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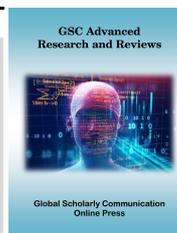
Ultrasonography (USG) diagnostic test compared to magnetic resonance cholangio pancreatografy (MRCP) in patients with obstructive jaundice in Dr. Moewardi Public Hospital

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Abstract

Background: Ultrasonography (USG) is still the first imaging modality for initial examination in patients with obstructive jaundice. Abdominal ultrasonography is quite good in seeing the morphology of the biliary tract, although the diagnostic etiological sensitivity of various causes of obstruction is very low. Magnetic resonance cholangio pancreatography (MRCP) is a new technique and can show the same picture as ERCP examination and no contrast media is needed.

Aim: Aim for this study is knowing the results of ultrasound diagnostic tests in detecting Obstruction jaundice which was confirmed by the results of MRCP examination at Dr. Moewardi public hospital.

Method: This study uses a diagnostic test that assesses sensitivity, big specifications, negative predictive value and positive predictive value of ultrasound in detecting jaundice obstruction confirmed by the results of the MRCP examination. Sampling was done by purposive sampling, on 68 research subjects.

Results: This study show the characteristics of jaundice in the form of stones with sensitivity and specificity values of 84% and 83%, positive predictive value 75% and negative predictive value 90% and in biliary tract tumors 83% and 84%, positive predictive value 75% and predictive value negative 90%.

Conclusions: Ultrasound has a high sensitivity and specificity value in diagnosing obstructive jaundice in the case of biliary tract stones and biliary tract tumors

Keywords: Obstructive Jaundice; Diagnostic; MRCP; USG; Ultrasound

1. Introduction

Jaundice is a change in the color of the skin, sclera or other tissues (mucous membranes) that turn yellow due to staining by bilirubin which increases its concentration in the blood circulation. Bilirubin is formed as a result of breaking the hem ring, usually as a result of red blood cell metabolism. The word jaundice comes from the French word *jaune* which means yellow. Jaundice should be examined under bright daylight, by looking at the eye sclera. Mild jaundice can be seen early in the eye sclera, and if this happens the concentration of bilirubin has ranged between 2-2.5mg / dL (34 to 43 umol / L). If jaundice can be clearly seen then bilirubin may actually have reached the number 7 mg% [1].

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Biliary tract examination is very important. Sonographic examination, CT, and MRI show widening of the biliary tract, which indicates a mechanical blockage, even if not present does not always mean an intrahepatic blockage, especially in acute conditions. The cause of the blockage may be shown, generally gall bladder stones can be confirmed by ultrasonography, pancreatic lesions with CT [2]. Most centers use mainly ultrasound to diagnose cholestasis because of its low cost.

Endoscopic Retrograde Cholangio-Pancreatography (ERCP) provides the possibility to look directly at the biliary tract and is very useful for determining the cause of extrahepatic blockage. Percutaneous Transhepatic Cholangiography (PTC) can also be used for this purpose. Both of the above methods have therapeutic potential [3]. MRCP examination can also look directly at the bile duct and detect stones and other ductal abnormalities and is an alternative non-invasive way to ERCP.

Ultrasonography is quite effective in differentiating the cause of jaundice due to hepatocellular or obstructive. In a study conducted by Farrukh *et al.* found that ultrasonography was able to diagnose Common Bile Duct (CBD) by 72.5%, CBD dilatation without apparent cause as much as 41.7%, proximal obstruction 63.15%, distal CBD obstruction 60% and sludge 66.7%. The overall ability of ultrasonography to diagnose the cause of obstruction is 64.17% [4]. While the research conducted by Karki *et al.* found that ultrasonography had a sensitivity of 100% and specificity of 89% in detecting choledocholithiasis. Sensitivity 98.87% and specificity 83.33% detect cholangiocarcinoma. While in pancreatitis, the sensitivity is 97.59% 66.67% specificity [4].

