Research Article

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Liver abscess: catheter drainage v/s needle aspiration

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ABSTRACT

Background: The aim of the study was to evaluate the clinical presentation, and to investigate the effectiveness of continuous catheter drainage in comparison to needle aspiration in the treatment of liver abscesses.

Methods: This is a comparative study of 121 patients, presented in outpatient and emergency department at the hospital, randomized double blind trial was done and divide into two groups (percutaneous needle aspiration and pigtail catheter drainage.) about which surgeon did not knew about the division it was marked by evaluator. The effectiveness of either treatment was measured in terms of duration of hospital stay, days to achieve clinical improvement, 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 decrease in abscess cavity volume as compared to those who underwent percutaneous needle aspiration.

Conclusions: 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

Liver is an important and vital organ of the body. This organ is subjected to numerous systemic infections viral, bacterial and parasitic and lies at the distal end of the portal circulation. Liver abscess has been recognized since Hippocrates (circa 400 B.C.) who speculated that the prognoses of the patients were related to the type of fluid within the abscess cavity.

Liver abscesses are infectious, space-occupying lesions in the liver; the two most common abscesses being pyogenic and amoebic. Pyogenic Liver Abscess (PLA) is a rare but potentially lethal condition; its severity depends on the source of the infection and the underlying condition of the patient. Amoebic Liver Abscesses (ALA) are common in tropical regions mainly where 'Entamoeba histolytica' is endemic and is more prevalent in individuals (mostly young males) with suppressed cell mediated immunity.³ Right lobe of the liver is the most likely site of infection in both type of liver abscesses. The clinical presentation of both the types may be elusive with combination of fever, right upper quadrant pain and hepatomegaly with or without jaundice.

Liver abscesses continue to be an important cause of morbidity and mortality in tropical countries. However, recent advances in interventional radiology, intensive care, progress in antibiotic therapy, and use of

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sonography and computerized tomography scanning of the abdomen have led to early diagnosis and treatment of patients with liver abscess, thus improving the patient outcome.

Previously liver abscess was regarded as a high morbidity disease requiring open surgical drainage, with mortality rates between 9% and 80%. If untreated, it was uniformly fatal. In the last quarter of a century we have witnessed a major paradigm shift in the management of pyogenic hepatic abscesses/amoebic liver abscesses, with a concomitant decrease in mortality to 5-30%.

Percutaneous drainage of liver abscess has been an important advancement and is traditionally use in the treatment of both type of liver abscesses.

METHODS

This was a randomized comparative study conducted in the department of surgery collaborated with the department of radiology of Jeevan Jyoti hospital, Allahabad, U.P. India, from 4^{th} February 2012 to 31^{st} July 2014.

Fifty subjects for liver abscess drainage were randomly divided into two groups. Group (I) was assigned for percutaneous needle aspiration (n=52) and (II) was assigned for pigtail catheter drainage (n=69).

Inclusion and exclusion criteria

The patients were selected from outpatient department and emergency department of hospital. All the patients were diagnosed to have liver abscess by clinically and ultrasonography (USG) or CT scan. The age groups of patients were 16 to 60 years were included in the study.

The patients having abscess cavity smaller than 5 cm, ruptured liver abscess, biliary tract malignancy and uncorrectable coagulopathy were excluded from the study.

An informed consent was obtained from the participating patients and all the consenting patients were started on medical treatment as per our protocol.

Detailed clinical history and clinical investigation including complete blood count, liver function test, prothrombin time, International Normalized Ratio (INR), blood culture, amebic serology, chest X-ray, abdomen USG with or without CT (as per indication of patients) were done for all subject fulfilling the inclusion criteria and after procedure all investigation done including pus culture.

All participating patients with valid consent and predetermined intervention were carried out as follows: The percutaneous procedures were carried out under local anesthesia (2% lignocaine) with IV analgesia and sedation if required. The procedures were carried out under continuous real-time USG guidance using LOGIQ P 5 ultrasound machine.

130 patients were enrolled, and after assessment 9 patients were excluded due to presence of hydrated cyst thus study was conducted on only 121 cases.

