

Research Article

COMPARATIVE OUTCOMES OF PERCUTANEOUS NEEDLE ASPIRATION VERSUS PERCUTANEOUS CATHETER DRAINAGE IN THE MANAGEMENT OF LIVER ABSCESS: A RETROSPECTIVE STUDY OF 50 PATIENTS

Dr Sharan Umeshchandara Gurugunti¹, Dr. Sangameshwar Patil²

¹MBBS, Postgraduate, Department of General Surgery, MRMC-Kalaburagi, Karnataka, India.

²MBBS, MS General Surgery, Associate Professor, Department of General Surgery, MRMC-Kalaburagi, Karnataka, India.

*Corresponding Author

Dr. Sharan Umeshchandara Gurugunti

Article History

Received: 02.05.2026
Revised: 12.05.2026
Accepted: 29.05.2026
Published: 05.06.2026

Citations:

Gurugunti, S. U., & Patil, S. (Year). Comparative outcomes of percutaneous needle aspiration versus percutaneous catheter drainage in the management of liver abscess: A retrospective study of 50 patients. *J Surg Radiol*, V5(6) 9-14

Abstract: **Introduction:** Liver abscess remains an important surgical problem in tropical and developing regions despite major advances in antimicrobial therapy, diagnostic imaging, and minimally invasive drainage techniques. Percutaneous needle aspiration (PNA) and percutaneous catheter drainage (PCD) are established image-guided treatment options, but their comparative utility in routine clinical practice remains relevant, particularly in larger or more complex collections. **Objective :** To compare the clinical outcomes of PNA and PCD in the management of liver abscess in a retrospective cohort of 50 patients. **METHODS:** This retrospective comparative study included 50 patients with clinically suspected and radiologically confirmed liver abscess treated at a tertiary care hospital. Hospital records were reviewed for demographic variables, clinical presentation, laboratory findings, abscess characteristics, microbiology, intervention performed, procedural success, complications, duration of hospitalization, and follow-up findings. Patients were categorized into two groups according to the primary drainage modality: PNA or PCD. **RESULTS:** Our cohort had a mean age of 46 years with 76% males. Predominant symptoms were right upper quadrant abdominal pain, fever and anorexia. Right-lobe was commonly involved, with pyogenic abscess accounting for 68% of cases. Mean abscess size was 402.17 cc. Primary success rate was 77% in PNA group and 100% in PCD group, with no major difference in serious complications. **CONCLUSION:** PCD appears to provide more reliable source control than PNA in liver abscess, particularly in larger cavities and cases with thick or persistent purulent collections. PNA remains useful in selected small and uncomplicated abscesses. These findings support a selective but PCD-favoring approach in contemporary surgical practice.

Keywords: Liver abscess; percutaneous needle aspiration (PNA); percutaneous catheter drainage (PCD); pyogenic liver abscess; amoebic liver abscess

INTRODUCTION

Liver abscess remains an important cause of morbidity in surgical practice, particularly in regions where enteric infection, poor sanitation, delayed presentation, and amoebic infestation continue to contribute substantially to disease burden.¹⁻³ Earlier experience with hepatic abscess was associated with high mortality, but the introduction of antimicrobial therapy, modern diagnostic imaging, and image-guided interventions has significantly improved prognosis and reduced the need for open surgical drainage⁴⁻⁶. Nevertheless, liver abscess continues to present important management challenges because patients often arrive with sepsis, nutritional compromise, and varying degrees of cavity complexity. From a clinical standpoint, liver abscess may be broadly categorized as pyogenic or amoebic, although overlap in presentation is common^{7,8}. Fever, right upper quadrant pain, anorexia, malaise, and leukocytosis are the most frequent presenting features, while ultrasonography remains the primary diagnostic modality in most hospitals and computed tomography is useful in selected

or complicated cases. Current management is centered on two principles: appropriate antimicrobial therapy and timely source control⁹. In this context, surgery is now generally reserved for rupture, generalized peritonitis, inaccessible collections, coexisting surgical pathology, or failure of percutaneous techniques¹⁰⁻¹².

