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EFFECT OF VARIATION IN THE NUMBER OF THICK SLAB ON THE SCAN TIME AND IMAGE INFORMATION ON THE EXAMINATION OF MAGNETIC RESONANCE CHOLANGIOPANCREATOGRAPHY (MRCP)

Ni Putu Rita Jeniyanthi[1,*], Leny Latifah[1], Donny Kristanto Mulyantoro[1],Sudiyono[1], Faisal Amri[1]

[1]Postgraduate Imaging Diagnostic Program, Semarang Health Polytechnic,
Jl. Tirto Agung, Pedalangan, Banyumanik, Kota Semarang, Jawa Tengah, Indonesia (50268).

*Corresponding author's email: puturita24@gmail.com

ABSTRACT

Background: *Thick Slab is a technique used in the MRCP examination to acquire the image of the biliary system by using oblique slices in taking some parts of the image at different angles. Image quality with a thick slab technique is considered better than the thin slice since the image visualization of the bile ducts system in various parts appear more clearly.*
Aims: *The purpose of this study is to determine the effect of variation in the number of thick slab on the scan time and image information on the MRCP and determine the most informative image with the most effective scan time as possible.*
Methods: *This study type was an experimental study conducted in St. Elisabeth hospital Semarang. The data were in the form of 90 MRI images of biliary tract of 3 patients with 5 variations of Thick Slab (6, 12, 18, 24, 30). The image assessment was taken by 5 respondents regarding the information of the objects of Right Hepatic Duct, Left Hepatic Duct, Common Hepatic Duct, Pancreatic Duct, Cystic Duct, Common Bile Duct and Gallbladder. Data analysis was conducted by regression test and cross tabulation.*
Results: *The study results showed that there was an effect of varying the amount of thick slab on the scan time. The effect of varying the amount of thick slab on the image information can be seen from the statistical test that there was no effect, however descriptively there was a different on the specific per object. The image of thick slab variation of 12 was an image that had the highest value of information with the mean value of 1,988, the total value of 13.936 and a scan time of 0.46 S so that the most informative image with the most effective scan time was on the thick slab number variation of 12.*
Conclusion: *There was an effect of variation in the number of thick slab on the scan time. More variation of the number of thick slab was followed by an increase in the value of the scan time. But there was no effect of variation in the number of thick slab on the image information, however descriptively there was a different on the specific per object which showed that the highest score for the Right Hepatic Duct, Common Hepatic Duct were in the thick slab of 12 and 30, respectively*

Keywords: *Thick Slab, Scan Time, MRCP*

INTRODUCTION

The quality of the MRI image is influenced by several factors such as SNR (Signal to Noise Ratio), CNR (Contras To Noise Ratio), spatial resolution and imaging time (scan time) [1]. On the usual abdomen MRI, there was a difficulty to evaluate the gallbladder organ and the ducts in detail and optimal so that there is not much to be assessed from these organs. The use of Ultrasonography modalities still has many limitations encountered in revealing the ducts from the gallbladder because they are hampered by the stomach and duodenum. As a solution for this problem, Magnetic Resonance Cholangiopancreatography examination is used to evaluate the gallbladder and the ducts due to possible presence of stones, tumors and other diseases with multiplanar images obtained by aligning the biliary tree with sensitive sequence MRI to show the flow without the use of contrast media [2].

Abdominal MRI examination such as MRCP is generally more difficult to do because it is a moving organ. Discrepancies or errors in taking the value of the technical parameters used and the lack of knowledge of the radiologist can produce less optimal image quality and inspection, so that the abdominal MRI examination depends on the technique used and knowledge of the radiologist in mastering the examination process and by performing modification of the inspection parameters [3].

