

COMPARISON OF PERCUTANEOUS VS. LAPAROSCOPIC DRAINAGE FOR RUPTURED LIVER ABSCESS: A RETROSPECTIVE COHORT ANALYSIS

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ABSTRACT

Background

Ruptured liver abscesses pose a significant clinical challenge due to their potential for severe complications, including peritonitis and sepsis. The study compares the outcomes of percutaneous drainage versus laparoscopic drainage for patients with ruptured liver abscesses.

Methods

Two groups of patients were developed: one for percutaneous drainage (n = 60) and another for laparoscopic drainage (n = 60). Analyses were conducted on baseline variables, procedural outcomes, complication rates, and clinical outcomes. The statistical analysis was done with SPSS 23.0.

Results

Middle-aged adults dominated the percutaneous and laparoscopic groups, with mean ages of 54.2 and 52.7 years, respectively. Men dominated both groups, with 63.3% of percutaneous and 60% of laparoscopic patients. Percutaneous drainage was associated with a significantly shorter procedure duration (45.3 ± 12.5 minutes vs. 73.8 ± 15.7 minutes, $p < 0.001$) and lower complication rate (13.3% vs. 30.0%, $p = 0.03$) compared to laparoscopic drainage. Additionally, patients in the percutaneous group experienced shorter hospital stays (7.2 ± 2.5 days vs. 10.3 ± 3.1 days, $p < 0.001$) and faster resolution of symptoms (5.1 ± 1.8 days vs. 7.8 ± 2.2 days, $p < 0.001$). There was no significant difference in the mortality rate between the two groups (3.3% vs. 5.0%, $p = 0.56$).

Conclusion

Percutaneous drainage demonstrates advantages over laparoscopic drainage in terms of shorter procedure duration, lower complication rates, and faster recovery for patients with ruptured liver abscesses. However, the slightly higher initial success rate of laparoscopic drainage suggests that both methods are viable, with the choice of procedure depending on individual patient factors and clinical judgment.

Recommendations

Future prospective studies are needed to validate these findings and explore long-term outcomes associated with each drainage method. Clinicians should consider patient-specific factors when selecting the appropriate drainage technique for ruptured liver abscesses.

Keywords: Ruptured liver abscess, Percutaneous drainage, Laparoscopic drainage, Minimally invasive techniques, Clinical outcomes.

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INTRODUCTION

Liver abscesses, particularly those that rupture, represent a significant medical challenge due to their potential for severe complications and high mortality rates if not promptly and effectively managed. The primary etiologies of liver abscesses include bacterial, amoebic, and fungal infections, with pyogenic liver abscesses being the most

common in developed countries [1]. Advances in imaging and interventional radiology have improved the diagnosis and treatment of liver abscesses, yet the optimal approach for managing ruptured abscesses remains debated.

Ruptured liver abscesses necessitate immediate intervention to prevent peritonitis and sepsis, conditions that can rapidly become life-threatening. Traditionally,

open surgical drainage was the standard treatment; however, less invasive methods such as percutaneous and laparoscopic drainage have gained popularity due to their reduced morbidity and faster recovery times [2]. Percutaneous drainage, guided by ultrasonography or computed tomography (CT), involves the insertion of a catheter to aspirate the abscess contents. This method is minimally invasive and can be performed under local anesthesia, making it suitable for high-risk patients. Laparoscopic drainage, on the other hand, offers the advantage of direct visualization of the abscess cavity, allowing for thorough drainage and irrigation. This approach benefits multiloculated abscesses or those not amenable to percutaneous access [3]. Despite its minimally invasive nature compared to open surgery, laparoscopic drainage requires general anesthesia and may involve a longer procedural time and hospital stay. Recent studies have explored the comparative efficacy of these two minimally invasive techniques. A systematic review highlighted that while both methods are effective, percutaneous drainage is associated with a lower complication rate and shorter hospital stay compared to laparoscopic drainage [4]. Another study demonstrated similar findings, emphasizing the importance of patient selection in determining the most appropriate intervention [5].

Despite the growing body of evidence, there is a paucity of large-scale comparative studies specifically focusing on ruptured liver abscesses. The management of these cases is further complicated by the variability in abscess characteristics, patient comorbidities, and institutional expertise. Consequently, the choice of drainage method often relies on clinical judgment and available resources. The study aims to compare the outcomes of percutaneous drainage versus laparoscopic drainage for patients with ruptured liver abscesses.

METHODOLOGY

Study Design

A retrospective cohort analysis.

Study Setting

The study was conducted at Kalinga Institute of Medical Sciences, Bhubaneswar, Odisha, India, with specialized facilities for gastrointestinal surgery and interventional radiology. Data were collected from patients admitted between 20 June 2015 to December 2020.

Participants

A total of 120 patients diagnosed with ruptured liver abscesses and treated with either percutaneous drainage or laparoscopic drainage were included in the study.

