-IVP) examination technique, it is explained in 3 research journals, namely research by Nugroho (2019), Septinarahma and Katili (2020), and Meldaria (2021). From these three journals, it can be concluded that patient preparation for the BNO-IVP examination is that patients are advised two or a day before the examination to eat foods that are low in fiber, such as porridge with soy sauce. Apart from that, the patient's last meal time is 21.00 or 9 pm, taking dulcolax tablets orally, and fasting from eating and drinking, and not talking too much. The

next morning, the patient was given dulcolax suppositories perianally. However, in the Meldaria journal (2021), there is additional patient preparation, namely that the patient must have a blood test in the laboratory before going to the radiology installation to measure urea and creatinine levels. According to Bontrager (2018), the stages of patient preparation for an IVP examination are that the patient must carry out a blood test in the laboratory to measure urea and creatinine levels. Normal urea levels are 8 - 25 mg/100 ml and normal creatinine levels are 0.6 - 1.5 mg/100 ml. After taking a blood test in the laboratory, the patient eats low-fiber foods before the examination. In the evening the patient is given a laxative to take care of it (at least 8 hours before the examination), after which the patient fasts. In the morning the patient was given dulcolax suppositories. Before the examination, the patient urinates first. Researchers are of the opinion that the journal Meldaria (2021) is in accordance with theory, while the other 2 journals are almost in accordance with theory, because they do not explain the patient's previous blood test.

To prepare patients for the bipolar voiding urethrocystography (BVUC) examination technique, it is described in 2 research journals, namely the journal Mufti et al., (2022) and Shiddiq (2023). It can be concluded from these two journals that there is no special preparation for this examination, patients are only asked to fill out informed consent, and the examination procedure is explained.

The preparation of patients for retrograde urethrography examination is explained in 2 research journals, namely Ningrum (2018) and Fauziyah (2018). It can be concluded from these two studies that there was no special preparation for the patient, only that the patient was asked to urinate and remove metal objects that were disturbing the examination area. Researchers are of the opinion that preparing the patient to urinate before the examination is to prevent reflux of the contrast medium with urine in the urinary bladder. However, due to the clinical condition encountered, namely urethral stricture, it was not possible to carry out this preparation. So the procedure carried out is in accordance with the theory of Long (2016) which generally requires no special patient preparation for examination of the lower urinary system.

The preparation of patients for cystography examination is explained in 4 research journals, namely research by Najibulloh (2023), Ningrum (2022), Avivah (2023), and Nada (2019). Meanwhile, the journal Sihotang & Sinaga (2020) does not explain the patient's preparation for this examination. From these four journals, it can be explained that the patient's preparation for a cystography examination is that the patient is asked to remove objects around the examination object, change examination clothes, empty the bladder or urinary bladder before the examination. For inpatients, catheters are installed in the inpatient ward, while for outpatients they are installed when they enter the examination room. These four studies are in accordance with the theory according to Long (2016), patient preparation before the cystography examination, namely that the patient is instructed to empty the bladder then when the patient is ready, the patient is positioned on the examination table for catheterization.

From the entire research journal, it can be concluded that there are similarities in preparing tools and materials. Preparation of tools and materials consists of X-ray plane, imaging plate (IP), computed

radiography (CR), syringe, contrast media, wing needle, alcohol swab, tweezers or clamps, sterile gauze, handscoon, bowl. The wing needle is used for BNO-IVP examinations, because the contrast medium enters through the veins, while for BVUC examinations, retrograde urethrography and cystography the contrast medium is introduced through a catheter.

The examination projections used in the BNO-IVP examination are explained in 4 research journals, namely Nugroho (2019), Septinarahma & Katili (2020), Meldaria (2021), and Arintoko et al., (2021). In the theory put forward by Lampignano & Kedrick (2018), the examination projections used consist of a plain abdominal photo, a 1 minute nephrogram phase photo, a 5 minute post-contrast anterior-posterior (AP) photo, a 10-15 minute post-contrast AP photo , 20 minute right posterior oblique (RPO) or left posterior oblique (LPO) photo, post-void or post-micturition photo. All projections were performed with full expiration or breath holding.

In research conducted by Nugroho (2019), the examination projection used consisted of a plain abdominal photo, followed by injection of contrast media, then a 7-minute post-contrast AP projection photo, a 15-minute post-contrast AP projection photo, a 30-minute AP photo. post-contrast, post-contrast RPO or LPO photos, lateral photos, and ending with post-micturition photos. In this study, the 1 minute nephrogram phase and lateral projection additional tone were not carried out. The reason for not using the 1 minute nephrogram phase photo is because the 7 minute post-contrast photo can show the overall anatomy of the kidney, and the lateral photo is used to visualize the opening of the ureter, especially for clinical ectopic ureters.

