

Role of Pigtail Catheter Drainage in the Management of Liver Abscess – A Retrospective Analysis

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Abstract

Introduction – Liver abscess (especially amoebic) is an important health concern in tropical countries. Effective management of liver abscess included appropriate antibiotics and drainage of abscess cavity. Percutaneous abscess drainage by pigtail catheterization is now gaining popularity. We analysed the role of pigtail catheter drainage in the treatment of liver abscess.

Method and Material – This was a retrospective analytical study conducted in a tertiary care center in western India. Data of total 64 patients admitted with diagnosis of liver abscess were analyzed. To find the effectiveness of treatment data were analyzed in three groups based on treatment strategies, Group A (Conservative treatment), Group B (Percutaneous needle aspiration) and Group C (Pigtail catheter drainage).

Results – A total of 64 patients of liver abscess were analyzed. There was male predominance (93.75%). Mean abscess volume in Group C (307.9 ± 212.8 ml) was significantly higher when compared to Group A (130.8 ± 72.9 ml, $p = 0.03$) and Group B (177.2 ± 129.5 ; $p = 0.024$). Duration of hospital stay and residual abscess volume at the time of discharge did not show statistically significant difference between treatment groups. Pigtail catheterization of abscess with volume >150 ml shortened the hospital stay, whereas it prolonged the hospital stay in patients with abscess volume <150 ml.

Conclusion - Percutaneous pigtail catheterization would be an operative decision for management of liver abscess. We concluded that use of pigtail catheterization of patients with abscess volume > 150 ml improved the clinical outcome.

Introduction

Liver abscess is a pus-filled cavity, occurs due to incursion of microorganism either from hematogenous spread or by the way of the biliary ductal system. Common etiology of liver abscesses includes amoebic or pyogenic and sometimes due to mixed infections. In developed world, polymicrobial pyogenic abscess is common while amoebic etiology is more prevalent in tropical countries. Despite of improved sanitation and advancement of treatment, amoebic and pyogenic liver abscesses are considered an important cause of morbidity or mortality in the tropical and subtropical areas of the world. (1)

The major approach of treatment to a liver abscess is antimicrobial therapy with or without radiology guided intervention. About one-fifth of patients with liver abscess remain refractory to antimicrobial therapy. Nowadays, generous use of sonography and computerized tomography scanning of the abdomen led to early diagnosis of liver abscesses. Advancement in interventional radiology along with the availability of good antibiotic options are important factors for better patient outcomes (2).

Pigtail catheter drainage (PCD) and percutaneous needle aspiration (PNA) of abscess are proven as more useful in large cavity size abscesses which are refractory to medical therapy (1, 3). Available data suggests the trend towards the preferable use of pigtail catheterization for liver abscess management (4).

Data regarding decision making based on abscess volume and cavity size are limited (4). This study focused on role of PCD with regards to the volume of abscess at hospitalization and discharge and need of antimicrobial therapy in management of liver abscess.

Material And Methods

This was a retrospective analytical study performed at a tertiary care centre in western India. Study duration was July 2018 to October 2020. Data of total 64 patients with liver abscess were taken from computerized patient management system.

Patients admitted with clinical features and ultrasound abdomen finding consistent with liver abscess were included in the study. Patients with age < 18 years and who refused to take treatment were excluded from the study. Data regarding clinical features, possible risk factors, comorbidities, laboratory investigations, treatment strategies and outcome were collected in predesigned proforma. Patients with positive *Entamoeba histolytica* serology and/or positive stool microscopy for amoebic trophozoites and cysts considered as of amoebic etiology. Positive pus culture and/or blood culture for bacteria was considered as of pyogenic origin. Mixed etiology (amoebic and pyogenic) was considered if both were positive.

All patients were started empirical intravenous ceftriaxone (1gm bid) and metronidazole (500 mg tid) in during hospitalization. Antibiotics were modified according to culture sensitivity and if not responded to initial therapy. Patients were allocated in three groups based on treatment modalities for further analysis. Group A was comprised of patients received conservative management in the form of intravenous antibiotics only, Group B included patients who underwent PNA and Group C who underwent PCD. All patients were discharged with recovery, so duration of hospital stay in day was taken for outcome analysis.

Statistical analysis – Data were analysed by using SPSS version 20. Continuous variables were represented as mean (\pm standard deviation), number and percentage were used for categorial variables. ANOVA test was used to find statistical significance of continuous variables between groups. Person coefficient correlation and multiple logistic regression were done to find association between variables.