Inclusion Criteria

- Patients aged 18 years and older.
- Confirmed diagnosis of ruptured liver abscess via imaging studies (CT or MRI).

- Patients who underwent either percutaneous drainage or laparoscopic drainage.
- Complete medical records available for review.

Exclusion Criteria

- Patients with unruptured liver abscesses.
- Patients treated with open surgical drainage.
- Loss to follow-up.
- Patients with co-existing severe comorbid conditions that could independently affect outcomes (e.g., advanced malignancies, severe heart failure).

Bias

To minimize selection bias, patients were consecutively selected based on admission records. Information bias was mitigated by using standardized data collection forms and cross-referencing multiple data sources. Confounding factors were adjusted for the statistical analysis.

Data Collection

Data were collected retrospectively from electronic medical records and included demographic information, clinical presentation, laboratory and imaging findings, details of the drainage procedure, complications, length of hospital stay, and follow-up outcomes.

Procedure

Patients were allotted into two groups based on the type of drainage received: percutaneous drainage or laparoscopic drainage. The choice of drainage method was based on clinical judgment, availability of resources, and patient preference. Both procedures were performed according to standard protocols. Follow-up data were collected at discharge, and subsequent follow-ups were conducted at 1-, 3-, and 6 months post-procedure.

Statistical Analysis

SPSS version 23.0 was used to analyze the data. At $p < 0.05$, statistical significance was established. The findings were displayed as mean \pm standard deviation, number (%), or median (interquartile range).

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

The trial comprised 120 patients in total, 60 of whom were in the percutaneous drainage group and 60 of whom were in the laparoscopic drainage group. Table 1 provides a summary of the individual's baseline characteristics. Regarding age, gender, comorbidities, and initial clinical presentation, there were no discernible variations between the two groups.

Table 1. Baseline Characteristics

Characteristic	Percutaneous Drainage	Laparoscopic Drainage	p-value
Age (years)	54.2 ± 12.3	52.7 ± 13.1	0.47
Male, n (%)	38 (63.3)	36 (60.0)	0.72
Diabetes, n (%)	15 (25.0)	18 (30.0)	0.54
Hypertension, n (%)	20 (33.3)	22 (36.7)	0.70
Initial fever (°C)	38.5 ± 0.8	38.4 ± 0.7	0.62
Abscess size (cm)	7.8 ± 2.3	7.5 ± 2.1	0.48
Multiloculated abscesses	12 (20.0)	14 (23.3)	0.67

Table 2 provides a summary of the procedural results. In comparison to the laparoscopic drainage group, the percutaneous drainage group's procedure took noticeably less time ($p < 0.001$). Although the laparoscopic drainage

group had a greater initial procedure success rate, the difference was not statistically significant ($p = 0.08$). The group that received percutaneous drainage experienced a considerably decreased rate of complications ($p = 0.03$).

Table 2. Procedural Outcomes

Outcome	Percutaneous Drainage	Laparoscopic Drainage	p-value
Procedure duration (minutes)	45.3 ± 12.5	73.8 ± 15.7	<0.001
Success rate, n (%)	54 (90.0)	58 (96.7)	0.08
Complications, n (%)	8 (13.3)	18 (30.0)	0.03
Reintervention rate, n (%)	6 (10.0)	3 (5.0)	0.31

Table 3 summarises the clinical results, which include the duration of hospital stay, the time it takes for symptoms to go away, and the death rate. Individuals who underwent percutaneous drainage exhibited a notably reduced

duration of hospitalization ($p < 0.001$) and a quicker remission of symptoms ($p < 0.001$). The death rate did not significantly differ between the two groups ($p = 0.56$).

Table 3. Clinical Outcomes

Outcome	Percutaneous Drainage	Laparoscopic Drainage	p-value
Length of hospital stay (days)	7.2 ± 2.5	10.3 ± 3.1	<0.001
Time to resolution of symptoms (days)	5.1 ± 1.8	7.8 ± 2.2	<0.001
Mortality rate, n (%)	2 (3.3)	3 (5.0)	0.56

We used a multivariate logistic regression analysis to find independent factors that were associated with favorable outcomes. Table 4 provides a summary of the findings.

Once other factors were taken into account, the type of draining process was no longer a significant predictor of success.

Table 4. Multivariate Logistic Regression Analysis for Successful Outcomes

Variable	Odds Ratio (95% CI)	p-value
Age	0.98 (0.94–1.02)	0.32
Diabetes	0.88 (0.41–1.92)	0.75
Abscess size	0.95 (0.82–1.10)	0.50
Multiloculated abscesses	0.69 (0.29–1.63)	0.40
Type of drainage procedure	1.34 (0.47–3.81)	0.58

DISCUSSION

The results of percutaneous and laparoscopic drainage techniques for burst liver abscesses were examined in this study. A fair comparison could be made because the 120 individuals' baseline characteristics were comparable in

the two groups. Notably, the distribution of age, gender, and concomitant illnesses including hypertension and diabetes was not significantly different, which offered a balanced basis for assessing the clinical and procedural outcomes.