The main image-guided drainage options are percutaneous needle aspiration (PNA) and percutaneous catheter drainage (PCD). PNA is simple, minimally invasive, inexpensive, and can be repeated when necessary, which makes it an attractive choice for small, unilocular cavities¹³⁻¹⁵. However, its efficacy may be limited by incomplete evacuation of thick pus, rapid re-accumulation, and the need for multiple sittings^{16,17}. By contrast, PCD permits continuous evacuation, irrigation, decompression of the cavity over time, and objective monitoring of output, which may improve success in larger or more complex abscesses¹⁸⁻²⁰.

A number of studies have compared these two modalities. Prospective and retrospective comparisons,

as well as recent meta-analyses, increasingly suggest that PCD offers higher treatment success and faster early radiological or clinical recovery, while major complication rates are not substantially different between the two techniques²¹⁻²³. Even so, the choice of intervention in many centers remains influenced by surgeon preference, affordability, local expertise, and perceived technical ease rather than by a standardized protocol. The present retrospective study was undertaken to compare the outcomes of percutaneous needle aspiration and percutaneous catheter drainage in 50 patients with liver abscess treated at a tertiary care hospital. The aim was to evaluate the relative effectiveness, safety, and practical utility of both procedures in real-world surgical practice and to determine whether the present institutional experience supports the growing preference for catheter drainage in selected patients.

MATERIALS AND METHODS

Study design and setting

This retrospective observational comparative study was conducted in the Department of General Surgery at MRMC Kalaburagi over the period from December 2012 to December 2025. Data were retrieved from inpatient medical records, radiology registers, procedure notes, microbiology reports, discharge summaries, and outpatient follow-up entries. Institutional ethics approval was obtained prior to data collection.

Objectives

- To compare and co-relate effectiveness of PCD with PNA in treatment of liver abscess.
- To identify and compare morbidity associated with both the procedures.

Study population

A total of 50 patients with clinically suspected and radiologically confirmed liver abscess who underwent image-guided percutaneous management were included. Patients were divided into two groups according to the initial intervention: PNA group and PCD group.

Eligibility criteria

Inclusion criteria

Patients with liver abscess more than 18 years of age, confirmed clinically and radiologically.
Patients treated with ultrasound-guided needle aspiration or catheter drainage.
Availability of baseline and in-hospital outcome data.

Exclusion criteria

Ruptured liver abscess at presentation.
Very small abscesses managed with medical treatment alone.
Multiple abscesses.
Patients primarily treated by open surgical drainage.
Incomplete medical records.

Clinical and laboratory evaluation

The clinical assessment including age, sex, presenting symptoms, symptom duration, abdominal examination findings, and relevant comorbid conditions were noted from records. Relevant laboratory investigations noted from records. Imaging findings of abdominal ultrasonography or computed tomography which was used selectively in diagnostically difficult or complicated cases were noted. Where available, blood culture and pus culture were recorded. Abscess characteristics including lobe involved, number, cavity size, estimated volume, and internal echoes or septations were documented.

Treatment protocol

It was noted that all patients received standard medical treatment consisting of intravenous fluids, analgesics, antipyretics, and empirical broad-spectrum antibiotics covering gram-negative enteric organisms and anaerobes, with later modification according to clinical response and microbiological results. Patients with suspected amoebic etiology also received anti-amoebic therapy according to departmental practice.

As per the records, percutaneous needle aspiration was performed under real-time ultrasound guidance using aseptic precautions and local anaesthesia. Pus was aspirated as completely as possible and sent for culture whenever feasible. Repeat aspiration was performed if residual cavity and symptoms persisted. Percutaneous catheter drainage was carried out under ultrasound guidance using an appropriately sized pigtail catheter introduced into the abscess cavity and connected to external drainage. Catheter care included regular monitoring of output and flushing where indicated. Catheter removal was undertaken after sustained decrease in output with concurrent clinical and sonographic improvement.

