Original Research Article

A prospective study of parameters predicting biliary communication after percutaneous catheter drainage

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Abstract

Introduction: Percutaneous biliary drainage (PBD) is performed in patients with malignant biliary obstruction (MBO) to address clinical problems resulting from the obstruction. PBD may be performed to relieve cholangitis or pruritus or to lower serum bilirubin to allow the administration of chemotherapy. Severe pruritus can be debilitating and rapid relief after biliary decompression has been reported. Other clinical benefits remain unproven.

Aim and objective: Identify the CT imaging appearances of emergent biliary pathologic conditions Discuss clinical scenarios that may lead to the development of biliary disease.

Materials and methods: Demographic, clinical, laboratory and imaging parameters within 24 hours of admission in 88 consecutive patients (age 45 ± 13 y, 83 male) with ALA (diagnosed by positive serology and suggestive imaging) referred to interventional radiology unit of Madras Medical College from November 2016 to July 2017 were prospectively recorded. PCD was done with one or more appropriate-sized catheters (10 to 14 French, Malecot, or Pigtail). BC was defined as the appearance of bile in the drainage bag any time following catheter insertion. Data of patients with or without the development of BC following drainage were compared using Mann-Whitney U-test and Chi-squared tests.

Results: BC developed in 26 (30%) patients. Patients with BC had prolonged drainage than those without (median 22 d [range, [4 to 120] vs. 7 [3 to 46]; p <0.001), higher AST (65 u/L [33 to 556] vs. 45 [15 to 468]; p 0.002), ALT (64 u/L [16 to 925] vs. 45.5 [12 to 299]; p 0.012), ALP (490 u/L [143 to 1367] vs. 219.5 [59 to 1127]; p 0.002) and clinical Jaundice (43% vs. 17%, p 0.035) on univariate analysis. Of these prolonged drainage and clinical jaundice were significant predictors on multivariate analysis. Patients with prolonged drainage had larger abscess sizes than those without (p <0.001) and larger volume (p <0.001) on univariate analysis.

Conclusion: 30% of patients with ALA develop BC. Prolonged drainage and clinical jaundice are predictors of its presence. The findings of this study might form the basis of discussion during informed consent for PBD. Additional studies are necessary to further delineate parameters for optimal patient selection and to determine the value of PBD relative to other strategies for management MBO.

Key words

Liver abscess, Catheter drainage, Biliary communication, Outcome.

Introduction

An amebic liver abscess (ALA) results from hepatocyte necrosis by amoeba [1]. Percutaneous catheter drainage (PCD) is widely accepted as the treatment of choice for ALA, because of its minimal invasiveness and high cure rate [1]. ALA is reportedly associated with a 27% prevalence of biliary communication (BC). BC may prolong an abscess healing due to external biliary fistula after percutaneous drainage and if so, require interventional treatment (papillotomy and/or endoscopic biliary stent) [2]. However, only a few studies have focused on predictors of BC in patients with ALA. Common bile duct (CBD) stones are found in 11–21% of patients with gallstones and cause various clinical symptoms, such as biliary colic, cholangitis, acute pancreatitis, obstructive jaundice, and biliary sepsis [3]. As a primary treatment of CBD stones, stone removal using endoscopic retrograde cholangiopancreatography (ERCP) has been favored since its inception in 1974 and is known to have a success rate of up to 97%. However, endoscopic stone removal is difficult to access and likely to fail in cases of large stones, intrahepatic duct stone, biliary stricture, periampullary diverticulum, and a history of gastrointestinal bypass surgery [4]. In these patients, initial treatment by percutaneous transhepatic biliary stone removal is known to be safe and effective. However, in the case of percutaneous CBD stone removal, the treatment period is longer than endoscopic treatment because percutaneous transhepatic biliary drainage (PTBD) is generally performed and the drainage tube is removed after several stones removal procedures [5]. PTBD duration is a critical factor that determines the duration of treatment and is an important factor that can have a significant influence on the quality of life of patients as well as on hospitalization and cost. If PTBD drainage duration can be predicted, it can be used to calculate treatment duration when starting treatment [6]. Moreover, it can help with providing better information to the patients. However, to the best of our knowledge and considering the literature to date, no study has analyzed or described factors affecting the drainage period in the percutaneous treatment of CBD stones.

