



EVALUATION OF DIFFERENT TREATMENT MODALITIES FOR LIVER ABSCESS IN TERTIARY CARE CENTER IN KUMAON REGION

General Surgery

Dr Rajeev Kumar Singh	Associate Professor Department of General Surgery, Government Medical College, Haldwani, District – Nainital, Uttarakhand PIN – 263139
Dr. Prateek Shakya*	Assistant Professor, Department of General Surgery, Government Medical College, Haldwani, District – Nainital, Uttarakhand PIN – 263139 *Corresponding Author
Dr. Manoj Verma	Post Graduate Resident, Department of General Surgery, Government Medical College, Haldwani, District – Nainital, Uttarakhand PIN – 263139

ABSTRACT

Background: The aim of the study was to evaluate the clinical presentation and to compare the effectiveness of pigtail catheter drainage and percutaneous needle aspiration in the management of liver abscess.

Methods: This is a prospective randomized comparative study of 100 patients, presented in outpatient and emergency department at the hospital, randomized equally into two groups, percutaneous needle aspiration and pigtail catheter drainage. The effectiveness of either treatment was measured in terms of duration of hospital stay, days to achieve clinical improvement, 50% reduction in abscess cavity size and total/near total resolution of abscess cavity.

Results: The success rate was significantly better in catheter drainage group. The patients in pigtail catheter drainage group showed earlier clinical improvement and 50% decrease in abscess cavity volume as compared to those who underwent percutaneous needle aspiration.

Conclusion: Percutaneous catheter drainage is a better modality as compared to percutaneous needle aspiration especially in larger abscesses which are partially liquefied or with thick pus.

KEYWORDS

Liver abscess, catheter drainage, needle aspiration

INTRODUCTION

A liver abscess is a suppurative cavity in the liver resulting from the invasion and multiplication of microorganisms, entering directly from an injury through the blood vessels or by the way of the biliary ductal system. Liver abscesses are most commonly due to pyogenic, amoebic or mixed infections. Less commonly these may be fungal in origin. Prior to the availability of percutaneous drainage, pyogenic liver abscesses used to carry a high mortality despite medical treatment and surgical drainage.[1,2,3] Amoebic liver abscess (ALA) and pyogenic abscess (PLA) are common clinical problems in India and other tropical countries. Pyogenic liver abscess can be single or multiple. The right lobe is more than two times affected as compared to left while in 5% cases both lobes of liver are involved. Amoebic liver abscess occurs in population where *Entamoeba histolytica* is endemic and it affects right lobe in 80% of cases. Hepatic abscesses develop insidiously with fever, sweats, weight loss and no local signs other than painless or slightly tender hepatomegaly. In patients it presents with abrupt onset of fever, nausea, severe abdominal pain and polymorphonucleosis. Whereas pyogenic liver abscess does not show gender difference, amoebic abscess is approximately 10 times more common in male sex as compared to females. Computed tomography (CT), and ultrasound are the imaging studies of choice these patients are treated with antibiotics along with percutaneous needle aspiration (PNA) or percutaneous catheter drainage (PCD) surgical drainage being used only in patients who fail to respond to such treatment. Imaging-guided percutaneous drainage has gained increasing acceptance as an integral part of treatment. In general, surgical drainage has been reserved for patients who fail to respond to treatment with percutaneous drainage and antibiotics or who have concurrent intraabdominal pathology which requires surgical management.[4] Although mortality figures have improved over the last two decades, pyogenic liver abscesses still demonstrate a significant mortality—figures of 6–14% are typical of the more recent studies. [5] Continuous catheter drainage has been the more widely accepted technique for draining pyogenic liver abscesses,[6] while intermittent needle aspiration has been preferred by some centers.[7] We present here a prospective study in which continuous catheter drainage and intermittent needle aspiration were directly compared for the treatment of pyogenic liver abscesses.

