

Gallbladder Ultrasound Examination Technique In Clinical Hydrops Gallbladder At Radiology Installation Of Banten Hospital

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ABSTRACT

Gallbladder hydrops is a pathological enlargement of the gallbladder usually caused by bile duct obstruction, requiring rapid and accurate diagnosis to prevent complications. Ultrasonography (USG) is an effective non-invasive imaging method for detection. To describe the USG examination technique for gallbladder hydrops cases at the Radiology Installation of Banten Regional Hospital. This descriptive study was based on real work practice (PKN) observations. USG examination using a C5-1 transducer with the patient in supine position effectively identified gallbladder distension, presence of stones, and wall thickening. Patient preparation with 6-hour fasting before examination enhanced diagnostic accuracy. Standardized USG examination technique with proper patient preparation is effective for diagnosing gallbladder hydrops.

Keywords: Ultrasound, Gallbladder, Hydrops, Radiology, Gallbladder.

INTRODUCTION

Ultrasound examination has confirmed its position as a non-invasive and safe imaging modality that is highly relied upon in the evaluation of the hepatobiliary system, particularly the gallbladder. Its radiation-free, portable, and ability to provide a real-time picture of organ structure make it a top choice for screening and early diagnosis of a wide range of pathological conditions. One condition that often requires an ultrasound evaluation is the gallbladder hydrops.

Gallbladder hydrops are defined as extreme pathological distension or enlargement of the gallbladder, often without a clear picture of acute inflammation as in acute cholecystitis. This condition generally arises due to chronic obstruction of the cystic duct, which is the duct that connects the gallbladder to the common hepatic duct. The most frequent cause of obstruction is the impaction of gallstones (calculus) in the neck of the gallbladder or in the cystic duct itself. However, non-calculus causes such as external compression by tumor masses, stricture, or even certain syndromes in children can also trigger this condition. As a result of persistent obstruction, the bile produced by the liver cannot flow out, and the mucosa of the gallbladder will continue to secrete mucus, leading to fluid accumulation and progressive distension. Without proper diagnostic and therapeutic interventions, gallbladder hydrops have the potential to cause serious complications, including ischemia of the gallbladder wall due to overstretching, spontaneous perforation (although rare), or empyema (accumulation of pus) in the event of a secondary infection.

Early and accurate detection of gallbladder hydrops depends critically on proper ultrasound technique. Abdominal ultrasound demonstrates high sensitivity and specificity for detecting gallbladder distension, wall changes, and peritoneal fluid. Standard examination protocols include 6-8 hours of fasting for optimal bile accumulation, multiple patient positions (supine, right lateral decubitus, or upright), and appropriate transducer selection (typically 3.5–5 MHz for adults).

At Banten Hospital's Radiology Installation, mastery of optimal gallbladder ultrasound techniques is essential for accurate diagnosis. This includes systematic patient preparation, appropriate transducer selection (high-frequency curvilinear), and comprehensive scanning

through multiple planes (longitudinal, transverse, oblique). Key sonographic features of gallbladder hydrops include significantly enlarged dimensions (>5 cm transverse, >10 cm longitudinal), minimal wall thickening (<3 mm), and potential identification of obstructing gallstones or sludge. Precise image acquisition, careful interpretation, and clear reporting directly support accurate diagnosis and effective clinical management.

Given the urgency and potential for threatening complications, accurate and timely diagnosis through ultrasound has become crucial. In the Radiology Installation environment of Banten Hospital, mastery of standard and optimal gallbladder ultrasound examination techniques is an absolute prerequisite for radiologists and radiographers. It includes a series of important stages, ranging from adequate patient preparation (e.g., fasting for optimal visualization), selection of a suitable transducer (generally high-frequency curviline), to the systematic application of scanning techniques through various slice planes (longitudinal, transversal, oblik) for comprehensive visualization of the gallbladder. Identification of the specific sonography picture of the gallbladder hydrops—such as significantly enlarged gallbladder dimensions (often >5 cm at transverse diameter or >10 cm at longitudinal diameter), absence of significant or minimal wall thickening (<3 mm), and the possibility of sludge or gallstones causing obstruction in the neck of the gallbladder—is vital. Accuracy in image acquisition, careful interpretation of findings, and clear and informative reporting of examination results not only support the enforcement of precise diagnoses, but directly contribute to effective clinical management and better prognosis for patients at Banten Hospital.

This study comprehensively examines ultrasound examination techniques for gallbladder hydrops at the Radiology Installation of Banten Hospital. The primary objectives are to: (1) evaluate the examination procedure from patient preparation through imaging parameters, (2) assess the accuracy and effectiveness of ultrasound in detecting and evaluating gallbladder hydrops, and (3) identify areas for technical optimization.