MRCP is the latest modality that should be the first choice in diagnosing obstructive jaundice because of its non-invasive nature and high accuracy [5]. MRCP is a new imaging technique in Asia in evaluating the causes of obstructive icterus. In research conducted by Karki, *et al.* MRCP was able to detect the cause of icterus obstruction in 74 of 77 patients, so that overall accuracy reached 96.1%. There were 71 positive and true positive cases. MRCP sensitivity reaches 97% and specificity is 75%. Positive predictive value of MRCP is 98.6% and negative predictive value reaches 60%. Compared with ultrasonography, MRCP has similarities that is not invasive and does not use ionizing rays [6,7]. Aim of this study was to determine the results of the ultrasound diagnostic test in detecting obstruction jaundice which was confirmed by the results of the MRCP examination at Dr. Moewardi public hospital.

2. Material and methods

This study uses observational analytic with cross sectional approach and uses secondary data retrospective [8]. The study was conducted in the Radiology Department of Dr. Moewardi public hospital Surakarta. This study was conducted for 4 months starting in August - November 2017. The population in this study was obstructive jaundice patients in Dr. Moewardi public hospital Surakarta. The study sample was patients who underwent USG and MRCP examinations in the Radiology department of Dr. Moewardi public hospital Surakarta in January-September 2017. The inclusion criteria for this study are suspected jaundice patients who underwent USG and MRCP examination at Dr. Moewardi public hospital. While the exclusion criteria for this study are patients with obstructive jaundice who only have an ultrasound examination, patients with obstructive jaundice who only have MRCP examination and patients with congenital obstruction jaundice.
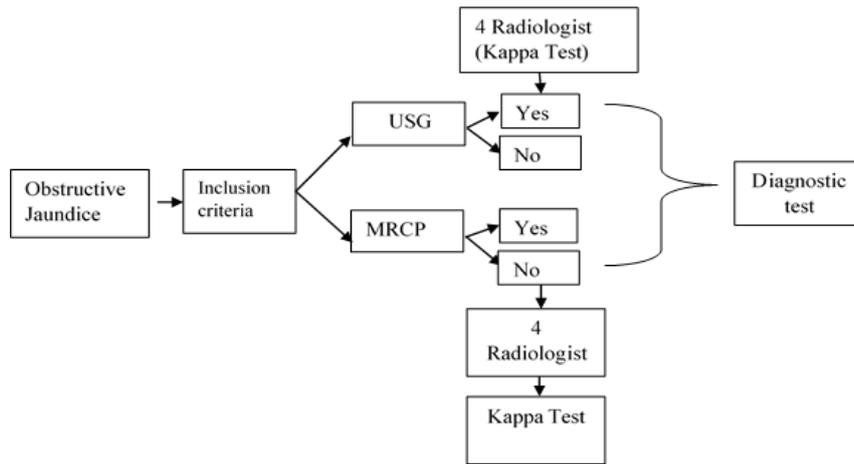
Figure 1 Research flow

The sampling technique in this study is to use purposive sampling, namely the selection of subjects based on certain characteristics or traits related to population characteristics [6]. The results of the reading of the 2-dimensional ultrasound diagnostic tool brand Medison in 2014 were carried out by experienced radiologists of at least 5 years with the number of USG operators 4 people [9]. The results of the MRCP reading were carried out by an experienced radiologist of at least 5 years using an MRI tool. The MRI tool used is the 2015 Siemens 1.5 Tesla brand with 3D Breath Hold technique using Respiratory Gatting placed on the stomach and done by an experienced radiologist of at least 5 years with a total of 4 people. Suitability test between observers was assessed using a kappa test [10]. Data collection was taken from secondary data of medical records of patients with obstructive jaundice at Dr. Moewardi public hospital Surakarta. Patients who met the inclusion criteria were examined by USG and MRCP were taken as research subjects. After the examination, the results of the ultrasound and MRCP were read by 4 radiologists with more than 5 years experience.

The research data obtained will be analyzed descriptively in the form of tables, diagrams, and narratives. To test the suitability between observers Kappa Test was used with the SPSS program rocks. Meanwhile, to find out the sensitivity, specificity, positive predictive value and negative predictive value, a diagnostic test analysis was used.

