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Original Research Article

A comparative study of liver abscess: therapeutic aspiration verses continuous catheter drainage

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ABSTRACT

Background: Previously liver abscesses were treated primarily by surgery but with advances in imaging techniques the trend is changing towards use of potent antimicrobials and minimally invasive ultrasound guided interventional procedures and surgery is being done only in selected cases. We conducted this study to find out the feasibility, limitations, effectiveness, outcome and complications of therapeutic needle aspiration and continuous catheter drainage of liver abscess.
Methods: This was a hospital based randomized control prospective study in which patients with liver abscess were included. 100 patients of liver abscess selected by simple randomization to 2 groups namely Group A (needle aspiration) or Group B (continuous catheter drainage) undergo the above two interventional procedures. For statistical purposes P value less that 0.05 was taken as statistically significant.
Results: This study consisted of 100 patients out of whom there were 78 (78%) males and 22 (22%) females with a M:F ratio of 1:0.28. Single hepatic abscess (75%) was more common than multiple abscesses (25%) and pyogenic abscess (67%) was more common than amoebic abscess (33%). Right lobe of liver was most commonly involved (61%) followed by left lobe (22%). All patients in both the groups were treated successfully and there was no treatment failure in any of the groups.
Conclusions: Therapeutic needle aspiration as well as continuous catheter drainage both are equally effective in management of liver abscess but needle aspiration had the advantage of being less expensive, easily available and requiring less hospital stay.

Keywords: Continuous catheter drainage, Hepatic abscess, Outcome, Therapeutic needle aspiration

INTRODUCTION

Liver abscess is a disease of frequent occurrence which figures predominantly in the differential diagnosis of upper abdominal and right lower respiratory tract diseases. Liver abscess had been recognized since Hippocrates. In the past century difficulty in the diagnosis and inadequate treatment regimens had led to significant morbidity and mortality.[1] Despite advances in diagnostic and therapeutic modalities, in developing countries like India, it still leads to significant morbidity and mortality.[2] In earlier period hepatic abscess used to be seen generally in elderly population usually in their 5th or 6th decades of life and used to be seen as a complication of appendicitis but recently the demography of liver abscess is shifted and younger population is getting affected. The incidence of hepatic abscess is comparatively more in patients with HIV infections, patients on immunosuppressive or prolonged steroid therapy.[3]

Liver abscess is a suppurative cavity in the liver resulting from invasion and multiplication of microorganisms, entering directly from an injury through the blood vessels

or by way of the biliary ductal system. Abscesses develop in the liver due to various reasons but are broadly classified into Amoebic and Pyogenic.[4] Less commonly these may be fungal in origin. Irrespective of the etiology the patient may present with clinical features such as right upper quadrant pain, jaundice, fever, vomiting and malaise. Weight loss may also be prominent feature in these patients.[5] The clinical features may develop gradually or there may be a rapid progression causing dramatic deterioration of general health of the patient. Generally in immunocompromised individuals hepatic abscess may have a more aggressive course.[6]

Ultrasonography and CT scanning play a vital role in the diagnosis and the management of the disease. On ultrasound liver abscess may present as predominantly hypoechoic lesion with internal echoes. Gas bubbles may be seen on ultrasound. Color Doppler characteristically will show absence of central perfusion. Computerized tomography may precisely localize the hepatic abscess which may present as centrally hypoattenuating showing peripheral rim enhancement after contrast injection. While advances in radiological techniques, treatment modalities also have changed from open surgical drainage to minimally invasive radiological drainage procedures. Open surgical drainage is rarely required today. Amoebicidal and appropriate antibiotic drugs have improved the management of the liver abscess.[7]

The options in managing this disease are medical management, percutaneous aspiration, drainage and open surgical drainage. A lot of research has been published locally as well as in international journals describing about different approaches in the management of the disease. Other underlying disease may give rise to pyogenic liver abscess which should be managed accordingly. There are different views and protocols for the management of this disease.[8]

This study was designed to find out the feasibility, limitations, effectiveness, outcome and complications of the two interventional procedures namely: therapeutic needle aspiration and continuous catheter drainage for a particular patient with reference to the clinical presentation of the different types of liver abscess. Several other factors were also analyzed in detail. All these problems were discussed, analyzed and compared in detail to get a conclusion. Effective management of the disease will help in decreasing morbidity and mortality associated with the disease and will also help in finding the ways of decreasing the incidence of the disease.