The results of the procedure showed that percutaneous drainage took 45.3 ± 12.5 minutes, which was significantly less time than laparoscopic drainage (73.8 ± 15.7 minutes), indicating that the former method was more efficient. Although the laparoscopic group's initial procedure success rate (96.7%) was somewhat higher than the percutaneous group's (90.0%), there was no statistically significant difference between the two groups. Crucially, the percutaneous group's complication rate was considerably lower (13.3%) than the laparoscopic group's (30.0%), suggesting that percutaneous draining may have a benefit for patient safety.

In terms of clinical outcomes, patients who underwent percutaneous drainage experienced shorter hospital stays (7.2 ± 2.5 days) and faster resolution of symptoms (5.1 ± 1.8 days) compared to those who had laparoscopic drainage (10.3 ± 3.1 days and 7.8 ± 2.2 days, respectively). These findings suggest that percutaneous drainage may contribute to a quicker recovery and reduced healthcare utilization. The mortality rates were low and not significantly different between the two groups, indicating that both procedures are generally safe. Multivariate logistic regression analysis revealed that the type of drainage procedure was not an independent predictor of successful outcomes after adjusting for other variables. This suggests that while percutaneous drainage may offer benefits in terms of procedural efficiency and reduced complications, both methods are viable options for treating ruptured liver abscesses.

Overall, the study's findings support the use of percutaneous drainage as a potentially preferable option due to its shorter procedure time, lower complication rate, and quicker patient recovery. However, the slightly higher success rate of initial procedures with laparoscopic drainage indicates that individual patient factors and clinical judgment should guide the choice of treatment method. Further prospective studies are warranted to validate these results and to explore long-term outcomes. One study evaluated the use of percutaneous double-catheter drainage in nine patients with spontaneous rupture of bacterial liver abscesses. The study reported that all patients were successfully treated without major complications, highlighting the method's convenience, safety, and feasibility, particularly for patients with limited abdominal abscesses [6].

In a comparative study, the outcomes of laparoscopic drainage were compared with open surgical drainage in 48 patients with complex pyogenic liver abscesses. The laparoscopic group demonstrated shorter operation times, reduced hospital stays, and lower morbidity rates compared to the open surgical group, suggesting the benefits of minimally invasive laparoscopic procedures over traditional open surgery [7].

Further supporting these findings, another study assessed the efficacy of laparoscopic drainage in 38 cases of liver abscess. They found that the procedure was generally safe, with a high success rate and minimal complications,

reinforcing the advantages of laparoscopic methods in managing liver abscesses [8].

A study also compared laparoscopic and open drainage methods in 60 patients with complex pyogenic liver abscesses. The study concluded that laparoscopic drainage resulted in shorter surgical times, lower morbidity rates, and shorter hospital stays, making it a preferable option for complex cases [9].

In a different trial, 117 patients with burst amebic liver abscesses had ultrasound-guided percutaneous catheter drainage. The outcomes demonstrated the method's feasibility as a first-line treatment for ruptured liver abscesses, showing that it was both safe and efficacious with few side effects [10].

Furthermore, a comparative study comparing intermittent needle aspiration and continuous catheter drainage revealed that both techniques were successful; however, needle aspiration demonstrated reduced complications and shorter hospital stays, indicating that it could be a better initial strategy for managing liver abscesses [11].

Generalizability

The generalizability of the study findings may be limited due to its retrospective design and single-center setting, which could restrict the applicability of results to broader, more diverse populations or different healthcare environments. Additionally, the study's focus on patients with ruptured liver abscesses treated with either percutaneous or laparoscopic drainage may not fully represent cases with different clinical characteristics or those managed with other techniques. However, the balanced baseline characteristics between the two groups enhance internal validity, suggesting that the results could be relevant to similar clinical contexts, particularly in settings with access to both drainage techniques. Further multicenter and prospective studies are needed to confirm these findings across varied populations.

CONCLUSION

The results of this study indicate that percutaneous drainage is associated with shorter procedure duration, fewer complications, and quicker recovery compared to laparoscopic drainage. However, the success rate of the initial procedure was slightly higher with laparoscopic drainage. These findings suggest that while both methods are effective, percutaneous drainage may offer advantages in terms of patient recovery and procedural efficiency.

Limitations

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of a comparison group also poses a limitation for this study's findings.

Recommendation

Future prospective studies are needed to validate these findings and explore long-term outcomes associated with each drainage method. Clinicians should consider patient-

specific factors when selecting the appropriate drainage technique for ruptured liver abscesses.

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Conflict of interest

The authors have no conflicting interests to declare.

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