The filming of gallbladder is by using series description acquisition technique of Thick slab MRI with SSFSE sequence [4]. The use of improper amount of thick slab on the biliary tract MRI often causes problems in presenting a good image of the biliary and gallbladder systems [5]. Moreover, inappropriate selection the thick slab may cause suboptimal results of the diagnostic information. This happens because there is no definitive benchmark in determining the amount of thick slab that causes technique variability performed by the radiologist. Variations in the amount of thick slab with the same thick slab size on biliary tract MRI used by the radiologist also cause the inconsistent scan time for the same organs in patients with a body mass index that is the same. It can be seen from the experience of researchers during practice in some hospitals in Central Java and East Java, where the radiologist used varied Thick Slab: 7,8,10,11,12,18,22, 24. With the variation of the number of thick slab used, it is not yet known how they affect the scan time, and the results of image information of Right Hepatic Duct, Left Hepatic Duct, Common Hepatic Duct, Cystic Duct, Pancreatic Duct, Common Bile Duct and Gallbladder to be able to diagnose optimally on clinical information is expected to be fulfilled by the most effective scan time as possible.

METHODS

It was a quasi-experimental study to test the effect of variation in the number of thick slab on the scan time and image information on the biliary tract MRI examination as effective as possible. Study Period: In June-July 2012. Study Location: St. Elisabeth Hospital. The independent variable was the change in the number of thick slab. The dependent variables were scan time and image information. The controlled variables were: FOV, TR, TE, Matrix (PE), Fractional Echo, Partial Fourier, NEX. The populations in this study were all MRCP examinations in St. Elisabeth Hospital Semarang in June - July 2012. The sampling technique in this study was accidental sampling technique. The samples consisted of 3 female patients with MRCP examination. The inclusion criteria in this study were adult patients, cooperative, weight 50-55 kg.

Study Instruments using observation guidelines, questionnaires, pen and camera. Tools and Materials for this research are MRI machine of GE Health Care1.5 Tesla, Film size of 34 x 45 cm, Coil Type (Body Coil), Processing, View box, Patient. Data Collecting Method by

Observation, Experiment and questionnaires. The author observed and documented the biliary tract MRI examination in the variation of the thick slab number of 6, 12, 18, 24, 30.Experiment by gave treatment of variation in the number of thick slab with the same size to determine the effect on the scan time and image information.The questionnaires was given to five radiology specialist doctors to provide an assessment of each image based on the variation in the number of thick slab, along with displaying the images of biliary tract MRI examination with thick slab number variation. The parts in the questionnaire to be observed were: Right Hepatic Duct, Left Hepatic Duct, Common Hepatic Duct, Cystic Duct, Pancreatic Duct, Common Bile Duct, and Gallbladder. Respondents were asked to observe and assess each image objectively by giving grades of 1-4.

RESULTS

The study was conducted on three female patients, age between 19-22 years. Total scanning time for T2 Weighting SSFSE sequence on a patient was about 30 minutes. Each patient were given five variations of the number of thick slab i.e. 6, 12, 18, 24, 30, which produced an images equal to the number of thick slab variation, and then six images form the number variation of thick slab of 12-30 considered the best to be able to reveal anatomical information of Right hepatic Duct, Left hepatic Duct, Common hepatic Duct, Pancreatic Duct, Duct fibrosis, Common Bile Duct, Gallbladder were chosen with the aid of a radiologist while the images in the thick slab number variation of 6 were all used so that in total there were 90 images.