METHODS

This was a hospital based randomized control prospective study conducted in the department of surgery of a tertiary care medical college situated in an urban area in which cases of liver abscess were included on the basis of a predefined inclusion and exclusion criteria.

All patients with liver abscess were diagnosed with help of clinical syptoms, signs and radiological investigations. Detailed clinical history of patients was taken with special emphasis on past history of alcoholism, diabeted mellitus, HIV, HbsAg, billiary tract stenting, cholelithiasis, sickle cell anemia, tuberculosis, ENT infection, dental infection, gall bladder disease, blunt trauma abdomen, malignancy and other causes. Patients were subjected to detailed clinical examination to assess vital parameters, abdominal examination and systemic examinatoin. All baseline blood examination (Hemogram, coagulation profile, HIV I and II, HBsAg etc.), biochemical examination (Blood sugar level, liver function tests, renal function test etc.), microbiological examination (routine and culture of pus drained out through either intervention) etc. Ultrasongraphy abdomen, pelvis and thoraz was done in all patients. Chest radiograph done in patients with respiratory problem and to know pleural effusion, raised dome of diaphragm, consolidation. Pleural effusion managed by medicalor therapeutic aspiration or intercostals drainage tube, or thoracoscopy. CT scan abdomen done in doubtful case, patients with abdominal pathology blunt abdominal trauma etc.

All patients of liver abscess underwent USG guided diagnostic tap to confirm the diagnosis and to differentiate between PLA and ALA. Aspirated pus was send for culture and sensitivity. All patients received inj. Ciproflozacin 400 mg 12 hourly, inj. Metronidazole 1000 mg 8 hrly and later on depending on culture-sensitivity report combination of appropriate antibiotics were given. If no organisms were found on culture h=the above antibiotics were continued. Patients were also given analgesics, antipyretics, antacid and treatment of associated conditions. Antibiotics were continued for 15 days or till sonographically detected complete resolution of abscess.

100 patients of liver abscess were divided on the basis of interventional procedures alloted to each of them by simple randomization procedures. USG guided aspiration of liver abscess & USG guided pigtail catheter drainage was done in 50 patients each. Patients not suitable for the procedure were excluded from the study. Written informed consent was taken from all the patients before starting the procedure.

Ultrasound guided aspiration of liver abscess

Patient was kept in spine position inj. Atropine 0.6 mg I.M, was given. Cleaning and draping was done. Liver abscess was localized with transducer and needle introduced into abscess cavity. Presence of needle in the abscess cavity was confirmed by a giving way sensation, scanning needle tip echo, and the free flow of pus. Trocar was removed and syringe was applied. Pus sample was collected in a sterile bottle for microscopy and culture sensitivity and the pus was drained till the cavity

collapsed (as confirmed by ultrasound) or till no more pus was aspirated.

Percutaneous pigtail catheter drainage

Intravenous line established and inj. Atropine 0.6 mg I.M, was given. Depending upon the abscess to be drained, the patient was given appropriate position. With all aseptic precaution the abscess cavity was located and approach decided, avoiding important structure, a direct easily accessible and safe path was chosen. Depth of the abscess from skin appropriate angle of the approach and the exact site of puncture was determined. Local anesthesia with 2% xylocaine was given to raise small wheal and then at site puncture a small cut was given on the skin with the blade of scalpel. Serially dilator no 6,8,10 passed over guide wire and the passage. Pigtail catheter no. 10 passed over guide into abscess cavity and position of tip of pigtail catheter inside the abscess cavity confirmed by USG. Guide wire removed. Pus aspirated from pigtail catheter and Pigtail catheter fixed to skin with skin 1-0 r/c and attached to pus collecting bag. Cleaning and dressing was done.