Outcome measures

The primary outcome was treatment success, defined as resolution of symptoms and radiological improvement without need for crossover to an alternative drainage modality or surgery.

Secondary outcomes included time to clinical improvement, reduction in abscess cavity size on follow-up imaging, duration of hospital stay, duration of intravenous antibiotics, requirement for repeat intervention, procedure-related complications, and mortality.

Statistical analysis

Data were analyzed using SPSS software. Continuous variables were expressed as mean \pm standard deviation or median with interquartile range as appropriate. Categorical variables were expressed as frequency and percentage. Intergroup comparisons were performed using the independent t-test or Mann-Whitney U test for continuous variables and the chi-square test or Fisher

exact test for categorical variables. A p value less than 0.05 was considered statistically significant.

RESULTS

Patient profile (Tables 1 and 2)

A total of 50 patients were included in the study, comprising 26 cases in the PNA group and 24 cases in the PCD group. The overall mean age was 46 years, and males constituted 76% of the study population. The most common presenting symptoms were right upper quadrant abdominal pain, fever, and anorexia. Most abscesses were located in the right lobe, while a smaller proportion involved the left lobe or both lobes.

Etiology and microbiology

Pyogenic abscess accounted for 68% of cases, amoebic abscess for 30%, and mixed etiology for the remainder. Pus culture was positive in 48% (24 out of 50) of patients, with the most frequent isolates being *Escherichia coli* (12 cases), followed by *Klebsiella sp* (7 cases), *Staphylococcus aureus* (1 case), *Streptococcus* (1 case), and *Pseudomonas sp* (1 case) in others.

Comparative outcomes (Table 3)

The mean abscess size or volume was 351.23 ± 176.32 in the PNA group and 453.12 ± 199.11 in the PCD group ($p > 0.05$). Primary treatment success was achieved in 77% of patients in the PNA group and 100% in the PCD group. Mean time to 50% reduction in cavity size was 5.4 ± 1.99 in PNA group and 4 ± 1.84 in PCD group, the difference being statistically significant. The mean time to clinical improvement was 4.12 ± 2.12 days for PNA and 3.13 ± 1.93 days for PCD.

The differences in the duration of intravenous antibiotic therapy and mean hospital stay were not statistically significant between the PNA and PCD groups.

Repeat intervention was required in 6 patients after PNA and none of the patients after PCD.

Complications:

No major life-threatening complication was noted. Minor catheter-related complications included 2 patients with bile leak and 1 localized peritonitis. Mortality in the present series was nil.

Table 1. Baseline demographic and clinical profile of the study population

Variable	Total (n=50)	PNA group(n=26)	PCD group (n=24)	P value (t test)
Age in years (mean \pm SD)	46.12 \pm 13.2	45.9 \pm 11.4	48.2 \pm 14.2	>0.05
Gender (male to female ratio)	3.16	3.5:1	2.8:1	>0.05
Right upper quadrant pain n(%)	45 (90%)	25(96.15%)	20(83.33%)	>0.05
Fever n(%)	42(84%)	22(84.61%)	20(83.33%)	>0.05
Anorexia n(%)	40(80%)	21(80.76%)	19 (79.16%)	>0.05
Nausea and vomiting n(%)	22(44%)	13 (50%)	9(37.5%)	>0.05
Diarrheal episodes n(%)	20(10%)	4(15.3%)	16(66.66%)	>0.05

Table 2. Laboratory work up of the study population

Variable	Total (n=50) mean \pm SD	PNA(n=26) mean \pm SD	PCD(n=24) mean \pm SD	P value
Serum Total bilirubin(mg/dL)	1.59 \pm 0.98	1.49 \pm 0.89	1.7 \pm 1.88	>0.05
AST (IU/L)	52.6 \pm 12.3	55.67 \pm 15.76	50.55 \pm 13.26	>0.05
ALT (IU/L)	63.2 \pm 10.26	64.34 \pm 11.23	62.34 \pm 13.34	>0.05
ALP (U/L)	352.6 \pm 23.45	350.45 \pm 23.76	360.34 \pm 14.56	>0.05
Total leucocyte counts (cells/cumm)	13885.3 \pm 4443.5	13667.2 \pm 3334.3	13889.3 \pm 4456.5	>0.05