Results

A total of 64 patients with liver abscess were analyzed. The mean age of study population was 43.8 ± 15.3 years with male predominance (93.75%). Alcohol and smoking were the most common associated risk factors. Pain abdomen was the most common presenting complaint (84%), followed by fever (78%). Right hypochondrium tenderness was the most common finding on per-abdominal examination. (Table 1)

Table 1
Demography, Etiology & Clinical profile of patients with Liver abscess

Total patients (n = 64)	Parameters	Number (Percentage)
Gender	Male	60 (93.75%)
	Female	4 (6.25%)
Risk Factors	Alcoholic	39 (61%)
	Smoking	38 (59.4%)
	Diabetic	6 (9.4%)
	Hypertension	4 (6.25%)
Etiology	Amoebic	50 (78%)
	Pyogenic	4 (6.25%)
	Mixed	3 (4.7%)
Symptoms	Pain abdomen	54 (84.3%)
	Fever	50 (78%)
	Anorexia	40 (62.5%)
	Nausea/vomiting	26 (40.6%)
	Weight loss	26 (40.6%)
Signs	Pallor	5 (7.8%)
	Icterus	5 (7.8%)
	Ascites	8 (12.5%)
	Pleural effusion	19 (29.7%)

Right lobe abscess was predominant (82.5%) followed by bi-lobar involvement (9.4%). Multiple liver abscesses were found in 12% of patients. Etiology could be ascertained in 57 (89%) patients (78% amoebic, 6.3% pyogenic and 4.7% mixed amoebic and pyogenic), while it was not evident in 7 (11%) patients nor by amoebic serology neither by pus culture.

All patients received antibiotic therapy. Twelve (18.8%) patients were treated with PNA and 35 (54.7%) patients underwent pigtail drainage, the decision of need of intervention was made by treating team including clinician and interventional radiologist.

Demographic, laboratory, and management data were analysed in between three treatment groups (Table 2). Mean abscess volume in Group C (307.9 ± 212.8 ml) was significantly higher when compared to Group A (130.8 ± 72.9 ml; $p = 0.03$) and Group B (177.2 ± 129.5 ; $p = 0.024$), while there was no

significant difference between Group A and Group B ($p = 0.27$). There was no statistically significant difference between treatment groups with respect to duration of hospital stay and residual abscess volume at the time of discharge (Table 2).

Table 2
Comparative analysis of data between treatment strategies groups

Variables (Mean \pm SD)	Total (n = 64)	Group A (n = 17)	Group B (n = 12)	Group C (n = 35)	P value
Age (Years)	44 \pm 15.3	40.1 \pm 12.9	44.8 \pm 20.1	45.5 \pm 14.4	0.51
Duration of Hospital Stay (Days)	17.8 \pm 10.6	14.4 \pm 13.7	16.7 \pm 8.4	19.8 \pm 9.3	0.23
Hb (gm%)	11.7 \pm 2.0	13.0 \pm 2.0	11.8 \pm 1.6	11.0 \pm 1.8	0.003
TLC	14133 \pm 6197	14036 \pm 6309	11267 \pm 6072	15275 \pm 6006	0.14
ESR	77.6 \pm 27.9	74.6 \pm 26.5	68.4 \pm 24.7	83.1 \pm 29.4	0.25
HsCRP	127.1 \pm 84.3	130.3 \pm 107.8	126.3 \pm 64.9	125.8 \pm 80.2	0.98
AST	59.1 \pm 49.6	35.4 \pm 18.1	56.2 \pm 42.9	71.4 \pm 59.2	0.13
ALT	51.1 \pm 41	39.1 \pm 34.4	62.1 \pm 46.1	52.6 \pm 41.5	0.31
Total Bilirubin	1.2 \pm 0.9	0.9 \pm 0.6	1.2 \pm 0.9	1.4 \pm 1.1	0.21
Abscess Volume on day of admission	231.5 \pm 192.1	130.8 \pm 72.9	177.2 \pm 129.5	307.9 \pm 212.8	0.001
Abscess Volume on day of Discharge	19.9 \pm 16	16.5 \pm 16.6	15.8 \pm 14.9	22.9 \pm 15.9	0.26
Duration of Metronidazole	23.1 \pm 8	20.4 \pm 6.3	23.4 \pm 7.5	24.3 \pm 8.7	0.29
Hb- Hemoglobin, TLC-Total leukocyte count, ESR- Erythrocyte sedimentation rate, HsCRP- Highly sensitive C-reactive protein, AST-Aspartate aminotranferase, ALT- Alanine aminotranferase					

Association between duration of hospital stay and treatment strategies was further analysed according with liver abscess volume at the time of hospitalization (Fig. 1). This showed PCD in abscess volume < 150ml was associated with statistically significant increase in duration of hospital stay ($p = 0.012$). However, PCD between abscess volume of 150–300 ml was not associated with increase in the duration of hospital stay (Fig. 1).

