Endoscopic Ultrasonography (EUS) Compared with Magnetic Resonance Cholangiopancreatography (MRCP) in Diagnosing Patients with Malignancy Causing Obstructive Jaundice

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ABSTRACT

Background: The common etiologies of obstructive jaundice were biliary stone and biliary neoplasms. The gold standard to diagnose malignancy causing obstructive jaundice is endoscopic retrograde cholangiopancreatography (ERCP) with sensitivity and specificity of >95% and 100%. However, ERCP is an invasive procedure associated with several complications such as bleeding, pancreatitis, and perforation. Other modalities include endoscopic ultrasonography (EUS) and magnetic resonance cholangiopancreatography (MRCP). Thus, we aim to evaluate the sensitivity and specificity of EUS with MRCP in patients with malignancy causing obstructive jaundice.

Method: This was a cross-sectional study that calculates the sensitivity and specificity of EUS and MRCP in diagnosing malignancy causing obstructive jaundice compared with the gold standard, histopathology examination from ERCP. The study was conducted in the Medical Record Unit, Gastroenterology Division, Dr. Cipto Mangunkusumo National General Hospital, on January – March 2019 by using a consecutive sampling method. The date of diagnosis was collected from the medical record within five years. Subjects were selected based on inclusion criteria which include patients aged ≥ 18 years old who were diagnosed with malignancy causing obstructive jaundice by ERCP, and had underwent EUS or MRCP with a maximum interval of 3 months to ERCP. The exclusion criteria include patients with previous evidence of biliary tract malignancy or concurrent parenchymal jaundice. Statistical analysis was performed using IBM SPSS Statistics 20.

Results: There were 54 subjects with a mean age of 56.48 ± 11.37 years. Subjects consisted of 29 (53.7%) males and 25 (46.3%) females. The median period between EUS to ERCP was 0-33 days, while MRCP to ERCP was 1-53 days. The sensitivity, specificity, positive predictive value, and negative predictive value to diagnose obstructive jaundice due to malignancy were 96%, 60%, 96%, 60% in EUS, and 90%, 40%, 94%, 29% in MRCP, respectively.

Conclusion: EUS was more superior to MRCP in the diagnosis of malignancy causing obstructive jaundice.

Keywords: endoscopic ultrasonography (EUS), malignancy, magnetic resonance cholangiopancreatography (MRCP), obstructive jaundice
ABSTRAK

Latar belakang: Etiologi paling sering dari ikterus obstruktif adalah batu empedu dan neoplasma bilier. Pemeriksaan baku emas untuk mendiagnosis keganasan yang menyebabkan ikterus obstruktif adalah endoscopic retrograde cholangiopancreatography (ERCP), dengan sensitivitas dan spesifisitas >95% dan 100%. Namun, ERCP merupakan prosedur invasif yang sering dikaitkan dengan beberapa komplikasi seperti perdarahan, pankreatitis, dan perforasi. Oleh karena itu, studi ini bertujuan untuk mengevaluasi sensitivitas dan spesifisitas endoscopic ultrasonography (EUS) dibandingkan dengan magnetic resonance cholangiopancreatography (MRCP) pada pasien dengan keganasan yang menyebabkan ikterus obstruktif.

Metode: Penelitian ini merupakan studi potong lintang yang menghitung sensitivitas dan spesifisitas modalitas diagnosis EUS dan MRCP pada pasien dengan keganasan yang menyebabkan ikterus obstruktif dibandingkan dengan modalitas diagnosis standar, yaitu pemeriksaan histopatologi dari ERCP. Penelitian dilakukan di Unit Rekam Medis, Bagian Gastroenterologi RSUD Dr. Cipto Mangunkusumo pada bulan Januari - Maret 2019 dengan metode pengambilan sampel konsekutif. Data diagnosis dikumpulkan dari rekam medis periode 2014-2019. Subyek dipilih berdasarkan kriteria inklusi yaitu pasien berusia ≥ 18 tahun yang terdiagnosis dengan keganasan yang menyebabkan ikterus obstruktif melalui ERCP, dan telah menjalani EUS atau MRCP dengan interval maksimum 3 bulan dengan ERCP. Kriteria eksklusi meliputi pasien yang telah terbukti memiliki keganasan sistem bilier sebelumnya, atau pasien dengan ikterus parenkimal selain obstruktif. Analisis statistik dilakukan dengan menggunakan IBM SPSS Statistics 20.