Table 3. Comparative outcomes of PNA and PCD

Variable	PNA group (mean \pm SD)	PCD group (mean \pm SD)	P value (t -test)
Volume of abscess cavity	351.23 \pm 176.32	453.12 \pm 199.11	>0.05
Time to clinical improvement (days)	4.12 \pm 2.12	3.13 \pm 1.93	>0.05

Time to 50% cavity reduction (days)	6.1±2.2	4.3±1.63	<0.05
Duration of hospital stay (days)	12.22±5.2	10.92±3.33	>0.05
Duration of I/V antibiotics (days)	8.8±2.98	9.3±2.6	>0.05
Time for total or near total resolution of cavity (weeks)	11.1±3.9	11.4±4.5	>0.05
Success rate (%)	77%	100%	<0.05
Complications (%)	0	12.5%	>0.05

DISCUSSION

The present study demonstrates that both PNA and PCD are effective minimally invasive options in the treatment of liver abscess, but the outcomes in this series favoured PCD with regard to primary success and early reduction in cavity size. This pattern is broadly consistent with previously published comparative studies and recent meta-analyses, which have reported improved success with catheter-based drainage in appropriately selected patients^{13,21-23}. The findings of the present study reinforce the practical importance of achieving dependable source control in the management of hepatic sepsis^{24,25}.

The demographic profile of the present cohort is comparable to that reported in earlier studies, in which liver abscess occurs more commonly in middle-aged men and usually presents with fever and right upper quadrant pain^{2,4}. The right lobe was more frequently involved in the current series, a pattern that has also been reported in the literature and may relate to its larger size and preferential portal venous inflow.

The better outcome observed with PCD is likely related to its ability to maintain continuous decompression of the abscess cavity. PNA may be sufficient in selected cases, but it can be less effective when the cavity contains thick pus, internal debris, partial liquefaction, or loculations that prevent complete evacuation in a single sitting⁷⁻⁹. In contrast, PCD enables ongoing evacuation, permits flushing when required, and allows direct monitoring of output. These factors are especially relevant in larger abscesses and in patients with persistent systemic manifestations of infection.

The present findings are in agreement with landmark comparative studies. Rajak et al¹³ reported better overall success with PCD than with repeated PNA, and Yu et al¹⁶ demonstrated similar findings in a prospective randomized comparison involving pyogenic liver abscess. More recent evidence has strengthened this position. Systematic reviews and meta-analyses by Ali et al., Cai et al., and Tan et al, have all supported the view that catheter drainage is associated with higher treatment success and earlier clinical or radiological improvement than needle aspiration²¹⁻²³.

At the same time, the results should not be interpreted to mean that PNA has no role. PNA remains a reasonable option in selected patients, particularly when the abscess is small, unilocular, technically accessible, and expected to contain less viscous material. It is less invasive, relatively economical, and avoids the inconvenience of an indwelling catheter. However, one practical limitation is that repeat aspiration may be necessary, and delayed source control may prolong symptoms, sepsis, and hospital stay. In such situations, early conversion to catheter drainage may be appropriate.

Abscess morphology appears to be an important determinant of procedural success. Larger cavities, thick contents, internal echoes, and multiloculation are less likely to be adequately managed by single-time aspiration. In the present series, patients in the PNA group who were successfully treated had a lower mean abscess volume than those who failed aspiration (302.67 cc vs 493.45 cc), suggesting that cavity size may influence outcome. This observation is clinically relevant because it supports individualized procedure selection rather than a uniform approach for all abscesses.