Involvement of right Lobe and amoebic etiology were found comparable in all three groups (Table 3). Duration of hospital stay was positively correlated with duration of fever ($r = 0.28$, $p = 0.028$) and total leucocyte count at the time of hospitalization ($r = 0.35$, $p = 0.003$).

Table 3
Distribution of amoebic etiology and right lobe involvement in different treatment strategies

Variables	Group A (n = 17)	Group B (n = 12)	Group C (n = 35)	P value
Amoebic Etiology	13 (76%)	10 (83%)	27 (77%)	0.19
Right Lobe Involvement	12 (70%)	10 (83%)	29 (82%)	0.65

Discussion

Liver abscess is an imperative health issue in tropical countries. The common etiology of liver abscess are *E. histolytica* (amoebic), bacterial (pyogenic) and Mycobacterium tuberculosis. (5) Amoebic liver abscess is more common in tropical counties and its incidence is > 50 million cases and 1,00,000 death per year (6, 7). Involvement of right lobe was predominant (82.5%) in this study which was similar to previous studies (5, 8). Etiology could be ascertained in 89% cases, of which 78% were of amoebic etiology. The disease is more common in younger population so effective treatment is required for decrease in morbidity and mortality in productive age group. Common presenting complaints of liver abscess are abdominal pain, fever, loss of appetite and weight loss (9). With the wide availability of ultrasound, the diagnosis of liver abscess is become easier but effective treatment with judicious selection of antimicrobial and early source control still an area of debate. With the advent of interventional radiology, percutaneous treatment in the form of either PNA or PCD are preferred in management of liver abscess (4).

The mean cavity volume was significantly higher in Group C (PCD group) when compared to Group A and B in present study. Despite of this, Group C had comparable duration of hospital stay and duration of antibiotic therapy. Few important randomised control trials have been conducted to compare efficacy between PCD and PNA (1, 10, 11, 12, 13, 14) with variable results. Among them three trial showed PCD was preferred method for abscess drainage and was more effective if cavity size is > 10cm (1, 10, 13). Yu et al (11) concluded that, there was no significant difference if hospital stay and clinical outcomes when compared PCD vs PNA in abscess cavity size of around 5cm. However, Zerem and Hadzic et al (12) concluded that PNA was preferred method if cavity size is smaller than 5 cm. Metanalysis by Cai YL et al (4) also favoured PCD as preferred method of management and lower success rate with PNA. The success rate of PNA is considered low due to need of multiple attempts for aspiration in larger cavity size abscess and risk of re-accumulation. We also analysed the effect abscess volume and treatment strategies on the duration hospital stay. PCD was found as an effective choice of abscess drainage if volume was > 150 ml. However, PCD was associated with higher duration of hospital stay if used in abscess volume < 150 ml. Kulhari M et al (14) showed better clinical outcome with PCD in view of decreased cavity size and duration of hospitalization and the mean volume in both groups were similar (293.2 ± 130.3 mL in PCD group and 291.4 ± 138.8 mL in PNA group, P = 0.925). Rajak et al (10) also showed that higher abscess volume was associated PNA failure (425 ml vs 178ml, p < 0.005).

Comparison between the conservative treatment versus PNA also done in previous studies (15, 16, 17). These studies were mostly before gaining the popularity of PCD. Results of these studies showed that PNA was more useful in higher abscess volume (15, 16, 17). In this study, conservative management was non-inferior to PNA with respect to duration of hospitalization and duration of antibiotics used even when abscess volume was similar in both groups (130.8 ± 72.9 vs 177.2 ± 129.5 ml, $p = 0.27$).

PCD related complications were major issues in previous reports (15, 16). There was no significant complication related to PCD in this study. The recent studies also favour that complication rates were not significantly different in PCD vs PNA in management of liver abscess (1, 20). While PCD reduces cavity size and abscess volume faster and are associated with fewer complications than PNA.

Lobe involvement and etiology were not found to affect the outcome in different treatment strategies in our study.

Limitations of this study were retrospective analysis and selection bias regarding preferable use of pigtail catheterization in patients with large abscess volume.

Conclusion

Liver abscess is mostly a disease of young and middle-aged males in tropical countries. The effective management with drainage decreases the duration of antibiotics and hospital stay. With the advent of interventional radiodiagnosis percutaneous PCD became favoured decision for management of liver abscess. We concluded that use of pigtail catheterization as well as percutaneous needle aspiration in patients with abscess volume > 150 ml improves the clinical outcome and reduces the disease related morbidity. Pigtail catheterization is found as better intervention modality than percutaneous needle aspiration in the patients with abscess volume more than 300 ml. Further large RCT with definite protocol would be required for effective guideline in management of liver abscess.

Declarations

Declarations

“Declarations”

Ethical considerations

The study was approved by institutional ethical committee, All India Institute of Medical Sciences, Jodhpur, India. (Approval letter No.2020-21/2065). All methods were performed in accordance with the relevant guidelines and regulations.