The patients were discharged from hospital when the infection had subsided clinically and there was sonographic resolution such as dissapearance of abscess cavity or static or decrease in size of abscess cavity. Tube drain (catheter if placed was removed if cathter output was <20 cc for 3 days with consequent decrease in volume of abscess cavity. All patients were started on appropriated antibiotics and antihemlmenthics depending upon culture and sensivity. Thereafter, all patients were followed up every 15 days in out-patient clinic upto 2 months until course of oral antibiotics was completed. Statistical software STATA version 14.0 was used for data analysis. For statistical purposes p value less than 0.05 was taken as statistically significant.

Inclusion criteria

All consenting cases of liver abscess admitted in surgery wards, diagnosed on basis of history, clinical signs &symptoms, and investigations.

Volume of abscess >100 cc.

Exclusion criteria

Exclusion criteria were non consenting patients; patients managed conservatively; patients who underwent surgical procedures; patients lost to follow up.

RESULTS

In this study 100 cases of liver abscess were included on the basis of a predefined inclusion and exclusion criteria. Out of 100 patients there were 78 (78%) males and 22 (22%) females with a M:F ratio of 1: 0.28 (Figure 1).

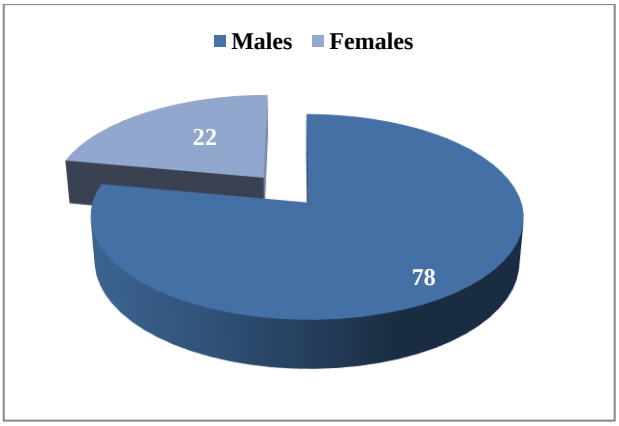

Figure 1: Gender distribution of the studied cases.

A total of 100 patients were treated either by Ultrasound guided aspiration of liver abscess (50%) or Percutaneous pigtail catheter drainage (50%) (Table 1).

Table 1: Distribution of study subjects by type of drainage.

Type of treatment	No of patients	Percentage (%)
Ultrasound guided aspiration of liver abscess	50	50
Percutaneous pigtail catheter drainage	50	50
Total	100	100

The most common age group in both groups was found to be in the 4th decade (41–50) years. The mean age in Group A was found to be 42.14±11.50 where the mean age in group B was 46.76±13.56. The mean age in both the groups were found comparable and there was no statistically significant difference in the age of both the groups (Table 2).

Table 2: Age distribution of the studied cases.

Age in years	Group-A	Group-B
11-20	3	2
21-30	5	2
31-40	13	13
41-50	17	13
51-60	9	10
61-70	3	9
71-80	0	1
Total	50	50
Meanage±SD	42.14±11.50 (15 - 63)	46.76±13.56 (16 - 74)
P value 0.1606, Not Significant		

The commorbidities in either group was similar with alcohol and diabetes topping both charts followed by smoking. The analysis of co-morbidities presents in both the cases showed that they were comparable and there

was no statistically significant difference in both the groups as far as co-morbidities were concerned (Table 3).

Table 3: Co-morbidities in the studied cases.

Comorbidity	Group-A	Group-B	P value
Alcohol	14	18	0.525 *
Diabetes	11	11	1.000 *
Smoking	6	3	0.487 *
HIV	5	0	0.056 *
SIC	2	0	0.495 *
TB	1	6	0.111 *
APP	1	2	1.000 *
HBsAg	1	2	1.000 *
C & C	1	1	1.000 *
Calculi	1	0	1.000 *
Dental	1	0	1.000 *

*(Not Significant)

The analysis of characteristics of hepatic abscess showed that multiple abscesses were more common in group B (36%) as compared to group A (14%). The difference was found to be statistically significant. Pyogenic and amoebic abscess was seen in 35 (70%) and 15 (30%) patients in group A where as in group B Pyogenic and amoebic abscess was seen in 32 (64%) and 18 (36%) patients. The difference was not found to be statistically significant (p>0.05). There was no statistical difference in the two groups regarding the site of abscess cavity. But in both groups the right lobe was involved more than either the left lobe or bilateral lobes. In our study most of continuous catheter drainage cases had a very large volume of liver abscess compared to therapeutic aspiration group. And the difference in volume of pus was found to be statistically significant (Table 4).