Clinical and Societal Impact: The findings will directly improve diagnostic accuracy and patient outcomes by standardizing ultrasound protocols for gallbladder hydrops—a condition that can lead to serious complications if misdiagnosed or detected late. By establishing best practices, this study will enhance the quality of radiology services at Banten Hospital, reduce diagnostic errors, and provide a practical reference for radiographers, radiologists, and medical students. Ultimately, this research contributes to better clinical decision-making and improved patient safety in the management of hepatobiliary disorders.

RESEARCH METHOD

This study was conducted to comprehensively examine ultrasound examination techniques in cases of gallbladder hydrops carried out at the Radiology Installation of Banten Hospital. This research is a descriptive research with a qualitative approach that aims to describe the examination technique. The main focus of this study is to find out how the examination procedure is carried out, starting from patient preparation, scanning techniques, examination position, transducer selection, to the imaging parameters used. In addition, this study also aims to assess the accuracy and effectiveness of ultrasound techniques in detecting and evaluating the condition of the gallbladder hydrops as a basis for further clinical decision-making. With this research, it is hoped that it can make a positive contribution to improving the quality of radiology services, especially in the technical aspects of abdominal ultrasound examination. In addition, the results of this study are also expected to be a reference for health workers, radiology students, and educational institutions in understanding and applying optimal ultrasound examination techniques in cases of gallbladder abnormalities. The instruments used were observation sheets, interview guides, and field notes. Data was analyzed using a thematic analysis method, namely by grouping findings based on themes such as examination techniques, procedural barriers, and image quality. This research was carried out by paying attention to ethical principles, including

maintaining the confidentiality of patient data and obtaining permission from the Banten Hospital. Informed consent is given to each participant before the data is collected.

RESULT AND DISCUSSION

This research was carried out at the Radiology Installation of Banten Hospital located on the Serang-Pandeglang Highway, Banten Province. The Radiology Installation of Banten Hospital is one of the medical support service units that has modern diagnostic radiology equipment, including ultrasound (ultrasound) equipment with various types of transducers that support abdominal examination. The facility has a team of radiographers and radiologists who are competent in the implementation of diagnostic examinations, including hepatobiliary and bile duct ultrasound examinations. The subjects of the study were patients who came to the Radiology Installation of Banten Hospital with a clinical diagnosis of gallbladder hydrop (gallbladder hydrochloride), both referrals from outpatient polyclinics and emergency installations.

Preparation of Tools and Materials

1. ULTRASOUND

The ultrasound used for this examination has the following specifications:

Brand : LOGIQ E9



Figure 1 LOGIQ E9

2. Patient Bed

Specialized beds designed to provide care and comfort for patients admitted to hospitals or other healthcare facilities.



Figure 2 2. Patient Bed

3. C5-1 Transducer

An ultrasound transducer (ultrasound) is a device used in ultrasound procedures to generate ultrasonic waves and receive the reflection of those waves to create a visual picture of organs and structures in the body.



Figure 3 Transducer C1-6

4. Ultrasound Gel

Gel ultrasound is a conductive medium used in ultrasound procedures to remove air between the transducer and the patient's skin and facilitate the transmission of ultrasonic waves.



Figure 4 Ultrasound Gel

5. Examination Gloves

Examination *gloves* are used by medical personnel to protect themselves and patients during the examination process or medical procedure.

Figure 5 Examination Gloves



The examination technique applied includes preparing the patient by fasting for at least 6–8 hours before the examination to reduce gas artifacts that can interfere with visualization. The initial patient position is carried out in the supination position, then followed by the lateral position of the cubitus as needed to get an optimal picture. The examination was conducted using ultrasound with a convex probe of a frequency of 3.5–5 MHz. Adjustments to the gain, depth, and focus settings were made to obtain a good contrast between the gallbladder wall and the bile fluid. The examination was carried out by longitudinal and transverse scanning to assess the size, contour, thickness of the walls, the presence of sludge or gallstones, as well as the evaluation of biliary duct dilation.

The results of the examination showed that the average *diameter of the gallbladder* in patients with *hydrop gallbladder*, ultrasound image documentation showed *an enlarged gallbladder (hydrops)*, with thickened walls, and in some cases sludge or gallstones were seen as *echogenic focus in the lumen of the gallbladder*. Some of the obstacles faced during the examination include the presence of excessive intestinal gas that interferes with the visualization of the gallbladder, variations in the anatomical position *of the gallbladder*, and the patient's non-compliance in fasting. Meanwhile, factors that support the success of the examination are optimal patient preparation, operator skills in *scanning techniques*, and the availability of good quality ultrasound equipment.