PNA

The patient was subjected to USG of the abdomen and the characteristics of the abscess cavity (IES) were recorded. Local anesthesia was infiltrated at the proposed puncture site using a 23 G needle. Under real-time USG guidance and using 16/18 G BD spinal needle (Becton Dickinson, Pvt. Ltd. New Delhi India) the abscess cavity was entered and pus was aspirated till no more pus could be aspirated further. A sample of pus was sent for gram stain, culture and sensitivity. A dressing was applied at the needle puncture site.

PCD

The PCD was accomplished by placing a 28-Fr pigtail catheter in the abscess cavity under USG guidance using the Seldinger technique. The patient was subjected to USG of the abdomen and the characteristics of the abscess cavity (IES) were recorded. Local anesthetic was infiltrated in the proposed area of puncture. Using a No. 11 blade a small stab was made on the anesthetized skin. A percutaneous Suprapubic pigtail catheter set (Blue Neem, Medical Devices Pvt. Ltd. Bangalore, India) with a 28 Fr catheter was used for drainage. Under real time sonographic guidance the initial puncture needle (14/16/18 G, 25 cm long with three parts) was inserted through the skin stab and guided to the center of the abscess cavity. The stylet was taken out and pus was aspirated to reconfirm the position and the aspirated pus was sent to the lab for testing. A decision to remove the pigtail catheter was made when the total drainage from the catheter decreased to less than 10 mL/24 h for two consecutive days.

Follow up

The patients were followed up weekly for a month, monthly for three months and at the end of six months, for clinical evaluation and USG assessment of abscess cavity until complete resolution of the abscesses was achieved. Data was collected and recorded in the printed proforma by the investigator.

Statistical analysis

The effectiveness of treatment was measured in terms of: duration of hospital stay; days to achieve clinical improvement; days to achieve 50% reduction in abscess cavity size; and days to achieve total/near total resolution of abscess cavity. Independent t- test was used to analyze these parameters.

The level of significance was set at P <0.05. Volume of abscess cavity and duration of drainage were also analyzed and range and mean values were calculated for both the parameters.

RESULTS

A total of 121 patients randomized into two groups of 52 for needle aspiration and 69 for catheterized drainage were included in the study. The following observations were made:

Age and sex

The age of the patients varied from 20 years to 60 years with most of the patients falling within the age range from 31-40 years (96 patients). The second most common age group was 21-30 years (25 patients) and the number of patients was less in extremes of age.

There were 110 male and 11 female patients with liver abscess involved in the study. The male to female ratio was 10:1.

Symptoms and signs

It was observed that out of 121 patients 117 (97%) patients have fever, 113 (93%) anorexia; nausea/vomiting 108 (89%), pain in the right upper quadrant of the abdomen was found in 102 (84%) cases. Weakness 99 (82%), 69 (57%) weight loss 29 (58%), night sweats 58 (48%), dyspnea 52 (43%), diarrhea 48 (40%), rigors 30 (25%), cough 24 (20%) and pain in the right shoulder region was observed in 21 (17%) cases (Table 1).

Table 1: Symptoms in order of decreasing frequency.

Symptom	No. of patients	Percentage		
Fever	117	97		
Anorexia	113	93		
Nausea/vomiting	108	89		
Right upper quadrant pain	102	84		
Weakness	99	82		
Weight loss	69	57		
Night sweats	58	48		
Dyspnea	52	43		
Diarrhea	48	40		
Rigors	30	25		
Cough	24	20		
Right shoulder pain	21	17		

Type of abscess

Mixed type of liver abscesses 103 (85%) were predominant over amebic 12 (10%) and indeterminate 6 (5%). All pyogenic was found in association with amebic etiology (Table 2A, 2B).

Table 2A: Type of abscess accordance with amebic serology and pus culture.

Etiology	Amoebic serology result	Pus culture result
Amebic	+	-
Pyogenic	-	+
Amoebic with secondary infection	+	+

Table 2B: Type of abscesses in each group.

	Amoebic	Pyogenic	Mixed	Indeterminate
PNA	5	45	45	2
PCD	7	58	58	4

Number of abscess

Out of 121 subject we found that only 15 (12.4%) having the single abscess and remaining 106 (87.6%) having the multiple abscess.

Location of abscess

In total 121 patients, 99 (82%) patients have abscess in right lobe, 15 (12%) patients have abscess in left lobe and remaining 7 (6%) having abscess in both lobes.