In research conducted by Septinarahma & Katili (2020), the examination projection used was a plain abdominal photo, followed by injection of contrast media, then a 5-minute photo of the AP supine projection, a 15-minute photo of the PA prone projection, a 30-minute photo of the PA prone projection, 60 minutes of photos, and ends with post-micturition photos. In this research, RPO and LPO projections were not carried out and 60 minute photos were added. The reason for the 15 minute and 30 minute PA prone photos is so that the organ being examined is closer to the cassette, the ureter is clearly visible, to see the filling of the contrast medium in the urinary bladder, and to see the remaining contrast medium in the ureter.

Meldaria's research (2021) explains that the examination projection used consists of a plain abdominal photo, followed by the introduction of contrast media, then a 5-minute post-contrast AP projection photo, a 15-minute post-contrast AP projection photo, a 45-minute post-contrast AP projection photo. contrast, and ends with a post-micturition photo. This study did not use 1 minute nephrogram phase photos, and did not use RPO or LPO projections, because the AP projection was able to provide good anatomical information.

Research by Arintoko et al., (2021) explains that the examination projection used consists of a plain abdominal photo, followed by injection of contrast media, then a 5-minute post-contrast AP projection photo, a 15-minute post-contrast AP projection photo, a 30-minute photo AP post-contrast projection, full blast photo, and ending with a post-void photo. All examinations are carried out without the patient exhaling and holding his breath, because without holding his breath the resulting photos are optimal and can confirm a diagnosis.

According to the author, all previous studies did not use 1 minute nephrogram phase photos, but went directly to 5-7 minute phase photos. The author is of the opinion that a 5-7 minute photo phase can show the overall anatomical picture of the kidney, so there is no need to use a nephrogram phase photo. Apart from that, it can reduce the dose to patients. The RPO, LPO and lateral projections can be used as additional projections according to the clinical examination, because the AP projection can confirm the diagnosis well and can display the anatomy well. For exposure, it is best to do it with the patient exhaling and holding their breath, so that the radiograph image is free from air around the abdominal area.

The examination projections used in the BVUC examination are explained in 2 research journals, namely Mufti et al., (2022) and Shiddiq (2023). In the theory of Lampignano & Kedrick (2018), it is explained that the examination projections used are plain photos, anterior-posterior (AP) projections, and 30° right posterior oblique (RPO) projections.

According to research conducted by Mufti et al., (2022), the examination projections used are plain photos, post-contrast AP projection, post-contrast RPO 45° projection, and left posterior oblique (LPO) projection. There is a difference in the degree of light direction with theory, because the amount of contrast media inserted is around 50-70ml, whereas in theory the degree of direction of the light used is 30° with the amount of contrast media used being around 150-500ml. The LPO projection is an additional projection that is routinely carried out to assist doctors in confirming a diagnosis from the left side in order to obtain maximum results. Shiddiq's research (2023) explains that the examination projections used are plain photos, post-contrast AP projections, RPO and LPO 15° projections. No reason was found regarding the use of a 15° beam direction, but from the research conclusions it can be concluded that the resulting radiograph can confirm the diagnosis well. According to the author, there is a difference between theory and practice regarding RPO projections and additional LPO projections. For differences in degrees of light direction, the author suggests following existing theory. For LPO projections, the author believes that additional projections can be carried out to help confirm the diagnosis.

The RUG examination projections are explained in 2 studies, namely Ningrum (2018) and Fauziyah (2018). According to the theory of Lampignano & Kedrick (2018), the projection used is the right posterior oblique (RPO) 30° projection. Research conducted by Ningrum (2018) explained that the projections used were plain photos, first post-contrast AP projection photos, second post-contrast AP projection photos, and post-contrast RPO. The purpose of a plain photo is to see if there are other abnormalities, such as a fracture in the pelvis, while the purpose of a post-contrast AP projection photo is to see the distal urethra to the urinary bladder. Research conducted by Fauziyah (2018) explains that the projections used are plain photos, first post-contrast AP projection photos, and second post-contrast AP projection photos. The first post-contrast AP projection photograph was taken with the urethra shifted to the right, and the second post-contrast urethra shifted to the left. By moving the urethra, it is enough to show the anatomy and morphology of the urethra because there is no superposition with other anatomy, because the penile organ can be shifted to the left or right.