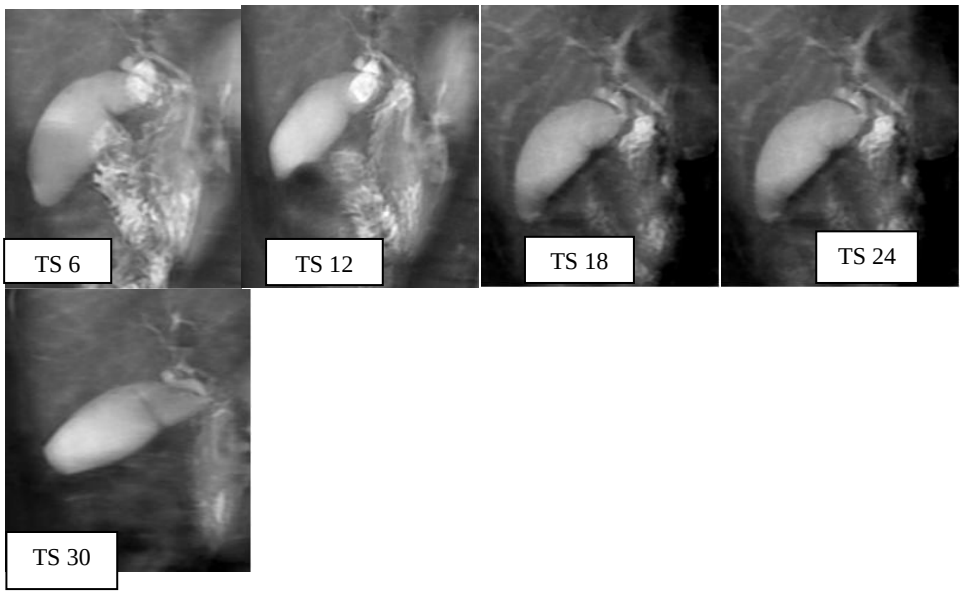

Figure 3.1 The samples of examination image results with the variation of thick slab number of 6, 12, 18,24,30 on the first patient (Source, study data at St. Elisabeth Hospital, 2012)

The effect of the number of thick slab on the scan time showed that an increase in the number of thick slab that was followed by an increase in scan time. The thick slab number of 6, 12, 18, 24, 30 produced scan time of 0.21: 0.46: 1.10: 1:34: 1.59 seconds.

Table 1 Value of regression test results thick slab of the scan time

Variasi Jumlah Thick Slab	R	R Square	P
Scan time	0,983	0,966	0,003

Further SPSS analysis was performed. Regression test result obtained the R value of 0.983 which meant that there was a very strong and significant relationship between variations in the number of thick slab and the scan time since R-value closed to 1, with R-square value of 0.966.

Table 2 Value of regression test results thick slab of the image information

Variasi Jumlah Thick Slab pada Informasi Citra	R	R Square	P
Right Hepatic Duct	0,606	0,368	0,278
Left Hepatic Duct	0,104	0,011	0,868
Common Hepatic Duct	0,476	0,227	0,418
Cystic Duct	0,383	0,147	0,524
Common Bile Duct	0,208	0,043	0,738
Gallbladder	0,286	0,082	0,641

Regression test on the thick slab variations on the anatomical information obtained R Square values of: 36.8%, 1.1%, 22.7%, 14.7%, 4.3%, 8.2%, which meant that object image information of Right Hepatic Duct, Left Hepatic Duct, Common Hepatic Duct, Cystic Duct, Common Bile Duct and gallbladder were affected by the variations of thick slab number in those values.

Table. 3 Variation in the number of thick slab on the scan time and image information.

Variation in the Number of Thick Slab	**Scan Time**	**Mean Value of Image Information**
6	0,21 S	1,79
12	0,46 S	1,98
18	1,10 S	1,83
24	1,34 S	1,84
30	1,59 S	1,92

Based on the results in the descriptive table above, it can be seen that there were differences in the variations of the number of thick slab on the scan time and image information, thick slab variation increase was followed by an increase in the value of scan time. And for the difference in variation thick slab number on image information, the highest mean value was on the thick slab number variation of 12 with the result of 1.98, followed by thick slab number variation of 30, 24, 18 and 6.

DISCUSSION

Regression test results obtained R square value of 0.966 which means that 96.6% of scan time was influenced by the variations of thick slab. The influence of variation thick slab on scan time is in accordance with the reference according to [5], which stated that by using a thick slab the MRI scan time would decrease. The time in performing thick slab during biliary tract MRI examination is an important part because it is determined by the patient's ability to hold his breath for a few seconds. The length of time that patients hold their breath is in accordance with the thick slab number variation. To produce 6 images in the variation of thick slab number of 6, the examiner required a scan time of 21 sec for the patient to hold their breath. In the variation of thick slab number of 12, 18, 24 and 30 the scan time became 46 seconds, 1.10 seconds, 1.34 and 1.59 seconds. So the increase/decrease in scan time was influenced by the variations in the number of

thick slab used and it is very beneficial for patients directly because it affects the time for patients to hold their breath to get optimum image results. It also affects the overall biliary tract MRI examination because if during thick slab part is taken the patient can follow the hold breath cues as instructed by the officer so well and there is no repetition, it makes overall biliary tract MRI examination time becomes shorter.