Hasil: Didapatkan 54 subyek dengan usia rata-rata 56,48 ± 11,37 tahun. Subyek terdiri dari 29 (53,7%) laki-laki dan 25 (46,3%) perempuan. Periode median antara EUS hingga ERCP adalah 0-33 hari, sedangkan MRCP ke ERCP adalah 1-53 hari. Sensitivitas, spesifisitas, nilai prediksi positif, dan nilai prediksi negatif untuk mendiagnosis ikterus obstruktif akibat keganasan adalah 96%, 60%, 96%, dan 60% pada EUS, dan 90%, 40%, 94%, dan 29% pada MRCP.

Simpulan: EUS lebih unggul dari MRCP dalam mendiagnosis keganasan yang menyebabkan ikterus obstruktif.

Kata kunci: endoscopic ultrasonography (EUS), ikterus obstruktif, keganasan, magnetic resonance cholangiopancreatography (MRCP)

INTRODUCTION

Obstructive jaundice is an obstruction of the biliary tract causing bilirubin accumulation within blood and bilirubin deposition within the skin.1 The common etiologies of obstructive jaundice were biliary stone and biliary neoplasms. In the USA, in 2017, 1 million new biliary stone cases were diagnosed every year, and the incidence of biliary obstruction was 1 case per 100,000.2,3 In the UK, there were 2.8 cases per 100,000 females and 2 cases per 100,000 males.2,3 Data in Indonesia in 2007 reported that among patients who underwent endoscopic retrograde cholangiopancreatography (ERCP), the prevalence of biliary stone was the highest (54%), followed by the tumour of ampulla of vater (17%), the tumour of the head of the pancreas (13%), biliary tract stricture (5%), cholangiocarcinoma (2%), Klatskin tumor (2%), and other etiologies (7%).4

Abdominal ultrasonography as the initial diagnostic modality is more convenient and cost-effective compared with other modalities.5 The gold standard for diagnosing obstructive jaundice is ERCP with sensitivity and specificity of > 95% and 100% to diagnose biliary tract malignancy.6 However, ERCP is an invasive procedure associated with several complications such as bleeding, pancreatitis, and perforation.6,7 Other available modalities are magnetic resonance cholangiopancreatography (MRCP) and endoscopic ultrasonography (EUS). MRCP is a non-invasive procedure, while EUS is an invasive procedure that is operator-dependent.6,8 ERCP procedure may be conducted simultaneously at the same time with the EUS allowing earlier diagnosis and management.6,8 Makmun et al. stated that the sensitivity (97% vs. 57%) and specificity (81% vs. 40%) of EUS were better than MRCP to diagnose choledocholithiasis in Indonesia.8 However, consensus on sensitivity and specificity of EUS compared with MRCP to diagnose biliary tract malignancy has not been declared. Based on a meta-analysis by Garrow et al which analyzed 36 studies involving 3,532 patients, the sensitivity and specificity of EUS to diagnose choledocholithiasis were higher (sensitivity 89%, specificity 94%) than for the diagnosis of malignancy (sensitivity 78%, specificity 84%).9 However, Garrow et al’s study did not address
a comparison between EUS and MRCP to diagnose obstructive jaundice caused by malignancy. Until now, in Indonesia, studies about sensitivity and specificity of EUS compared with MRCP to diagnose biliary tract malignancy and pancreas have not been published. Therefore, we conducted this study to evaluate the sensitivity and specificity of EUS compared with MRCP in patients with obstructive jaundice due to malignancy.

METHOD

This study was a cross-sectional analytic observational study. The study calculated the sensitivity and specificity of EUS and MRCP in obstructive jaundice due to malignancy compared with the gold standard (histopathological examination from ERCP). We conducted the study in the Medical Record Unit, Gastroenterology Division, Dr. Cipto Mangunkusumo National General Hospital, on January – March 2019 by using a consecutive sampling method. Diagnostic data were collected from the medical record within five years.