Materials and methods

Demographic, clinical, laboratory, and imaging parameters within 24 hours of admission in 88 consecutive patients (age 45 $\pm$ 13 year, 83 male) with ALA (diagnosed by positive serology and suggestive imaging) referred to the interventional radiology unit of Madras Medical college from November 2016 to July 2017 were prospectively recorded. PCD was done with one or more appropriate-sized catheters (10 to 14 French, Malecot, or Pigtail). BC was defined as the appearance of bile in the drainage bag any time following catheter insertion. The diagnosis was further confirmed by aspiration of pus and its microbiological investigations. Various clinical, laboratory, and radiological parameters were recorded in these patients.

Clinical data: Clinical parameters including age, sex, symptoms, signs, history of diabetes, hypertension, and alcohol intake were noted.

Laboratory data: The following tests were carried out within 24-hours of admission: total and differential leukocyte counts, hemoglobin, erythrocyte sedimentation rate (ESR), serum

protein (total and albumin), serum bilirubin (total and direct), aspartate aminotransferase (AST), alanine aminotransferase (ALT), alkaline phosphatase (ALP), prothrombin time and activated partial thromboplastin time.

Ultrasonographic findings: All patients were subjected to ultrasonographic examination. Abscess size, volume, location (lobe and segment), number, free fluid, and/or loculated collections in the abdomen were recorded.

Indication for catheter drainage: Indication for performing catheter drainage included: non–response to medical therapy, imminent or occurrence of rupture. Non-response to medical therapy was considered to be present when fever, toxemia, pain and local signs persisted despite antiamebic therapy for at least one week. If the thickness of the rim of the liver between the abscess cavity and liver surface was less than one cm on ultrasonography, imminent rupture of the abscess was considered.

Catheter drainage: Informed consent was taken from all the patients. Catheter drainage of the liver abscess was performed using standard techniques described previously [10, 11]. Under ultrasound guidance, the appropriately sized catheter (10 to 14F, Malecot or Pigtail) was inserted into the abscess cavity. When multiple abscesses and associated abdominal or pelvic collection were present, each was drained separately. Broad-spectrum antibiotic therapy had been initiated before the procedure and was modified when sensitivities were demonstrated by bacterial cultures. Amoebic liver abscess was diagnosed based on positive serology and suggestive imaging. Amebic serology was done by enzyme-linked immunosorbent assay method according to manufacturers instructions. It was reported as positive, negative, and borderline. A borderline result was repeated before classifying it to either positive or negative.

Catheter upsizing: Catheter upsizing was defined as the exchange of a catheter with a minimum of two French higher sizes than the initial catheter.

Monitoring and catheter removal: Following the procedure, regular catheter irrigation was performed with normal saline, color and volume of pus drained were noted. Abscess cavity size was monitored periodically by ultrasonography. BC was defined as the appearance of bile in drainage on any day following catheter insertion. A cartogram was done in selected patients to confirm the reduction of the size of abscesses and documentation of a biliary cutaneous external fistula. Catheters were removed when the pus drainage was less than 10 ml in two consecutive days, with the clinical improvement and/or follow-up sonography showing negligible residual cavity.

Statistical analysis

Numerical data were expressed as the median and range. Univariate analysis of various parameters was performed using the Chi-squared test for nominal variables and the Mann-Whitney U test for numerical variables. Subsequently, the parameters found to be significant on univariate analysis were entered into a multivariate model (linear regression) to determine the parameters associated independently with abscess-biliary communication. P-values below 0.05 were considered significant.