MATERIAL AND METHODS

Patient Inclusion Criteria and Randomization

100 patients with the diagnosis of Liver abscesses based on clinical and radiological investigations admitted in Dr. Susheela Tiwari

Government Hospital, Haldwani in the study period (June 2017-june 2019) were included. Exclusion criteria were: all abscess cavities smaller than 5 cm in their greatest dimension; prior intervention; ruptured liver abscess; uncertain diagnosis; concomitant biliary tract malignancy; and uncorrectable coagulopathy. Patients included for randomization had begun intravenous antibiotic treatment at presentation with ceftriaxone 1g 8 hourly, amikacin 500 mg 12 hourly, and metronidazole 500 mg 8 hourly and had idiopathic or biliary causes for their liver abscesses. Informed consent was obtained from all participating patients. Patients fitting the inclusion criteria were alternatively allocated to two percutaneous intervention groups, for either continuous catheter drainage or intermittent needle aspiration.

Antibiotic Treatment

At presentation, all patients had been treated with intravenous ceftriaxone, amikacin, and metronidazole. The antibiotics therapy was adjusted according to the results of culture and sensitivity test of pus aspirated at the time of the drainage procedure. Patients with negative culture results were continued to be treated with same regimen. Intravenous antibiotic therapy was continued for a minimum of 7 days. The patients were then put on the appropriate oral antibiotics for a total treatment period of 6 weeks.

Intervention

All percutaneous interventions were performed under ultrasound guidance. A free hand technique using an 18G disposable trocar needle of varying lengths was employed for puncturing the abscesses. A sample of pus was routinely taken and sent for microbiological analysis including microscopy, culture, and antibiotic sensitivity tests.

Continuous Catheter Drainage

Under ultrasound guidance, the 18G needle was inserted into the liver abscess. After serial dilatation, an 8F multi-sidehole pigtail catheter was inserted into the largest cavity of the abscess. Aspiration was then performed with the catheter until no more pus could be removed. The catheter was then secured to the skin for continuous external drainage and the patient was sent back to the ward. When catheter output had stopped for 24 hours, a follow-up sonography was performed. If an abscess cavity was absent, the catheter was removed. If a residual cavity was present, the catheter was flushed with saline and aspirated until the return was clear. Residual loculations of abscess were treated with catheter repositioning and aspiration. Further sonography was performed 3 days later and the catheter was removed if the catheter had remained unproductive. Otherwise, the catheter was left *in situ* until

catheter output had stopped. Sonography was repeated every 3 days until the cavity had either disappeared or had shown reduction or stasis in size with clinical recovery. A final sonogram was performed 2 weeks later to exclude recurrence.

Percutaneous Needle Aspiration

Complete evacuation of pus from each cavity was attempted with the 18G disposable trocar needle. The needle tip was inserted into the various locules of a multi-loculated abscess for complete pus removal. Sonography was performed every 3 days and the size of the abscess(es) was recorded. Aspiration was repeated if there was either no clinical improvement or no reduction in size of the abscess cavity/cavities. The end-point of sonography and the timing of the final sonography were the same as those for the continuous catheter drainage group.

Follow-up

The patients were assessed clinically until they were discharged from the hospital or dead. Patients' response to treatment in terms of clinical symptoms and laboratory tests was monitored. The criteria of successful percutaneous intervention was defined as adequate drainage of abscess to allow resolution of infection without the need for surgical drainage and with subsequent discharge of patient from the hospital. Patient outcomes, including the duration of hospital stay, procedure-related complications, treatment failure, and death, were recorded. The patients were discharged from hospital when the infection had subsided clinically and there was sonographic evidence of abscess resolution such as disappearance of abscess cavity or static or decrease in size of abscess cavity. Afterwards, the patients were followed-up in the out-patient clinic biweekly until the course of oral antibiotics was completed without evidence of recurrent infection.