Inclusion criteria included males and females aged ≥ 18 years with a diagnosis of obstructive jaundice due to malignancy (not biliary stone) based on history taking, physical examination, and supporting tests in the period of 2014 – 2018, patients with MRCP or EUS data at the initial diagnosis before undergoing ERCP and biopsy, patients with confirmed malignancy based on ERCP or ERCP with biopsies, and a period of maximum three months between MRCP or EUS to ERCP. Exclusion criteria included patients with confirmed primary malignancy with suspicion of metastasis to the biliary tract or biliary system, evidence of parenchymal jaundice occurring concurrently with obstructive jaundice, and previous evidence of biliary tract malignancy.

There were 54 subjects included in this study. Secondary data was collected in Medical Record Unit dr. Cipto Mangunkusumo National General Hospital. The first patients who satisfy the criteria were included as subjects of this study using a consecutive sampling method. The secondary data included the EUS or MRCP results, ERCP with the histopathological examination findings, and confounding factors.

Statistical analysis was performed using IBM SPSS Statistics 20. Sensitivity, specificity, positive predictive value, negative predictive value, and likelihood ratio will be described. Ethical clearance was licensed by the Ethical Committee of the Faculty of Medicine Universitas Indonesia.

RESULTS

There were 54 subjects analyzed within this study. Subjects consisted of 29 (53.7%) males and 25 (46.3%) females with mean age of 56.48 ± 11.37 years. The median period between EUS and ERCP was 0 (0-33) days, while the median period between MRCP and ERCP was 11 (1-53) days. The characteristics of subjects were demonstrated in Table 1.

Table 1. Demographic characteristic of the subjects

| Patients characteristics | n = 54 |
|--------------------------|-------|
| Gender, n (%)            |       |
| Male                     | 29 (53.7) |
| Female                   | 25 (46.3) |
| Mean Age ± SD (years)    | 56.48 ± 11.37 |
| Ethnic, n (%)            |       |
| Acehnese                 | 1 (1.9) |
| Batakinese               | 4 (7.4) |
| Betawinese               | 3 (5.6) |
| Jambinese                | 2 (3.7) |
| Javanese                 | 27 (50) |
| Lampungnese              | 1 (1.9) |
| Makassarnese             | 1 (1.9) |
| Manadoenese              | 1 (1.9) |
| Padangnese               | 3 (5.6) |
| Palembangnese            | 1 (1.9) |
| Sudanese                 | 6 (11.1) |
| Tionghoa                 | 4 (7.4) |
| Education, n (%)         |       |
| Elementary/junior high school | 12 (22.3) |
| Senior/ vocational high school | 19 (35.2) |
| Bachelor                 | 23 (42.5) |
| Occupation, n (%)        |       |
| Unemployed/housewife     | 32 (59.3) |
| Entrepreneur             | 7 (13.0) |
| Private employee         | 12 (22.2) |
| Government employee      | 3 (5.5) |
| Family history of malignancy, n (%) |       |
| Positive                 | 14 (25.9) |
| Negative                 | 40 (74.1) |
| Smoking history, n (%)   |       |
| Positive                 | 22 (40.7) |
| Negative                 | 32 (59.3) |
| Alcohol consumption, n (%) |       |
| Positive                 | 7 (13.0) |
| Negative                 | 47 (87.0) |
| VAS of initial abdominal pain | 3 (0-7) |
| Nausea/vomiting, n (%)   |       |
| Positive                 | 44 (81.5) |
| Negative                 | 10 (18.5) |
| Body mass index (kg/m²), n (%) |       |
| Underweight              | 15 (27.7) |
| Normoweight              | 34 (63.0) |
| Overweight               | 5 (9.3) |
| Median decrease of body weight within the past three months (kg) (range) | 5 (0-15) |
| Bilirubin level (mg/dL)  |       |
| Total                    | 11.25 (1.8-39.2) |
| Direct                   | 9.35 (1.4-30.8) |
| Hepatitis B infection, n (%) |       |
| Positive                 | 3 (5.6) |
| Negative                 | 51 (94.4) |
| Hepatitis C infection, n (%) |       |
| Positive                 | 2 (3.7) |
| Negative                 | 52 (96.3) |
| Diabetes mellitus, n (%) |       |
| Positive                 | 10 (18.5) |
| Negative                 | 44 (81.5) |
| Median Period until ERCP (days) (range) |       |
| Endoscopic ultrasound (EUS) |       |
| Magnetic resonance       | 0 (0-33) |
| cholangiopancreatography (MRCP) | 11 (1-53) |
All subjects underwent EUS and MRCP examination. Among 54 subjects who underwent EUS, 49 (90.7%) subjects were diagnosed with pancreaticobiliary malignancy. On MRCP, there were 47 (87%) subjects with malignancy. Based on ERCP examination (gold standard), there were 49 subjects (98%) diagnosed with malignancy, and 48 of them were in the advanced stage (unresectable).