Results

One Eighty-eight consecutive patients (age 45 $\pm$ 13 y, 83 male) with ALA were studied. Sixty-two patients had a solitary abscess, 17 had two abscesses and the remaining nine patients had more than two abscesses. The lesions ranged in size from 4.5 cm to 15 cm in diameter with a mean size of 9.6 $\pm$ 2.3 cm. Fever (97%), right upper quadrant pain, anorexia, chills, weight loss, hepatomegaly, abdominal tenderness, clinical jaundice, diabetes mellitus, and hypertension were present in eighty-five, 79, 53, 52, 43, 76, 76, 24, 22 and nine patients, respectively. Forty-three patients had a history of alcohol intake. Catheter drainage: A total of 111

abscesses were treated with 136 catheters. Catheter drainage was technically successful in all patients. For PCD, appropriate-sized catheters (10 to 14 French, Malecot, or Pigtail) were introduced into the abscess cavity. Fourteen, six, and one patient required catheter upsizing once, twice, and thrice, respectively. Additional interventional procedures: Eight patients required percutaneous catheter drainage of right subphrenic collection. One patient each required right paracolic gutter collection, pelvic collection, right subhepatic collection, left paracolic gutter, perisplenic collection, left subphrenic collection drainage. Five patients required single-time aspiration of liver abscess, which was a small size for catheter drainage. Two and five patients required single-time aspiration of pelvic collection and right pleural effusion, respectively. One patient required transrectal ultrasonography-guided drainage of right pelvic collection. Follow-up: Patients with BC had a longer duration of drainage than those without (median 22 d [range, 4 to 120] vs. 7 [3 to 46]; p <0.001). Table:2 Result of microbiological and serological evaluation: 87 patients were amebic serology positive. Four patients had positive pus culture and sensitivity and were considered to have an amebic liver abscess with secondary pyogenic infection. Amebic serology was borderline in one patient despite retesting. Frequency of biliary communication: Our study shows 26 (30%) patients had biliary communication. Management of biliary communication: Patients with biliary communication were observed clinically and monitored by drainage catheter output and ultrasonographic examination. Patients with persisting catheter drainage output (more than 10 ml/day persisting for one week) and decreased residual abscess cavity on ultrasonography were planned for endoscopic interventional management. Seven (27%) patients with biliary communication required endoscopic interventional management (papillotomy with endoscopic stenting). Factors associated with the development of biliary communication: **Table - 1 and 2** show the relationship of various factors with the outcome of catheter drainage of liver abscess on univariate analysis. Clinical jaundice, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, and prolonged drainage were all associated with the development of biliary communication. Multivariate analysis: Of the variables found significant on univariate analysis, clinical jaundice and prolonged drainage were found to be significant on multivariate analysis.

Discussion

In the present study abscess, biliary communication developed in 26 of 88 (30%) patients. Three of the 26 showed bile in the pus within 24 hrs after catheter insertion. Clinical jaundice, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, and prolonged drainage were associated with the development of biliary communication on univariate analysis. Clinical jaundice and duration of drainage were independently associated with the development of biliary communication on multivariate analysis [7]. Our study confirms the result of the previous study, which showed that patients who presented with abscess communicating with the biliary tree presented more frequently with clinical jaundice (67% vs. 0%, p<0.005) [8]. The frequency of clinical jaundice was low (43% vs. 17%, p 0.035) among our patients in contrast to the previous study. This difference might be related to population variation. Also, the sample size in our study was large. Our study shows that there is no significant correlation between abscess volume and BC (425 ml vs. 306 ml, p 0.379). Our study confirms the results of the previous studies, which showed that patients with BC required catheter drainage for longer periods [9]. Knowledge of the parameters associated with BC may be useful in clinical decision-making. This is an important issue because prolonged catheter drainage may be associated with a secondary infection [10]. However, publications of studies on the role of various parameters, despite the availability of such clinical indices of BC in outcome prediction, suggest the need for a better method of predicting BC. Our study is an attempt

in this direction. We found that clinical jaundice and prolonged drainage were independent predictors of BC on multivariate analysis in patients after PCD of ALA [11]. This is not entirely unexpected. Clinical jaundice may suggest biliary radical compression by the abscess [12]. Several parameters conventionally believed to be associated with biliary communication did not reach significance in our study. Abscess size and volume did not differ between patients with biliary communication and without biliary communication. Aspartate aminotransferase, alanine aminotransferase, and alkaline phosphatase were not significant on multivariate analysis [13, 14, 15].