RESULTS

The 100 patients included in the study were diagnosed to have liver abscess, commenced on ceftriaxone, amikacin and metronidazole, and had liver lesions greater than or equal to 3 cm in diameter. Fifty patients were randomized into each of the catheter drainage and needle aspiration groups. The clinical characteristics and laboratory results of the 100 patients at inclusion were studied. Features such as incidence of fever, incidence of chills and rigor, body temperature of those patients with fever, incidence of epigastric or right upper quadrant abdominal pain, incidence of leucocytosis and white blood cell count in patients with leucocytosis, incidence of hyperbilirubinemia and bilirubin level in patients with hyperbilirubinemia, serum level of alkaline phosphatase, which is commonly elevated in patients with liver abscess, prothrombin time, and activated partial thromboplastin time were analysed.

Table 1. Patient Demographics

	Needle Aspiration	Catheter Drainage
Sex Male:Female	32:18	29:21
Mean Age (years)	57.00	60.00
No. of patients with co-existing disease		
Diabetes	20	9
History of gastrointestinal surgery	9	8
Cholangitis	1	2
Cholecystitis	10	11
CBD stone	10	0

Out of 100 patients, 61 were male and 39 were female. In the needle aspiration group, there were 32 male patients and 18 female patients. In the continuous catheter group, there were 29 male patients and 21 female patients. Majority of the patients belonged to the age group of 18-40 years (n=72; 49.0%). Most common comorbidity found among the patients was diabetes mellitus (n=29; 29%).

Table 2. Clinical Feature and Laboratory Results

	Needle Aspiration	Catheter Drainage
No. of patients with fever	41	36
No. of patients with chills and rigor	13	8
No. of patients with epigastric or right upper quadrant abdominal pain	19	25
No. of patients with leucocytosis	29	28
No. of patients with hyperbilirubinaemia	8	9

Most patients presented with fever in both the groups (n=77) followed by chills, rigors and right upper quadrant pain. Leucocytosis was seen in 29 patients among needle aspiration group (58%) and 28 patients among catheter drainage group (56%).

Table 3. Abscess Characteristics

	Needle Aspiration	Catheter Drainage
Size (cm)	5.55	6.15
No. of patients with abscess no. 1:2:3	37:8:5	39:10:1
No. of patients with abscess morphology Uniloculation : multi-loculation	35:15	31:19
No. of patients with positive pus culture	20	18

The number of aspirations required in the needle aspiration group was once in 37 patients (74%), twice in 8 patients (16%), and three times or more in 5 patients (10%). The abscess cavity was found to be absent in the final sonogram in half of the patients (50%) in both groups. The patients' response to treatment in terms of the time required for fever to subside and the time required for USG evidence of resolution of liver abscess. There was no procedure related complication such as hemorrhage of any degree of severity, or septicemia, in either group of patients.

Table 4. Results of Pus Culture from the Two Percutaneous Treatment Groups

Pathogenic Organism	Needle Aspiration (n = 50)	Catheter Drainage (n = 50)
Negative pus cultures	30	32
E. coli	9	11
Klebsiella	2	1
Staphylococcus	1	0
Streptococcus milleri	1	1
Combination of Klebsiella, E. coli, Staphylococcus, Streptococcus milleri	4	3
Enterobacter species	0	1
α -hemolytic streptococcus	1	0
Bacteroides fragilis	1	1
Gram negative cocci	1	0

The details of pathogenic organisms identified from pus culture, of which all were pyogenic organisms, are shown in Table 4. It was noted that negative pus culture from the abscess was more common in the catheter drainage group (32 vs. 30).

Table 5. Patients Treatment

	Needle Aspiration	Catheter Drainage
Days of parenteral antibiotics before drainage	3.50	3.00
Days of parenteral antibiotics after onset of drainage	8.50	12.00
Number of patients with antibiotics changed after sensitivity test	11	7
Total volume of pus drained from each patient in the first treatment (ml)	38.50	37.50

The duration of intravenous antibiotics administered to the patients before and after the commencement of percutaneous intervention was compared between the two groups (Table 5). It was also noted that the number of patients with antibiotics changed after pus culture and sensitivity test was fewer in the catheter drainage group (7 vs. 11) (Table 5).