Descriptive analysis of the results of the mean value of the thick slab number on the image information showed that there were differences in the scores of the variation of thick slab number of 12 and 30, which were two of the thick slab number variations with the best mean value of 1,988 and 1,924, respectively. There was no effect of variation of the number of thick slab on image information due to the absence in the weighting of the objects assessed. It is consistent with the statement of the respondents who were Radiology Specialist doctors that all objects that to be seen in the biliary tract examination were equally important.

After being associated with abnormalities on certain objects that want to be observed with biliary tract MRI examination, not all parts are common disorders, in quantity there are specific objects to be mainly concerned and frequently have abnormalities which should get a specific weighting such as gallbladder for diagnosis of inflammation of the gallbladder (cholecystitis), cholesterolosis, gallbladder hydrops (mucolele), Cholelithiasis [7,8].

Abnormalities in the biliary system are needed to be seen with MRI in the diagnosis of gallbladder with cholelithiasis, acute and chronic cholecystitis and carcinoma of the gallbladder [6]. So if the weighting is given on specific object, it will yield a different assessment score. Moreover, the lack of effect might be due to the dominating subjectivity of the respondents, when reading overall 90 images for each respondent, there was a tendency that the respondents' eyes were tired to give score to the assessment since it was viewed on a computer so that the assessment scores could have a tendency to be similar. Specific to the pancreatic duct object has a similar image information data value that is 1, because of all the ducts that wants to be observed with biliary tract MRI, pancreatic duct is the most small duct, so there is a tendency that this organ is not visible, except when the patient is in ill condition with enlarged pancreatic duct [8].

There was an influence of variation in the number of thick slab on the scan time as can be in descriptive and statistical tests. Descriptively, the effect of variation in number of thick slab on the image information showed that there was a difference from the specific per-object which showed that the highest score for the Right Hepatic Duct and Common Hepatic Duct were in thick slab of 12 and 30, respectively. While the highest score for the Left Hepatic Duct, Cystic Duct, Common Bile Duct were on thick slab of 12, and the highest score for gallbladder was in the thick slab of 30. When it is suspected abnormalities in one particular object observed from the preliminary examination such as ultrasound, the better focus and optimal view of these objects in biliary tract MRI can use the reference of thick slab number variation in accordance with the highest score on each of these objects. Based on the results of a total score of 13.936 and an mean score of 1,988 in the descriptive count of the variation of thick slab number of 12 had an informative and the highest value of image information with a scan time of 0.46 S. Variation in the thick slab number of 12 got the highest score rather than the variation of the highest thick slab number due to in the thick slab of 30 the breath holding time was long of 1 minute 59 seconds, so there was a chance of the patients movement of the organs as the effect of breath holding in long enough time, and also the chance of visceral movement since the duodenum near the biliary system tends to move. Besides, liquid produced from the gallbladder itself can move with an increased scan time because of the possibility of gallbladder to be distressed by the body coil during the examination.

CONCLUSION

There was an effect of variation in the number of thick slab on the scan time. More variation of the number of thick slab was followed by an increase in the value of the scan time. But there was no effect of variation in the number of thick slab on the image information, however descriptively there was a different on the specific per object which showed that the highest score for the Right Hepatic Duct, Common Hepatic Duct were in the thick slab of 12 and 30, respectively. Furthermore, the highest scores for the Left Hepatic Duct, Cystic Duct, Common Bile Duct were in the thick slab of 12, images with the variation in the number of thick slab 12 was an image that had the highest information value, it was indicated by the mean value of 1,988, the total value of 13.936 and a scan time of 0.46 S, so that the image which was the most informative with the most effective scan time might be on the thick slab number variation of 12.

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