Based on the results obtained, the ultrasound examination technique applied at the Radiology Installation of Banten Hospital proved to be effective in detecting changes in gallbladder morphology in patients with clinical hydrop gallbladder. Ultrasound can provide a clear picture of the size and contents of the gallbladder, and help identify the presence of sludge, gallstones, or dilatation of the bile ducts. These findings are in line with the literature that states that ultrasound is a reliable and accurate non-invasive modality in the initial evaluation of cases of gallbladder abnormalities, and plays an important role in the enforcement of proper diagnosis and therapeutic planning for patients.

DISCUSSION

The results of this study show that gallbladder ultrasound examination in patients with clinical gallbladder hydrops at the Radiology Installation of Banten Hospital provides typical morphological findings. These findings are consistent with the pathophysiology of gallbladder hydrops, where fluid accumulation in the lumen results from biliary obstruction or inflammatory processes, leading to gallbladder distension. Bile sludge found in some patients indicates altered bile composition due to stasis, which may serve as a precursor to gallstone formation. Meanwhile, gallstones identified in some patients support the theory that mechanical obstruction is a key etiological factor in gallbladder hydrops. Additionally, biliary duct dilatation observed in several patients suggested obstruction of bile flow, either from direct obstruction or surrounding tissue inflammation. The ultrasound examination technique applied proved effective, with 6–8 hour fasting reducing intestinal gas artifacts, varied patient positioning (supine and lateral) maximizing visualization, and 3.5–5 MHz convex probe providing adequate morphological evaluation.

These findings align with research by Wijayanti et al. (2020), reporting ultrasound sensitivity of 90–95% for detecting sludge and gallstones, and Putri and Sari (2019), who demonstrated that fasting significantly improves image quality. However, some results partially diverge from Ahmad et al. (2018), who reported difficulty distinguishing gallbladder wall thickening from pericholecystic edema in severe inflammation. **This discrepancy may be explained by several factors:** differences in disease severity between patient populations, variations in operator experience and interpretation criteria, or technical differences in ultrasound equipment specifications. **Alternative explanations for our findings should also be considered:** the high detection rate of sludge and stones may reflect referral bias (patients with higher clinical suspicion being sent for ultrasound), and the observed biliary dilatation could represent physiological variation rather than pathological obstruction in some cases.

Several limitations warrant consideration. First, the study's sample size and single-center design limit generalizability to other institutions with different patient demographics or equipment. Second, the subjective nature of ultrasound interpretation, despite experienced operators, introduces potential inter-observer variability that was not formally assessed. Third, lack of histopathological or surgical confirmation in all cases means some diagnoses rely solely on imaging criteria. Fourth, intestinal gas interference, anatomical variations, and patient non-compliance with fasting protocols affected image quality in some cases, potentially impacting diagnostic accuracy. Finally, patients requiring follow-up imaging (CT or MRCP) for confirmation represent a subset where ultrasound alone proved insufficient, highlighting the technique's inherent limitations in complex cases.

Despite these limitations, supporting factors such as operator competence and quality equipment helped mitigate obstacles. Overall, this study supports that gallbladder ultrasound examination at Banten Hospital's Radiology Installation is an effective, non-invasive, and accurate initial diagnostic tool for gallbladder hydrops, consistent with current literature recommendations for evaluating hepatobiliary complaints.

CONCLUSION

Based on the results of this study conducted on gallbladder ultrasound examination techniques in patients with clinical gallbladder hydrops at the Radiology Installation of Banten Hospital, ultrasound examination proved to be an effective and accurate method for evaluating gallbladder morphology, with standardized techniques—including patient fasting preparation, optimal positioning, and appropriate equipment settings—successfully visualizing gallbladder enlargement, wall thickening, sludge, gallstones, and biliary duct dilatation to support accurate clinical diagnosis. Recommendations for clinical practice include: (1) implementing standardized ultrasound protocols across all radiographers to minimize inter-operator variability, (2) establishing regular training programs to enhance technical competency in managing challenging cases, (3) developing clear referral criteria for follow-up imaging (CT/MRCP) when ultrasound findings are inconclusive, and (4) ensuring strict patient compliance with fasting protocols through improved pre-examination education. This study reinforces ultrasound's role as the first-line, non-invasive diagnostic tool for gallbladder hydrops, with potential to reduce unnecessary radiation exposure and healthcare costs while supporting quality improvement initiatives in radiology services at Banten Hospital and providing evidence-based protocols adoptable by other institutions. Future research should explore inter-observer reliability in ultrasound interpretation, compare diagnostic accuracy with advanced imaging modalities in complex cases, evaluate long-term clinical outcomes following ultrasound-guided management decisions, and investigate the cost-effectiveness of ultrasound-first diagnostic pathways versus immediate cross-sectional imaging to provide valuable health economics data for resource-limited settings.

REFERENCE

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