DISCUSSION

Liver abscess is a major tropical disease of the gastrointestinal system [8,9]. The liver abscess is mainly classified into amebic and pyogenic. In our study we found the male to female ratio to be roughly 3: 2. The most frequently affected age group was in the third and fourth decade. The clinical presentation of the patients studied in our series was similar to the descriptions in previous reports [10]. The common symptoms and signs of liver abscess in our study were fever, right upper quadrant pain and chills & rigors. These clinical manifestations

are similar to those described in previous studies [11,12]. The pus cultures were negative in 62 of 100 patients out of which 30 patients underwent needle aspiration and 32 patients underwent catheter drainage. Aerobic cultures were declared negative after 48 h of incubation. The most frequently isolated bacteria on pus culture was *Escherichia coli* (n=20) closely followed by *Klebsiella* species (n=3). *Escherichia coli* has been reported to be the organism most frequently grown in western series [13,14]. However, Asian series have reported *Klebsiella* to be the most frequently isolated bacteria [15,16].

We performed image-guided percutaneous intervention in 100 patients with uncomplicated liver abscess and obtained good results. There was no mortality or any major complication requiring any treatment. Many solitary and some carefully selected macroscopic multiple abscesses are amenable to percutaneous abscess drainage. Several groups have reported reasonably good results with needle aspiration along with systemic antibiotics [17,18]. Giorgio et al performed on an average 2.2 aspirations in 115 patients and reported resolution of symptoms and hepatic lesions in 98% of the patients. In our study we treated 50 patients with needle aspiration along with systemic antibiotics. 50 patients were successfully treated with 37 requiring only one aspiration, 8 requiring a second aspiration and 5 patients requiring a third aspiration as well. The mean duration of time taken for clinical improvement was 5.0 days in this modality of treatment. Rajak et al [19] reported a success rate of 60% with needle aspiration.

The major advantages of needle aspiration over catheter drainage are: 1) it is less invasive and less expensive; 2) avoids problems related to catheter care; and 3) multiple abscess cavities can be aspirated easier in the same setting [20,21]. In contrast to some of the earlier reports that show that the initial size of the abscess cavity did not affect the ultimate outcome [21], larger abscesses are more difficult to evacuate completely in one attempt, necessitating subsequent aspirations [19].

Placement of an indwelling drainage catheter addresses all three of these issues as it provides continuous drainage, drains thick pus because of wider calibre catheter, and prevents re-accumulation. Both treatment modalities resulted in rapid clinical relief with most patients showing resolution of signs and symptoms within the first 3 days of the procedure. The time required for 50% reduction in the cavity size was significantly less in the catheter drainage compared to needle aspiration group (4.9 days and 7.1 days respectively). However, time required for total or near-total resolution of the abscess cavity did not show any significant difference in the two groups. It can be concluded that the abscess cavities showed faster collapse during the initial period in the catheter drainage group but it did not have an advantage as far as total or near-total resolution of cavity is concerned. Similar observations were recorded by other investigators as well [19].

Complications such as hemorrhage, pleural effusion/empyema, persistent bile drainage, catheter displacement, sepsis etc., have been reported with both needle aspiration (4% in series of Baek et al) [20] and catheter drainage (12% in the series of Lambiase et al) [21]. However, in our study and some recent studies (Rajak et al 1998 [19], Yu et al 2004 [22]), both the procedures were found to be safe if performed properly with minimal complications. There was no mortality in either of the study groups.

CONCLUSION

From this study, we can conclude that minimal invasive techniques for the treatment of liver abscess are effective in the clinical setting. Both the procedures were equally effective with minimal risk of complications and mortality.