3. Results

In this study we got a total of 81 respondents, with 4 USG operators using the Medison ultrasound device in 2014. There were some that were outside the limits of our study, so 68 respondents were taken who were in line with the object of the study, including patients with jaundice due to congenital abnormalities and hepatitis, and tumors in the small intestine. With 68 respondents, an examination was conducted using 2 measuring instruments namely USG and MRCP, then grouped into 2 categories of diseases based on USG, including billier duct stones and billier duct tumors. To test the suitability between operators, a kappa test was carried out with the help of SPSS version 23, the following results were obtained

Table 1 Interoperator compatibility test tables

| | | Operator | | | | |
		operator A	operator B	operator C	operator D	**Total**
	USG	19	14	18	17	68
	MRCP	16	17	15	20	68
Total		35	31	33	37	136

Table 2 Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Measure of Agreement	Kappa	,029	,039	,739	,460
N of Valid Cases		136			
a. Not assuming the null hypothesis.					
b. Using the asymptotic standard error assuming the null hypothesis.					

Based on the Kappa test results it was found that the value of p = 0.460> α = 0.05, which means that the results of USG and MRCP readings between operators are the same. This means that in operators A, B, C and D statistically the results are not different.

Table 3 Ultrasonography and MRCP results in detecting biliary tract stones

	Reference Standard MRCP	
	Stone (+)	Stone (-)
USG Stone (+)	21	7
USG Stone (-)	4	36

Tabel 4 Table 2 x 2 Ultrasonography and MRCP results in detecting tumors in the biliary tract

	Reference Standard MRCP	
	Tumor (+)	Tumor (-)
USG Tumor (+)	36	4
USG Tumor (-)	7	21

After 68 samples were obtained that had USG results and MRCP results and fulfilled the inclusion and exclusion criteria, USG diagnostic values were obtained by tabulating data and entered into a 2 x 2 table. From the 2 x 2 table then data were calculated to look for sensitivity, specificity, positive predictive value and negative predictive value.

After calculating the formula, it was found that the USG sensitivity value in finding stones in the 84% billier channel, 83% specificity, 90% positive predictive value and 75% negative predictive value. While the value of USG sensitivity in looking for tumors as a cause of billier obstruction is 83%, specificity 84%, positive predictive value 75% while negative predictive value 90%.

4. Discussion

The results of this study found the most sex in men as many as 40 people (58%). The most characteristic of patients based on age is 41-60 years old age group (57%). From this study, the sensitivity of ultrasound obtained in finding stones in the biliary channel 84%, specificity 83%, positive predictive value 90% and negative predictive value 75%. The sensitivity value of this study is different compared to the results of previous studies. Where research conducted by Karki et al found 100% sensitivity and 89% specificity to detect biliary stone systems. It turned out that the ultrasound in Moewardi Public Hospital was lower in sensitivity when compared to the results of research conducted by Karki *et al*. However, the hypothesis had been proven that the sensitivity of ultrasound above 80% in finding stones in the biliary canal.

From this study the sensitivity of ultrasound was obtained in finding tumors in the biliary tract 83%, specificity 84%, positive predictive value 75% and negative predictive value 90%. The sensitivity value of this study is different compared to the results of previous studies. Where research conducted by Karki et al found a sensitivity of 98.87% and specificity of 83.3% for detecting biliary system tumors. It turns out that the ultrasound in Moewardi Public Hospital is lower in sensitivity when compared to the results of research conducted by Karki *et al*. However, the hypothesis has been proven that the sensitivity of ultrasound above 80% in finding tumors in the biliary tract.

5. Conclusion

In a study of patients with obstructive jaundice performed by USG and MRCP examination, USG sensitivity was found to detect stones in the biliary tract as a cause of jaundice by 84%, specificity by 83%, positive predictive value by 75% and negative predictive value by 90%. While the sensitivity of ultrasound in detecting tumors as a cause of jaundice is 83%, specificity 84%, positive predictive value is 90%, negative predictive value is 75%.

Ultrasound has a sensitive value above 80% in cases of jaundice caused either by stones or tumors but cannot reach 100%. The sensitivity of ultrasound to start obstructive jaundice by biliary stones is higher than obstruction jaundice caused by tumor.

Compliance with ethical standards

Conflict of interest

There is no conflict of interests. The author reports no conflicts of interest in this work. By this statement, all authors who consist of Rahmi Fauziah Rahayu, Luths Maharina, and Yuyun Yueniwati have no conflict of interest regarding this manuscript publication.

Disclosure of conflict of interest

There is no conflict of interests.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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