The analysis of clinical features and investigations of the studied cases showed that pain was universally present in both the groups. 50 (100%) and 49 (98%) of the patients had pain at the time of presentation. The other common signs and symptoms included fever, leukocytosis and vomiting which was seen in 78%, 76% and 70% in group A and 76%, 88% and 70% in group B patients. Anemia was present in 40 (80%) and 34 (68%) patients in group A and group B patients respectively. The less common features included hypernatremia, raised alkaline phosphatase levels and raised bilirubin levels. There was no statistically significant difference in any of the clinical feature or investigation in both the groups (Figure 2).

Table 4: Characteristics of abscess in the studied cases.

	Characteristic	Group A	Group B	
Number	Single	43	32	Chi2=7.9496 P=0.012, Significant
	Multiple	7	18	
Type	Pyogenic	35	32	Chi2=0.4071 P=0.523, Not Significant
	Amoebic	15	18	
Site	Right	29	32	Chi2= 2.3133 P=0.315, Not Significant
	Left	14	8	
	Both	7	10	
Volume	Mean	253.72±93.53	481.2±152.78	P<0.0001 Highly Significant

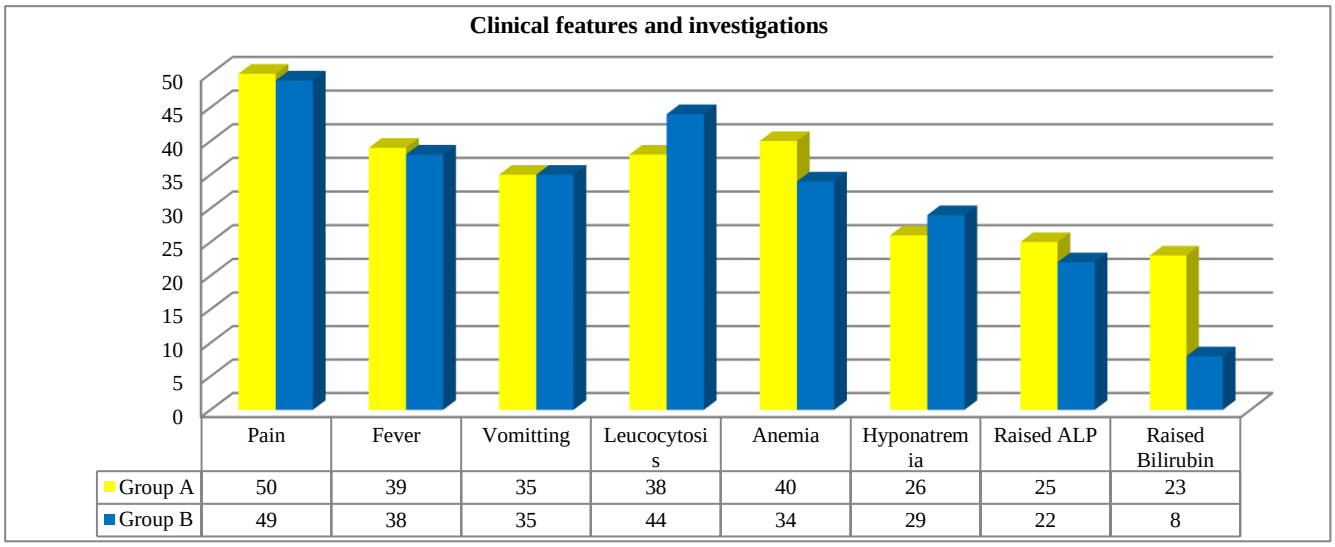

Figure 2: Clinical features and investigations in the studied cases.