REFERENCES

- Huang CJ, Pitt HA, Lipsett PA, Osterman FA Jr, Lillemo KD, Cameron JL, Zuidema GD. Pyogenic hepatic abscess: changing trends over 42 years. *Ann Surg* 1996; 223: 600–609.
- Pitt HA, Zuidema GD. Factors influencing mortality in the treatment of pyogenic liver abscess. *Surg Gynecol Obstet* 1975; 140: 228–234.
- Bertel CK, van Heerden JA, Shedy PF 2nd. Treatment of pyogenic hepatic abscesses. Surgical vs percutaneous drainage. *Arch Surg* 1986; 121: 554–558.
- McCorkell SJ, Niles NL. Pyogenic liver abscesses: another look at medical management. *Lancet* 1985; 1: 803–806.
- Yu SCH, Lo RHG, Kan PS, Metreweli C. Pyogenic liver abscess: treatment with needle aspiration. *Clin Radiol* 1997; 52: 912–916.
- Rajak CL, Gupta S, Jain S, Chawla Y, Gulati M, Suri S. Percutaneous treatment of liver abscesses: needle aspiration versus catheter drainage. *Am J Roentgenol* 1998; 170: 1035–1039.
- Baek SY, Lee MG, Cho KS, Lee SC, Sung KB, Auh YH. Therapeutic percutaneous aspiration of hepatic abscesses: effectiveness in 25 patients. *Am J Roentgenol* 1993; 160: 799–802.

- Cook GC. Gastroenterological emergencies in the tropics. *Baillieres Clin Gastroenterol*. 1991;5:861–886.
- Reeder MM. Tropical diseases of the liver and bile ducts. *Semin Roentgenol*. 1975;10:229–243.
- Hughes MA, Petri WA., Jr Amebic liver abscess. *Infect Dis Clin North Am*. 2000;14:565–582. viii.
- 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;86:405–412.
- Barnes PF, De Cock KM, Reynolds TN, Ralls PW. A comparison of amebic and pyogenic abscess of the liver. *Medicine (Baltimore)* 1987;66:472–483.
- Seeto RK, Rockey DC. Pyogenic liver abscess. Changes in etiology, management, and outcome. *Medicine (Baltimore)* 1996;75:99–113.
- Alvarez Pérez JA, González JJ, Baldonado RF, et al. Clinical course, treatment, and multivariate analysis of risk factors for pyogenic liver abscess. *Am J Surg*. 2001;181:177–186.
- Chou FF, Sheen-Chen SM, Chen YS, Chen MC. Single and multiple pyogenic liver abscesses: clinical course, etiology, and results of treatment. *World J Surg*. 1997;21:384–388. discussion 388–389.
- Wong W-M, Wong BCY, Hui CK, et al. Pyogenic liver abscess: retrospective analysis of 80 cases over a 10-year period. *J Gastroenterol Hepatol*. 2002;17:1001–1007.
- Giorgio A, Tarantino L, Marinello N, et al. Pyogenic liver abscesses: 13 years of experience in percutaneous needle aspiration with US guidance. *Radiology*. 1995;195:122–124.
- Stain SC, Yellin AE, Donovan AJ, Brien HW. Pyogenic liver abscess. Modern treatment. *Arch Surg*. 1991;126:991–996.
- Rajak CL, Gupta S, Jain S, Chawla Y, Gulati M, Suri S. Percutaneous treatment of liver abscesses: needle aspiration versus catheter drainage. *AJR*. 1998;170:1035–1039.
- Baek SY, Lee MG, Cho KS, Lee SC, Sung KB, Auh YH. Therapeutic percutaneous aspiration of hepatic abscesses: effectiveness in 25 patients. *AJR*. 1993;160:799–802.
- Do H, Lambiase RE, Deyoe L, Cronan JJ, Dorfman GS. Percutaneous drainage of hepatic abscesses: comparison of results in abscesses with and without intrahepatic biliary communication. *AJR*. 1991;157:1209–1212.
- Yu SCH, Ho SSM, Lau WY, et al. Treatment of pyogenic liver abscess: prospective randomized comparison of catheter drainage and needle aspiration. *Hepatology*. 2004;39:932–938.