Procedure-related complications were uncommon in the present study. PCD was associated with a few minor complications, including bile leak and localized peritonitis, but no major life-threatening adverse event was observed. Contemporary evidence suggests that both PNA and PCD are generally safe when performed under image guidance, with low rates of major complications²⁵. Therefore, the higher efficacy of PCD in selected patients does not appear to be offset by a substantial increase in serious procedural risk.

Current guidance on complicated intra-abdominal infections continues to emphasize the importance of appropriate imaging, microbiological evaluation, and adequate drainage of purulent collections as central components of treatment^{24,25}. Although these recommendations are not specific to liver abscess alone, the same principle applies in hepatic abscess management: ongoing fever and inflammatory response may reflect incomplete source control rather than antimicrobial failure. This concept provides a practical

rationale for favouring PCD when complete evacuation through PNA is uncertain.

The present study has certain limitations. It was a retrospective record-based analysis, and the initial choice between aspiration and catheter drainage may have been influenced by abscess size, disease severity, operator preference, technical considerations, and patient affordability. Prior antibiotic use may also have reduced microbiological yield, and the timing of follow-up evaluation was not uniform in all patients. Despite these limitations, the study reflects routine clinical practice and therefore provides useful real-world information from a general surgery setting.

Overall, the present findings suggest that both PNA and PCD remain valid treatment options for liver abscess, but they are not equally suitable in every clinical scenario. PCD appears to offer more reliable and sustained source control, particularly in larger, symptomatic, or complex cavities. PNA remains useful in selected uncomplicated abscesses, provided that patients are monitored closely and escalation to catheter drainage is undertaken when early response is unsatisfactory.

CONCLUSION

Both PNA and PCD are effective minimally invasive treatment options for liver abscess. However, PCD appears to provide greater procedural reliability and more dependable source control, particularly in larger or more complex abscess cavities. PNA remains valuable in carefully selected uncomplicated lesions, but its limitations include the possibility of incomplete evacuation and the need for repeat intervention. The findings of the present retrospective study support a selective management strategy in which PCD is preferred for larger or complex abscesses, while PNA is reserved for appropriately chosen cases.

Ethical approval: Approved by the Institutional Ethics Committee, MRMC, approval number: 2026032.

Informed consent: Waiver of consent/patient consent obtained according to institutional policy for retrospective studies.