Table – 1: Demographic and clinical parameters in relation to biliary communication (results of univariate analysis).

All continuous data were given as median (range). Comparison was performed using the chi-squared test for categorical data and the Mann-Whitney U-test for continuous data.

Variables	**Biliary communication + (n= 26)**	**No biliary communication (n=58)**	**p-value (univariate)**
Age (yrs, median (range))	41.5 (18-81)	49 (19- 70)	NS
Male gender	25 (96%)	58 (93%)	NS
Ruptured abscess	7 (27%)	12 (19%)	NS
Right upper quadrant pain-present	24 (92%)	55 (88%)	NS
Epigastric pain-present	9 (34%)	12 (19%)	NS
Fever >100 F	26 (100%)	59 (95%)	NS
Anorexia- present	16 (61%)	37 (59%)	NS
Weight loss- present	8 (31%)	32 (51%)	NS
Anemia – present	13 (50%)	25 (40%)	NS
Jaundice- present	11 (43%)	11(17%)	0.035
Abdominal distension – present	8 (31%)	18 (29%)	NS
Pedal edema-present	8 (31%)	7 (11%)	NS

Table – 2: Laboratory and imaging parameters in relation to biliary communication in ALA (results of univariate analysis).

Variables	**Biliary communication + (n=26)**	**No biliary communication (n=58)**	**p-value (univariate)**
Total leukocyte count (1000/ul) (median, (range))	17.3(5.7- 47.1)	15.0(4.5- 42.50)	NS
Hemoglobin (gm/dl)	10.5(7.5- 14.5)	9.6(6.6- 16.4)	NS
Total bilirubin (mg/dl)	0.90(0.40- 14.40)	0.60(0.20- 14.30)	0.001
Direct bilirubin (mg/dl)	0.36(0.10- 4.60)	0.18(0.03- 6.80	0.015
Total protein (g/dl)	6.3(4.70- 8.40)	6.6(3.20- 8.10)	NS
Albumin (g/dl)	2.4(1.90- 5.20)	2.9(1.5- 4.2)	NS
AST* (u/l)	65(33- 556)	45(15- 468)	0.002
ALT† (u/l)	64(16- 925)	45 (12- 299)	0.012
ALP‡ (u/l)	490 (143-1367)	219 (59- 1127)	0.002
Prothrombin time (sec)	15.9 (11.5- 23.1)	15.0 (10.4- 26.9)	NS
Activatedpartial thromboplastin time (sec)	30.8 (20.7- 40.5)	28 (18.4- 90)	NS
Right lobe liver abscess	15	45	NS

Abscessvolume (median, range)	425(54.0- 903)	300(40- 1420)	NS
Abscess size (cm)	10.5(4.8- 15.1)	9.2(4.5- 14.5)	NS
Abscess wall thickness (mm)	3.1(2.0- 5.0)	3.5(1.9- 9.0)	NS
Solitary abscess	17	41	NS
Solid appearing abscess	3	12	NS
Generalized IHBRD¶	2	0	NS

All continuous data are given as median (range). The comparison was performed using the chi-squared test for categorical data and the Mann-Whitney U-test for continuous data. * aspartate aminotransferase, † aspartate aminotransferase, ‡ alkaline phosphatase, Intrahepatic biliary radical dilatation.

Conclusion

The results of this study highlight the fact that patients with MBO presenting for PBD have high early mortality and a declining QoL, likely due to the progression of the underlying disease. QoL does not increase after PBD regardless of technical success. Palliation of pruritus is probable, whereas the procedure is less successful in lowering the serum bilirubin to a level that permits the administration of chemotherapy. The performance of PBD without a clear clinical indication is not supported.

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