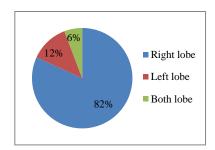


Figure 1: Location of abscess.

Interventions and their results

A total of 121 patients underwent either of the two percutaneous procedures randomly and their response to treatment was recorded and analyzed (Table 3). Pigtail percutaneous drainage was successful in all the cases (69). On the other hand, image-guided needle aspiration was successful only in 40 of 52 patients (P < 0.005). In the PNA group, on comparing the cavity volumes the mean cavity volume in those who were successfully treated was 358 ± 136 cc which was significantly less than those failing treatment; the mean volume being 405 \pm 11 cc (P < 0.005). The patients in PCD group showed earlier clinical improvement 4.2 ± 1.7 days and 50%decrease in abscess cavity volume 5.0 ± 1.3 days as compared to PNA group. However, there was no significant difference between the duration of hospital stay or the time required for total or near-total resolution of cavity.

Table 3: Intervention and their results.

Parameter	Percutaneous needle aspiration		Pigtail catheter drainage		P value
1 at affects	No. of patients	Mean ± SD	No. of patients	Mean ± SD	1 value
Volume of the largest cavity (c.c.)	52	358 ± 136	69	405 ± 118	< 0.005
Duration of drainage (days)	52	NA	69	9.8 ± 3.5	NA
Clinical improvement (days)	52	5.5 ± 2.2	69	4.2 ± 1.7	< 0.005
Time for 50% reduction in cavity size (days)	52	7.5 ± 2.4	69	5.0 ± 1.3	< 0.005
Time for total or near total resolution of cavity (weeks)	52	10.6 ± 3.5	69	10.1 ± 4.2	>0.005
Hospital stay (days)	52	9.6 ± 4.5	69	10.8 ± 3.5	>0.005
Success	52	77%	69	98%	< 0.005

DISCUSSION

In gastrointestinal system liver abscess is a major tropical disease.⁵ The liver abscess is mainly classified into amebic and pyogenic. Pyogenic liver abscess which used to be mainly tropical in location is now more common due to increased biliary interventions, stenting, cholecystitis, cholangitis etc. Liver abscess is 3 to 10 times more common in men.⁶

In our study we found the male to female ratio to be 10:1. The most frequently affected age group was in the 30 to 40 year the male female ratio was 7:1 and the most frequently affected age group was 30-40 year have been mentioned by Sukhjeet Singh et al.⁷

The clinical presentation of the patients studied in our series was similar to the descriptions in previous reports. The common sign and symptom in our study were anorexia (93%), right upper quadrant pain and tenderness (84%), weakness (82%), and fever in 97% cases, similar report were made by previous studies.⁷⁻⁹

In our study we found 10% of the abscesses to be amebic in etiology, 5% to be indeterminate and 85% to be amebic with secondary bacterial infection (or mixed liver abscess, MLA), all pyogenic was found in association with amebic infection, no any cases were found to be infected with only pyogenic, this was controversy to Sukhieet Singh et al. who reported 58% of the abscesses to be amebic in etiology, 23% to be pyogenic, 12% to be indeterminate and 7% to be amebic with secondary bacterial infection, ⁷ and Khan et al. reported 68% amebic, 21% pyogenic, 8% indeterminate, and 3% MLA. The use of serological testing for diagnosis of amebic liver abscesses can occasionally lead to either false negative results early in the course of the disease, due to delay in rise of antibody titer, or to false positives due to background subclinical amebic infections. Consideration of high titers for diagnosis may help exclude these false positives. 11 The pus cultures were negative in 35 of 121 patients. Aerobic cultures were declared negative after 48 h of incubation. There were 4 patients (3%) in whom the

amebic serology as well as pus cultures were negative. As several of our patients prior to reporting to our hospital had been given antibiotics as well as antiamoebic drugs, this might explain the finding of 5% cases with indeterminate etiology. Similar data have been reported by Khan R et al. ¹⁰

In our study, 82% of the abscesses were located in the right lobe of liver, 12% in left lobes and 6% in both lobes which was similar to previous studies. ^{7,8,12}

We performed image-guided percutaneous intervention in 121 patients with uncomplicated liver abscess. There was no mortality and no any major complication requiring any treatment.