Based on ERCP examination, the type of malignancy commonly found was a tumor of the head of the pancreas (50%). Similar findings were also observed in EUS and MRCP examination. The findings of specific malignancies (tumor of ampulla of vater, the tumor of the head of the pancreas, cholangiocarcinoma, other malignancies, and non-malignancy) for each modality were shown in Table 2.

Table 2. Endoscopic ultrasound (EUS) (n = 54), magnetic resonance cholangiopancreatography (MRCP) (n = 54), and endoscopic retrograde cholangiopancreatography (ERCP) (n = 54) findings among patients with obstructive jaundice

| Findings                     | EUS n (%) | MRCP n (%) | ERCP n (%) |
|------------------------------|-----------|------------|------------|
| Tumor of ampulla of vater    | 12 (22.2) | 8 (14.8)   | 6 (11.1)   |
| Tumor of head of pancreas    | 21 (38.9) | 24 (44.4)  | 27 (50.0)  |
| Cholangiocarcinoma           | 12 (22.2) | 7 (13.0)   | 12 (22.2)  |
| Other malignancies           | 4 (7.4)   | 8 (14.8)   | 4 (7.4)    |
| Non-malignancy               | 5 (9.3)   | 7 (13.0)   | 5 (9.3)    |

Each of the EUS and MRCP findings was compared with ERCP (gold standard) to confirm the specificity of EUS and MRCP for diagnosis of malignancy. For EUS examination, there were 43/49 (87.7%) subjects with malignancy diagnosis, which were confirmed by ERCP. However, for MRCP, there were only 39/49 (79.6%) subjects with malignancy diagnosis from which the type of malignancy was verified by ERCP. The proportion of the type of malignancy was shown in detail in Table 3.

Table 3. Types of pancreaticobiliary malignancy diagnosed with endoscopic ultrasound (EUS) (n = 43) and magnetic resonance cholangiopancreatography (MRCP) (n = 39) after confirmation with endoscopic retrograde cholangiopancreatography (ERCP)

| Type of malignancies       | EUS, n (%) | MRCP, n (%) |
|----------------------------|------------|-------------|
| Tumor of ampulla of vater  | 6 (14.0)   | 5 (12.8)    |
| Tumor of the pancreatic head | 21 (48.8) | 23 (59.0)   |
| Cholangiocarcinoma         | 12 (27.9)  | 7 (17.9)    |
| Other malignancies         | 4 (9.5)    | 4 (10.3)    |

Based on histopathology examination, there were 26/54 (48%) subjects with adenocarcinoma, 14/54 (26%) with atypical or inconclusive results, and 14/54 (26%) with negative results.

EUS had higher sensitivity, specificity, positive predictive value, negative predictive value, and positive likelihood ratio than MRCP to diagnose obstructive jaundice due to malignancy. The negative likelihood ratio of EUS was lower than MRCP. The diagnostic value for each modality was shown in Table 4 and Table 5.

Table 4. Endoscopic ultrasound (EUS) and magnetic resonance cholangiopancreatography (MRCP) results compared with endoscopic retrograde cholangiopancreatography (ERCP) results on obstructive jaundice cases due to malignancy

| Diagnostic Method          | ERCP (gold standard) | Non-malignancy | Total |
|----------------------------|----------------------|---------------|-------|
| EUS                        | Malignancy           | Non-malignancy| 49    |
| Tumor of ampulla of vater  | 47 (22.2)            | 2 (1.0)       | 49    |
| Tumor of head of pancreas  | 2 (4.1)              | 3 (5.1)       | 5     |
| Cholangiocarcinoma         | 14 (27.8)            | 3 (5.1)       | 17    |
| Other malignancies         | 12 (24.5)            | 2 (3.5)       | 14    |
| Non-malignancy             | 5 (10.2)             | 2 (3.5)       | 7     |

The sensitivity, specificity, positive predictive value, and negative predictive value to diagnose obstructive jaundice due to malignancy were 96%, 60%, 60% in EUS, and 90%, 40%, 94%, 29% in MRCP, respectively. The positive likelihood ratio and negative likelihood ratio were 2.40 and 0.07 in EUS, while in MRCP were 0.07 and 0.26, respectively.