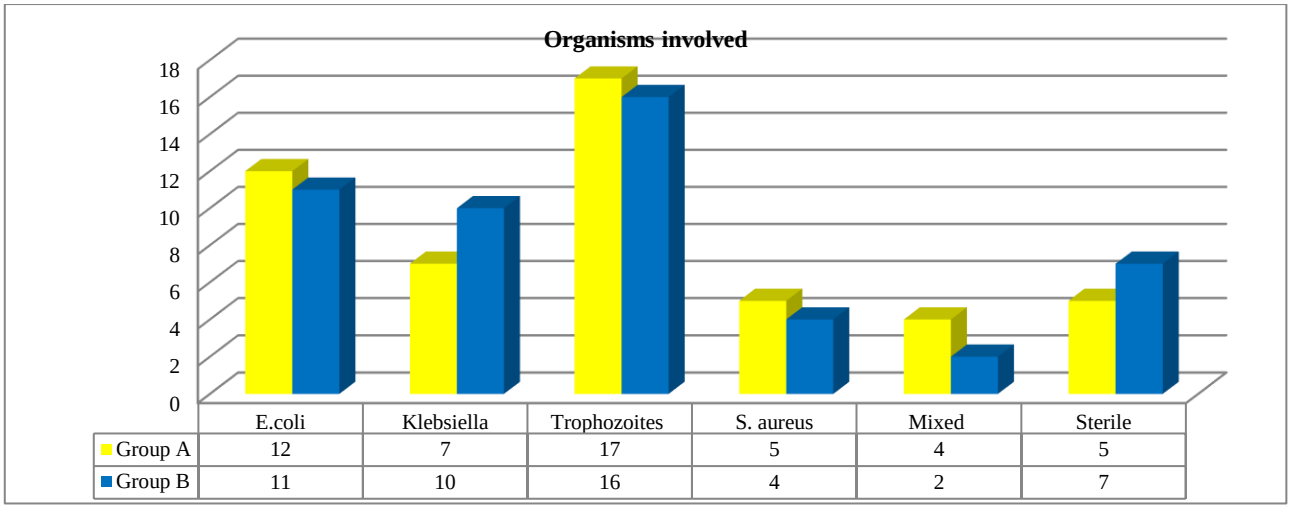

Figure 3: Organisms found on culture in the studied cases.

Table 5: Comparison of the complications in both the groups.

	Characteristic	Group A	Group B	
Outcome	Success	50	50	P=1 Not Significant
	Failure	0	0	
Hospital Stay	Mean Hospital Stay	6.06±3.73	13.24±5.53	<0.0001, HS Significant
Complications	Pain	17	12	P>0.05 Not Significant
	Bleeding	6	7	
	Bile drainage	2	1	
	Pleural damage	0	2	

The analysis of organsism involved showed that trophozoites were the most common cause ob absces in group A (34%) as well as group B (32%). The other common organisms involved were *E.Coli* (24% in group A and 22% in group B) and *klebsiella* (14% in group A and 20% in group B). As per the study there was no difference in the growth of organisms in the two groups (Figure 3).

The analysis of outcome showed that there was no statistically significant outcome in both the groups. All the patients were successfully treated in both the groups and there was no patient who had to undergo any other intervention. The mean hospital stay in group A was 6.06±3.73 whereas in group B this mean hospital stay was 13.24±5.53. Hospital stay was significantly less in group B as compared to group A ($p<0.0001$). Complication rates were found to be comparable in both the groups and there was no statistically significant difference in the complication rates of both the groups (Table 5).

There were some complications which were specific to continuous catheter drainage cases and were added in the complication category of the study. The most common complication seen in this category was tube blockage (6%) followed by catheter re-insertion (4%). Bile drainage, accidental removal and peri-cathter leakage was seen in 1 (2%) patients each (Table 6).

Table 6: Complications specific to the group undergoing continuous catheter drainage.