The author believes that by shifting the urethra in the AP projection it is very good to show the urethra on both sides without superposition on the other. However, an oblique projection should still be made to evaluate the urethra with more diagnostic information and thus help determine the length of the urethra, location and number of structures and the severity of these structures.

Projections for cystography examinations are explained in 5 studies, namely research by Sihotang & Sinaga (2020), Najibulloh (2023), Ningrum (2022), Avivah (2023), and Nada (2019). According to the theory of Lampignano & Kedrick (2018), the projections used are plain photos, post-contrast AP projection photos with an angle of 10-15° towards the caudad, RPO and LPO projections, and optional lateral projections.

Research by Sihotang & Sinaga (2020) explains that the examination projections used are plain photos, AP projection photos, RPO projection photos, and lateral projection photos. The reason for using the lateral projection is to clearly visualize the distal ends of the ureters, the bladder, and the proximal urethra.

Research by Najibulloh (2023) explains that the examination projections used are plain photos, post-contrast AP projection photos without angles, lateral projection photos, and optional oblique projection photos. The post-contrast AP projection is not angled because it sees the right and left lateral walls of the urinary bladder, as well as for time efficiency. The reason the lateral projection is used is because it is to see the anterior and posterior walls of the urinary bladder, but this projection must be consulted with a doctor before the examination.

Research conducted by Ningrum (2022) explained that the examination projections used consisted of plain photos, post-contrast AP projection photos, post-contrast RPO projection photos, and post-contrast LPO projection photos. There is no angle required for post-contrast AP photo projection because it uses an examination table with the cup positioned perpendicularly, and to shorten time. The reason for using RPO and LPO projections is because they can provide clearer information so that you can compare the two radiograph results.

In research conducted by Avivah (2023), the examination projections carried out were plain photos, post-contrast AP projection photos without angles, post-contrast RPO projection photos, post-contrast LPO projection photos, and left lateral photos. The reason the post-contrast AP projection photo is not angled is because the urinary bladder is not superposed with the pubic symphysis and is well visualized. However, female patients tend to appear superposed because the anatomy of the sacrum bones is more curved in the front. Nada's research (2019) was carried out using plain photos, post-contrast AP projection photos without angles, post-contrast RPO projection photos, and AP projection post-micturition photos. The reason it is not angled in the post-contrast AP projection is because the urinary bladder is not thought to be superposed with the pubic symphysis. Meanwhile, the purpose of post-micturition photos is to assess the function of expelling fluid in the bladder, and to assess the anatomical function of the bladder neck. According to the author, it is best to angle for the post-contrast AP projection, because each person's pelvic anatomy is different, especially in women, to avoid superposition.

Post-micturition photo projections can be used as routine additional projections to assess the anatomical function of the bladder neck so that the diagnosis can be made very well.

CONCLUSION

Based on the results of the literature review, radiographic examination of the urinary system consists of 4 examination techniques, namely blast nier overzicht intravenous pyelography (BNO-IVP), bipolar voiding urethrocystography (BVUC), retrograde urethrography, and cystography.

During the BNO-IVP examination, patients are advised to consume low fiber foods, be given laxatives (dulcolax), carry out urea and creatinine tests, and fast before the examination is carried out the next day. The examination projections used are plain abdominal photos, 5 minute post-contrast photos, 15 minute photos, 30 minute photos, and post-micturition photos. The post-contrast phase can be adjusted according to the visualization that has been obtained. The right posterior oblique (RPO) and left posterior oblique (LPO) projections are additional projections according to the needs of the doctor who will diagnose, because this projection can show the ureter away from the vertebral column.

BVUC examination technique, patients do not need to make special preparations. The examination techniques used are plain photos, post-contrast anterior-posterior (AP) photos, RPO 30° and LPO 30° photos. LPO 30° projection photos are additional projection photos because they can help doctors in making a diagnosis to get maximum results.

There is no special preparation for retrograde urethrography examination. The projections used in this examination are plain photos, post-contrast AP projection photos, and RPO photos. Post-contrast AP projection photos are taken by shifting the urethra to the left or right so that superposition does not occur, while oblique photos are taken to evaluate the urethra so that the doctor can assess and diagnose properly.

Before the cystography examination is carried out, the patient is asked to urinate so that the bladder is empty so that reflux does not occur. The examination technique starts with plain photos, post-contrast AP projection photos, RPO and LPO projection photos. Lateral projection can be used as an additional projection according to the doctor's needs to assess and diagnose. For post-contrast AP projection photos, an angle is recommended to avoid superposition with the pubic symphysis.

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