Receiver operating characteristic (ROC) analysis was also performed. Area under the curve (AUC) for EUS was 78% (95% CI: 51-100%; p = 0.041) while AUC for MRCP was 64.9% (95% CI: 36.2-93.6%; p = 0.276).

DISCUSSION

Most of the patients in this study were male (53.7%), with a mean age of 56.48 ± 11.37 years. This result was coherent with the study by Mohamadnejad et al in which male patients were more prevalent than female patients.10 Goyani et al. also reported that most of the patients in the study were in the age range from 51 – 60 years (23.3%).11 Besides, a study in Indonesia by Makmun et al also reported similar demographic characteristics among patients with obstructive jaundice. The ratio between male and female patients was 3:2, with a mean age of 52.9 ± 13.31 years.8

In this study, abdominal pain was reported in 87.04% of patients, and nausea/vomiting in 81.5%. A similar finding was also reported by Goyani et al. in which abdominal pain was the second most common symptom (86.6%).11
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There were 40/54 (74.1%) subjects without a family history of malignancy. This result was coherent with the pooled result of 12 retrospective studies (2,246 cases) by Dyke et al, which reported no association between family history and risk of biliary tract malignancy.12

The median of total and direct bilirubin of subjects in this study were 11.25 (1.8-39.2) mg/dL and 9.35 (1.4-30.8) mg/dL, respectively. This value was higher than the study by Palmucci et al in Italy, in which the mean of total bilirubin was 6.85 mg/dL, and direct bilirubin was 4.12 mg/dL. The difference could be caused by the difference of characteristics of patients in Italy and Indonesia; and the lower total subjects (45 subjects) in those studies.13

Based on logistic regression analysis, Jin et al. reported that bilirubin level, particularly direct bilirubin, was one of the primary predictors for malignancy of the head of the pancreas (p < 0.001) besides age and abdominal pain.14 Garcea et al reported that a bilirubin level of 100 μmol/L had a sensitivity of 71.9%, a specificity of 86.9%, and a positive predictive value of 5.5% to diagnose malignancy. Specificity is increased at higher bilirubin level.15

This study showed that EUS was superior to diagnose malignancy causing obstructive jaundice than MRCP with better sensitivity, specificity, positive predictive value, and negative predictive value.

The specificity of both diagnostic modalities of EUS and MRCP were lower than the sensitivity of both modalities. These results could be caused by the high number of true negative and false positive for both diagnostic modalities depending on operator ability. A study by Schembre et al, Cho et al, and Lennon AM et al. reported that operator ability and the specificities of both diagnostic modalities could influence the effectiveness of EUS.16-18 ASGE also recommended that endoscopic operator underwent 190 supervised EUS procedure (including 75 cases of pancreaticobiliary and 75 mucosal cancer staging).19

In this study, the specificity of EUS was better because the capacity of EUS to diagnose lymph node metastasis due to malignancy was better than MRCP. A meta-analysis by Garrow et al which consisted of 36 studies involving 3,532 patients, reported that the sensitivity and specificity of EUS to diagnose malignancy were 78% and 84%.9 Singh et al also reported coherent results in which the specificity of EUS was better compared with MRCP (95% vs. 89%).20 The study by Canto et al reported a similar result with this study, in which EUS was better than MRCP to diagnose pancreatic neoplasms (42.6% vs. 33.3%).21 Jiwani et al reported that MRCP had a sensitivity of 95.35%, a specificity of 94.74%, a positive predictive value of 93.18%, and a negative predictive value of 94.43%. The difference between the study by Jiwani et al and our current study could be caused by the difference in the gold standard modality. Jiwani et al. also used histopathology examination from surgical specimens, while our present study only used ERCP as the gold standard.22