Complication	No. of patients	(%)
Bile drainage	1	2.0
Catheter re-insertion	2	4.0
Blockage	3	6.0
Accidental removal	1	2.0
Peri catheter leakage	1	2.0
Total	8	16.0

DISCUSSION

According to our institute's data total number of hospitalized during study period was 1, 80,000. The incidence of liver abscess was found to be 77/ 1, 00,000 hospital admissions. Mohsen et al, found that annual incidence of liver abscess in UK was 2.3 per 1, 00,000 people per year. NW Pearce reported incidence of PLA 20 per 1,00,000 hospital admissions in a western population.[9,10] Similar incidence rates were reported by Sharma et al.[11] Mean age of presentation in our study was 39.41 year, with range between 12 years to 78 years. Tsai et al[12] found that ages of patients ranged from <1 through 106 years of age, with a median age of 61 years. Khan et

al, they studied liver abscess from 1995 to 2004 with mean age 43±17 years.[13]

In our study 78(78%) were males and 22(22%) were females with male: female ration 5.5:1. This ratio was same in both groups and more incidence of males in both groups. Khan et al, studied 966 liver abscess patients from 1995 to 2004 and found that there was a male predominance.[13] Out of the 966 cases there were 738 (76%) males and 228 (24%) females.

In present study, pain in abdomen was found in 100 (100%), fever in 77 (77%), vomiting in 69 (69%). The frequencies of the above features were similar in both groups. Cosme et al, found that in amoebic cases the associated features were being aged 45 or younger and presence of diarrhea.[14] Khan et al, found that the most common symptom in cases of hepatic abscess was fever (81.66%).[15]

Depending upon the result of diagnostic tap we divided the liver abscess into two groups. In our study pyogenic liver abscess was found to be a little more than amoebic liver abscess. But in both in needle aspiration and continuous catheter drainage groups the difference was not that profound. It was found that it was not statistical significant. Mohsen et al, found that out of 69 patients of liver abscess, pyogenic liver abscess and amoebic liver abscess found in 65 and 4 patients respectively.[9]

In our study 60% cases presented with right lobe of liver where as 23% in left lobe and 17% were affecting both lobes of liver. There was no statistical difference in the two groups also regarding the involved lobe. Right lobe was involved more than the left lobe in either cases. Cosme et al, found that there was a single abscess in 10 patients and all expect one were located in right lobe.[14]

In our study 75 (75%) of cases presented with single abscess and 25 (25%) patients had multiple abscess. Chou they studied 483 patients out of which 343 were single abscesses and 140 were multiple abscesses.[16]

In our study the cases in needle aspiration were found to have less volume of abscess than compared to that in catheter group. The statistical difference was high ($p \leq 0.0001$). Khan et al found that volume of pus drained by first sitting by catheter group was significantly more than needle aspiration group ($p=0.0001$).[15]

In our study ultrasonography was sensitive in 100 (100%) patients for detecting liver abscess. Mohsen et al found that abdominal ultrasound was diagnostic for liver abscess in >90% of cases.[9]

In present study pus culture was positive in 64 cases. Out of 100 cases of PLA i.e. in 64%. Organisms grown were *E. coli* 23(23%), *Staphylococcus aureus* 7 (7%), *Pseudomonas* 7 (7%), *Klebsiella* 17 (17%), mixed 16 (5.90%). Barrio J[17] et al (2000) found that pus culture was positive in 77.1% with 44.4% involved multiple organism. *E. coli* and *Stretococcus milleri* were the germs isolated most frequently in patients of pyogenic liver abscess.

In our study, 100 patients were given treatment according to randomization done at beginning at time of diagnosis. The success rate was equal i.e. 100% in either the pyogenic or the amoebic type of abscesses. Ramani et al, found that ultrasound guided aspiration is safe and diagnostic and therapeutic approach which enhances clinical recovery, accelerates, especially in large abscesses and prevents complications.[18] Similar Findings were reported by McGarr, Giorgio et al.[19,20] Outcome and complications of both the groups were found to be comparable.

CONCLUSION

Pyogenic liver abscess is a common occurrence in developing countries. Managemnt either by needle aspiration or continuous catheter drainage or by is equally effective in management of liver abscess but needle aspiration being less expensive, easily available, has a slight advantage over continuous catheter drainage. The only disadvantage of needle aspiration is increased pain related to repeated number of aspirations compared to continuous catheter drainage. Patients with catheter drainage have a relatively longer hospital stay than aspiration cases.

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