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Availability of Data and Materials - The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Consent for publication – Informed consent was obtained from all subjects or from a parent and/or legal guardian if subjects were under 18. The patients have given written informed consent for their personal and clinical details. Authors certify that they have obtained all appropriate patient consent forms. In the form, the patients have given their informed consent for images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published, and due efforts will be made to conceal their identity.

Competing interests – Nil

Author's contributions –: **SK**: Investigation, Resources and Data Curation. **KA**: Methodology, Data Curation. **NKM**: Conceptualization, Methodology, Resources, Writing- Original draft preparation. **DK**: Conceptualization, Methodology, Data Curation, Writing - Original Draft. **MG**: Methodology, Data Curation, Writing and Review. **BK**: Methodology, Data Curation, Writing and Review. **GKB**: Editing and Supervision of preparation of manuscript. **BS**: supervised radiological interventions. **MKG**: Editing and Supervision of preparation of manuscript.

'All authors have read and approved the manuscript'.

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Figures

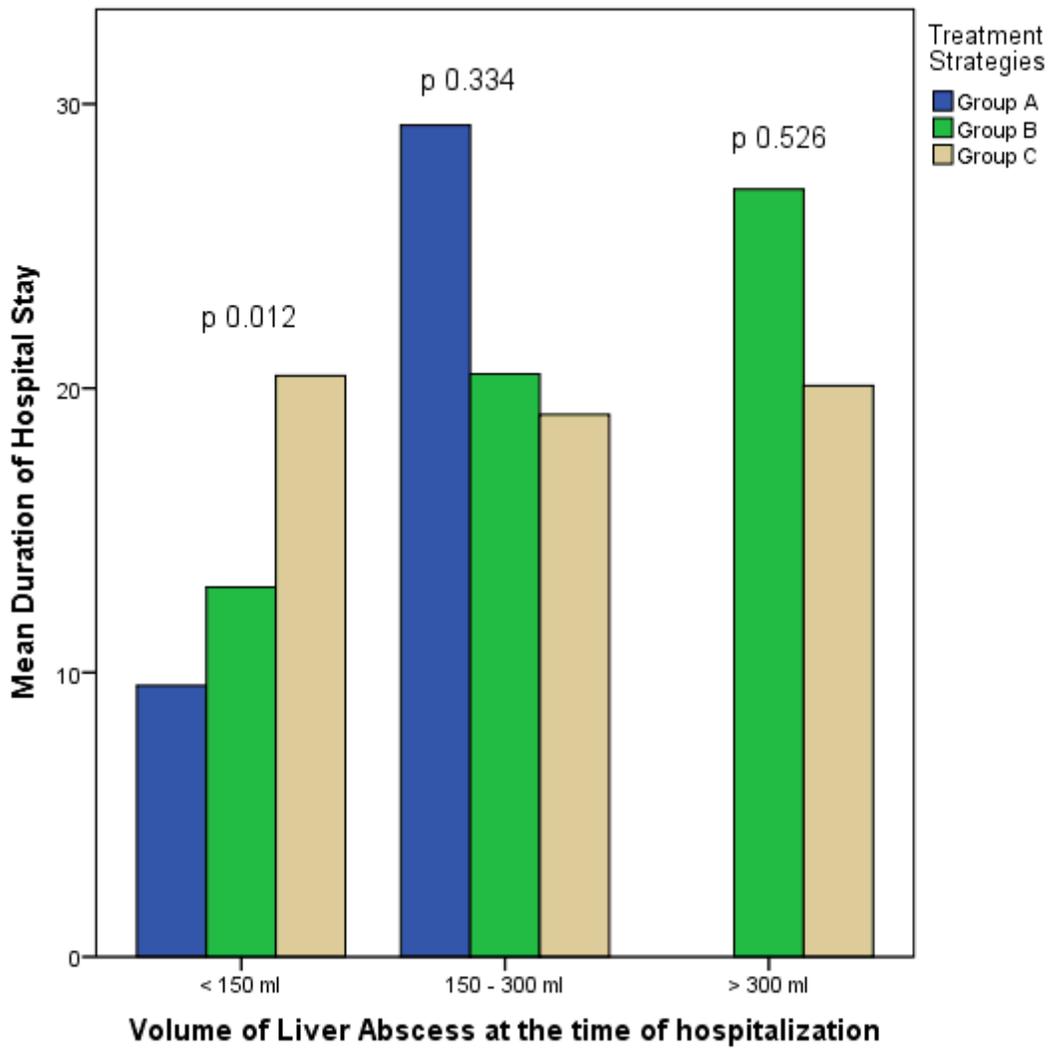


Figure 1

Association between duration of hospitalization and treatment strategies according with liver abscess volume