The diagnostic value of EUS and MRCP for obstructive jaundice due to malignancy was different with choledocholithiasis. Based on Makmun D et al, the sensitivity of MRCP (90% vs. 81%) was better for diagnosis of malignancy than choledocholithiasis. Besides, the positive predictive value of EUS: (96% vs. 87%) and MRCP (94% vs. 68%); and negative predictive value of EUS: (60% vs. 88%) and MRCP (29% vs. 74%) was better in malignancy compared with choledocholithiasis.8 The sensitivity and positive predictive value of both modalities were not significantly different from Materne et al. However, specificity (EUS: 88%; MRCP: 94%) and negative predictive value (EUS: 94%; MRCP: 84%) between the two studies were far higher.24 These results show that the ability of the operator was important for diagnostic accuracy with both modalities. Besides, the specification of modalities used in this study was similar to the study by Makmun D et al and Materne et al which used EUS with radial probe and frequency of 7.5 MHz and MRCP 1.5 Tesla.8,24

This study showed that the most common etiology of obstructive jaundice was pancreatic head cancer (55.1%). The result was similar to the study by Jiwani et al. in which the most common malignancy discovered was pancreatic head cancer (26.79%).22 However, other studies by Goyani et al and Suthar et al found that the most common type of cancer was cholangiocarcinoma, with a proportion of 20% and 62%, respectively.11,25 Singh et al reported that periampullary carcinoma was the most common malignancy pathology causing obstructive jaundice.26 This discrepancy might be caused by the different number of subjects enrolled in both of those studies. Another study by Makmun et al from Indonesia discovered that cancer of the head of the pancreas was the most common type of cancer (54.2%) found in patients undergoing EUS-BD, followed by the periampullary tumor (41.6%) and cholangiocarcinoma (4.2%).27

A meta-analysis by Maisonneuve et al reported that a history of smoking, diabetes mellitus, and a family history of malignancy were moderate risk...
factors for pancreatic cancer (RR = 1.5-1.9). This was different from our study results, which showed that 59.3% of patients were non-smokers, 81.5% did not have a history of diabetes mellitus, and 74.1% did not have a family history of pancreaticobiliary cancer. This difference might be caused by the different demographics and characteristics of our patients.

EUS was generally more accurate in diagnosing specific types of malignancy compared with MRCP. The accuracy of EUS compared with ERCP in diagnosing cholangiocarcinoma was 100%. However, MRCP only detected 7/12 (58.3%) cases of cholangiocarcinoma. Concerning cholangiocarcinoma, a study by Mohamadnejad et al. found that the accuracy of EUS in the diagnosis of cholangiocarcinoma was 94%, much higher than the accuracy of MRCP, which was only 42%. Another study by Eloubeidi et al. found that the sensitivity and specificity of EUS were 86% and 100%, respectively, with an accuracy of 88%. A study by Zidi et al. showed that the accuracy of MRCP in the diagnosis of hilar cholangiocarcinoma was 78%. Our study did not specify the type of cholangiocarcinoma (intraductal, hilar, or extra ductal) and thus could affect the accuracy of EUS in our research.

A study by Artifon et al. reported that EUS was more sensitive and specific than a CT scan in the staging of the tumor (T) and node (N). The accuracy of tumor staging by EUS was in the range of 62-90%, with the best sensitivity found in the N0 tumor (88%) and the best specificity in the T3 tumor (87%). Another study by Domagk et al. reported that the accuracy of MRCP in classifying benign and malignant lesion was only 58%, much less than the accuracy of ERCP, which had an accuracy of 76%.

The accuracy of EUS in the diagnosis of the pancreatic head tumor was less than MRCP (77.7% vs. 85.2%). This result was similar to the study by Hwang et al., which showed that the area under the curve (AUC) of MRCP was higher than EUS (71.2% vs. 68.8%), respectively. The diagnostic value of EUS for detecting pancreatic tumors could be improved by including a fine-needle aspiration (FNA) procedure. A meta-analysis by Puli et al., which evaluated 41 studies (4,766 patients), found that the sensitivity and specificity of EUS-FNA to diagnose the etiology of solid pancreatic mass were 86.8% and 95.8%, respectively, with a positive predictive value of 15.2 and a negative predictive value of 0.17.