REFERENCES

1. Ochsner A, DeBakey M, Murray S. Pyogenic abscess of the liver: II. An analysis of forty-seven cases with review of the literature. *Am J Surg*. 1938;40(1):292-319.
2. Barnes PF, De Cock KM, Reynolds TN, Ralls PW. A comparison of amebic and pyogenic abscess of the liver. *Medicine (Baltimore)*. 1987;66(6):472-83.
3. Chiu CT, Lin DY, Wu CS, Chang-Chien CS, Sheen IS, Liaw YF. A clinical study on pyogenic liver abscess. *Taiwan Yi Xue Hui Za Zhi*. 1987;86(4):405-12.
4. Hughes MA, Petri WA Jr. Amebic liver abscess. *Infect Dis Clin North Am*. 2000;14(3):565-82.
5. Branum GD, Tyson GS, Branum MA, Meyers WC. Hepatic abscess: changes in etiology, diagnosis, and management. *Ann Surg*. 1990;212(6):655-62.
6. Donovan AJ, Yellin AE, Ralls PW. Hepatic abscess. *World J Surg*. 1991;15(2):162-9.
7. Stain SC, Yellin AE, Donovan AJ, Brien HW. Pyogenic liver abscess: Modern treatment. *Arch Surg*. 1991;126(8):991-6.
8. Do H, Lambiase RE, Deyoe L, Cronan J, Dorfman GS. Percutaneous drainage of hepatic abscesses: comparison of results in abscesses with and without intrahepatic biliary communication. *AJR Am J Roentgenol*. 1991;157(6):1209-12.
9. Baek SY, Lee MG, Cho KS, Lee SC, Sung KB, Auh YH. Therapeutic percutaneous aspiration of hepatic abscesses: effectiveness in 25 patients. *AJR Am J Roentgenol*. 1993;160(4):799-802.
10. Seeto RK, Rockey DC. Pyogenic liver abscess: changes in etiology, management, and outcome. *Medicine (Baltimore)*. 1996;75(2):99-113.
11. Cosme A, Ojeda E, Zamarreño I, Bujanda L, Garmendia G, Echeverria R, et al. Pyogenic versus amoebic liver abscesses: a comparative clinical study in a series of 58 patients. *Rev Esp Enferm Dig*. 2010;102(2):90-9.
12. Alvarez Pérez JA, González JJ, Baldonado RF, Sanz L, Carreño G, Junco A, et al. Clinical course, treatment, and multivariate analysis of risk factors for pyogenic liver abscess. *Am J Surg*. 2001;181(2):177-86.
13. Rajak CL, Gupta S, Jain S, Chawla Y, Gulati M, Suri S. Percutaneous treatment of liver abscesses: needle aspiration versus catheter drainage. *AJR Am J Roentgenol*. 1998;170(4):1035-9.
14. Giorgio A, Tarantino L, Mariniello N, Francica G, Scala V, Amoroso P, et al. Percutaneous needle aspiration of multiple pyogenic abscesses of the liver: 13-year single-center experience. *AJR Am J Roentgenol*. 2006;187(6):1585-90.
15. Longworth S, Han J. Pyogenic liver abscess. *Clin Liver Dis (Hoboken)*. 2015;6(2):51-4.
16. Yu SC, Ho SS, Lau WY, Yeung DT, Yuen EH, Lee PS, et al. Treatment of pyogenic liver abscess: prospective randomized comparison of catheter drainage and needle aspiration. *Hepatology*. 2004;39(4):932-8.
17. Gupta SS, Singh O, Sabharwal G, Hastir A. Catheter drainage versus needle aspiration in management of large amoebic liver abscesses. *ANZ J Surg*. 2011;81(7-8):547-51.
18. Mavilia MG, Molina M, Wu GY. The evolving nature of hepatic abscess: a review. *J Clin Transl Hepatol*. 2016;4(2):158-68.
19. Heneghan HM, Healy NA, Martin ST, Ryan RS, Nolan N, Traynor O, et al. Modern management of pyogenic hepatic abscess: a case series and review of the literature. *BMC Res Notes*. 2011;4:80.

20. Mohan BP, Chandan S, Khan SR, et al. Management of pyogenic liver abscesses: contemporary strategies and challenges. *J Clin Gastroenterol*. 2023;57(8):774-81.
21. Ali FH, Dasti SD, Alaa A, et al. Percutaneous needle aspiration versus catheter drainage in the management of liver abscess: an updated systematic review and meta-analysis. *ANZ J Surg*. 2023;93(1-2):49-57.
22. Cai YL, Xiong XZ, Lu J, Cheng Y, Yang C, Lin YX, et al. Percutaneous catheter drainage versus needle aspiration for liver abscess: a systematic review and meta-analysis. *Ann Transl Med*. 2023;11(5):190.
23. Tan X, Zhang L, Wu J, et al. Percutaneous catheter drainage versus percutaneous needle aspiration for liver abscess: a systematic review, meta-analysis and trial sequential analysis. *BMJ Open*. 2023;13(7):e072736.
24. Solomkin JS, Mazuski JE, Bradley JS, et al. 2024 Clinical Practice Guideline Update by the Infectious Diseases Society of America on complicated intra-abdominal infections: risk assessment, diagnostic imaging, and microbiological evaluation in adults, children, and pregnant people. *Clin Infect Dis*. 2024;79 Suppl 3:S81-S87.
25. Mazuski JE, Solomkin JS, et al. 2024 Clinical Practice Guideline Update by the Infectious Diseases Society of America on complicated intra-abdominal infections: diagnostic imaging of suspected acute intra-abdominal abscess in adults, children, and pregnant people. *Clin Infect Dis*. 2024;79 Suppl 3:S113-S117.