In our study we treated 52 patients with PNA along with systemic antibiotics. Out of 52 patients 40 patients were successfully treated. In these the mean volume of largest cavity was 358 ± 136 c.c., clinical improvement were seen within mean time of 5.5 ± 2.2 days, mean time taken to reduce the cavity size up to 50% was 7.5 ± 2.4 days, time taken to resolution of total cavity size was 10.6 ± 3.5 days, the average hospital stay time was 9.6 ± 4.5 days. Unsuccessful of cases may be due to use of alcohol. A study done by Sukhjeet Singh et al. showed approximate same result the reported success rate of 77%, the mean volume of largest cavity was 249 ± 121 c.c., clinical improvement were seen within mean time of 5.5 ± 1.9 days, mean time taken to reduce the cavity size up to 50% was 7.1 ± 2.3 days, time taken to resolution of total cavity size was 10.1 ± 4.2 weeks, the average hospital stay time was 10.5 ± 5.2 days.⁷ Several studies documented that patients can be managed with a combination of systemic antibiotics and percutaneous drainage with excellent results. 13,14

In our study we treated 69 patients with PCD along with systemic antibiotics. Out of 69 cases 67 patients were successfully treated and 2 cases not completely reduce the size of cavity due to alcohol addiction. In these the mean volume of largest cavity was 405 ± 118 c.c., clinical improvement were seen within mean time of 4.2

 \pm 1.7 days, mean time taken to reduce the cavity size up to 50% was 5.0 \pm 1.3 days, time taken to resolution of total cavity size was 10.1 \pm 4.2 days, the average hospital stay time was 10.8 \pm 3.5 weeks, same result was reported by Sukhjeet Singh et al.⁷

The time required for 50% reduction in the cavity size was significantly less in the PCD compared to PNA group (5 days and 7.5 days respectively, P <0.000). However, time required for total or near-total resolution of the abscess cavity did not show any significant difference in the two groups (PCD=10.8 weeks, PNA=10.1 weeks, P >0.005). Thus the result showed that the relapse of cavity was better in PNA group than the PCD group, similar result were recorded by other researcher as Rajak CL et al. 15

Giorgio A et al. have reported reasonably good results with PNA along with systemic antibiotics, performed on an average 2.2 aspirations in 115 patients and reported resolution of symptoms and hepatic lesions in 98% of the patients. The mean duration of time taken for clinical improvement was 5.5 ± 1.9 days in this modality of treatment. Rajak et al. reported a success rate of 60% with needle aspiration. However, in their study only two attempts of aspiration were made and failure to attain clinical, hematological and radiological improvement was taken as failure of therapy. 15

The major advantages of PNA over PCD 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. ^{17,18}

However, in our study we had a success rate PNA which was significantly lower than with catheter drainage (76% versus 100%, P <0.005). There are some problems with catheter drainage like nuisance to the patient, pain, cellulites at the insertion site and sometimes catheter dislodgement. The success rate of PNA in the literature varies from 79-100%. ¹⁹

Another important reason for failure of needle aspiration is the inability to completely evacuate the thick viscous pus that may be present in some of the abscesses. Rapid re-accumulation of pus in the abscess is another reason described for failure of needle aspiration. Placement of an indwelling drainage catheter addresses all three of these issues as it provides continuous drainage, drains thick pus because of wider caliber catheter, and prevents re-accumulation. This explains the higher success rates (100%) observed in our study and several previous studies. ²¹

The only reasons for failure of PCD as reported in some of the earlier series have been either thick pus not amenable to percutaneous drainage (this can be overcome by placement of a wider bore catheter) or premature removal of drainage catheter. No recurrence occurred in any of our cases during the follow up period. However,

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.²²

CONCLUSION

Our study concludes that the percutaneous catheter drainage is a better modality as compared to percutaneous needle aspiration in respect to clinical improvement, resolution of cavity, success rate but there was no significant difference in hospital stay time. There was no major complication occur during both the procedure. The chances of failure of percutaneous needle aspiration increased with the increase in size of abscess cavity to be aspirated.

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institutional ethics committee

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