The time interval between EUS and MRCP with the ERCP procedure might affect the results of the diagnostic performance of EUS and MRCP in this study. In our study, the median interval between EUS and ERCP was 0 (0-33), much shorter than the median interval between MRCP and ERCP, which was 11 days (1-53 days). Materne et al. also showed that a long interval between EUS or MRCP and the final diagnosis might influence the diagnostic accuracy.

Stadium of Cancer

Our study showed that 98% of subjects (48/49) presented with a late-stage and unresectable tumor. Most of the patients in this study were referred from various primary and secondary health facilities in Indonesia. The lack of diagnostic modality in primary and secondary health facilities led to late diagnosis and referral. Besides, most of the patients in this study had a low to moderate education level, which was associated with late presentation to healthcare facilities.

EUS and MRCP have an essential role in the staging of biliary malignancies. The 2016 ESMO Guideline stated that EUS was very helpful in N-staging (especially when combined with FNA/biopsy) and could also obtain information about blood vessel involvement. On the other hand, MRCP was useful for T-staging and the detection of biliary duct involvement.

A study by Artifon et al. showed that EUS was more sensitive and specific than a CT scan for the staging of the tumor (T) and node (N). The sensitivity of EUS for T-staging (75-85%) was comparable with the sensitivity for N-staging (70-88%). However, the specificity of T-staging (70-88%) was higher than the specificity for N-staging (64-87%). Shoup et al. stated that the accuracy of EUS in diagnosing tumor was superior to CT scan in both tumor size of < 2 cm and ≥ 2 cm (90% vs. 70% and 100% vs. 87.5%, respectively).

A meta-analysis by Nawaz et al. from 29 studies (1,330 patients) showed that the sensitivity and specificity of EUS for N-staging were 69% and 81%, respectively. Another meta-analysis by Li et al. showed similar results, in which EUS had a sensitivity of 62%, a specificity of 74%, and an AUC of 0.79 for N-staging. However, the accuracy increased to 88% when it was combined with FNA/biopsy. Therefore, EUS and MRCP could be the alternative modalities for staging biliary malignancy.

Several considerations determine the diagnostic modality for obstructive jaundice, including safety, accuracy, time, and cost-effectiveness of each diagnostic modality. A review from Gornals et al. stated that EUS was relatively safer and more comfortable for patients. Besides, EUS was more accurate in detecting
small tumors or lesions (especially pancreatic tumors), which allowed locoregional staging of the neoplastic lesion. EUS was also a time-saving and cost-effective procedure since tissue can also be obtained during EUS (by FNA or biopsy). EUS could also reduce the requirement for sedation. However, EUS is still an invasive procedure that depended highly on the operator’s skills and the devices’ quality.

MRCP could give a better visualization and 3D projection of the biliary tracts without contrast injection, which reduces the risk of cholangitis. MRCP could also accurately determine the obstruction and tumor extension level, including blood vessel involvement in all types of biliary malignancies. However, MRCP requires a relatively long time to complete, expensive, and can not be done at the same time with ERCP.

Both EUS and MRCP have difficulty detecting distant metastasis and distal lesion (such as in cholangiocarcinoma). Proximal lesions are more difficult to reach because the proximal perihilar biliary duct’s location is far from the duodenal and stomach lumen.

Potential limitations of this study stemmed from the fact that EUS interpretation was very dependent on the operator’s skills, which could result in false negative results. However, even with that potential bias, the result of this study did show that EUS had higher diagnostic accuracy than MRCP. Besides, in this study, EUS was performed by expert gastroenterologists with extensive experience. Most patients in this study also had advanced stage cancers. Further studies might be needed to determine the accuracy of EUS and MRCP in detecting early-stage cancer. The advantage of our study is that it is the first study comparing EUS and MRCP for the diagnosis of malignant obstructive jaundice in Indonesia. EUS is still a relatively new modality in Indonesia, and our study showed that it has a high diagnostic accuracy for the patient population.

CONCLUSION

EUS was more superior to MRCP in the diagnosis of biliary malignancy causing obstructive jaundice. The sensitivity, specificity, positive predictive value, and negative predictive value of EUS were better than MRCP.

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