Research Article

Outcome of ultrasound guided pigtail catheter drainage of liver abscesses a prospective study of 126 cases

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ABSTRACT

Background: With the advances in the intervention radiological techniques the laparotomy for liver abscess has been taken over by the percutaneous ultrasound guided needle aspiration as well as percutaneous ultrasound guided pigtail catheter drainage. This study was undertaken at Govt. Medical College & Associated hospitals, Jammu to assess the outcome of this minimally invasive procedure for Liver abscess.

Methods: 126 patients were subjected to pigtail catheter drainage after localization with ultrasonography using modified Seldinger's technique. The pigtail catheters of 8-14 Fr size were used. All the samples of pus were subjected to microscopy for EH trophozoites, Gram stain and for pus culture and sensitivity. Patient's vitals were monitored for 24 hours. Daily estimation of volume, colour and consistency of the drainage fluid was recorded. Follow-up USG was done on average of 5th postoperative day to assess the shrinkage of cavity and the amount of residual fluid. Removal of catheter was decided based on; the amount of pus drained (<50 ml for three consecutive days); disappearance of symptoms & signs; and USG abdomen showing signs of resolution.

Results: The age of the patients in this study ranged from the 21 years to 70 years with M: F ratio of 13.5: 1. Pain, fever, tender hepatomegaly & anaemia were common symptomatology. Right lobe abscess was seen in 74.60% (n=94) of patients. Solitary abscess was seen in 110 patients (87.3%). 66 patients (52.38%) had ALA, 18 patients PLA & 42 were having indeterminate liver abscess. Smaller size catheter specially 8-10 Fr invariably blocks. Common problems encountered were local pain or discomfort due to catheter, peri-tubal leak in few cases, and local wound infection. The average period of continuous catheter drainage was 7.2 days maximum being 26 days. Average duration of hospital stay was 2.45 days. Success rate of the procedure was 96.82% (n=122). 04 patients needed laparotomy.

Conclusions: Advances in interventional radiology have influenced management of liver abscess. We in our series of 126 pts of liver abscess conclude that image guided percutaneous pigtail drainage of liver abscess is a safe, effective minimally invasive procedure with negligible morbidity and no mortality. High procedural success rate has almost replaced conventional laparotomy in uncomplicated liver abscess.

Keywords: Pyogenic liver abscess, Amoebic liver abscess, Pig tail catheter, Ultrasound guided

INTRODUCTION

Liver abscess, be it amoebic or pyogenic, is an important clinical problem in tropical and sub-tropical countries accounting for a high number of hospital admissions. Though the entity is treatable with good clinical outcome yet, it has potential for morbidity and even mortality, if treatment is delayed.¹ Liver abscess can present as solitary or multiple abscesses, mostly in the right lobe more frequently encountered in adult life, amoebic in 3rd-5th decades & pyogenic in 5th-6th decades.² It is seven to nine times more common in males than females. Higher incidence in males is still unexplained; some attribute it to the alcoholism.³

Routes of infection in liver abscesses are via biliary tree, portal vein, hepatic artery, direct extension from nearby focus of infection, blunt or penetrating trauma and obscure/cryptogenic origin. Biliary pathology is most common underlying cause for PLA.⁴ Abscesses from pyelophlebitis or cholangitis tend to be polymicrobial with preponderance of gram negative rods, most common organisms cultured are *Escherichia coli*, staphylococcal, *Enterococcus faecalis*, *Klebsiella*, *Bacteroides*.⁵

Most common local symptom of a liver abscess is right upper quadrant pain that can be present in 65% to almost 100% of cases.⁶ Fever either continuous or intermittent and may be accompanied by rigors and chills is seen in 70% of patients with PLA. Cough is usually dry and unproductive. Liver abscess with basal pulmonary signs may also give rise to breathlessness. Sometimes patients suffer from hiccup.⁷ 40% of patients with amoebic liver abscess give history of diarrhea, 10% suffer from amoebic dysentery with trophozoites present in the stool.² Toxemia is suggestive of bacterial infection leading to a more severe disease.⁸ One-third of patients may develop clinical jaundice.⁹

The common complication of liver abscess is extra-hepatic rupture that may occur into the peritoneal cavity, retro peritoneum, pericardium or intestines & trans-diaphragmatic rupture into the lung, tracheobronchial tree and into the pleural space with subsequent empyema.¹⁰

Laboratory investigations may show features of anemia, hypoalbuminemia, jaundice, raised erythrocyte sedimentation rate.¹¹ Leukocytosis is present in 70 to 90% of the patients. ALP is mildly elevated in 80% of the patients, while transaminases are increased in 60% of the patients. Bilirubin is increased in 20 to 50% of the patients.¹² Ultrasonography (USG) having sensitivity of 96% is modality of choice in the initial evaluation of liver abscess that is picked as hypoechoic lesion with distinct margins. Contrast enhanced computed tomography (CECT) scan is more accurate than USG in differentiation of PLAs having sensitivity of 100%, in acute phase of ALA, computed tomography does not add to the diagnostic accuracy of Ultrasonography.^{2,13}

Previously the standard treatment of liver abscesses was appropriate antibiotics/antiamoebics and supportive care in ALAs less than cm and PLAs less than 5 cm. Now image-guided percutaneous aspiration/continuous catheter drainage and appropriate antibiotics/antiamoebics are the treatment of choice in all uncomplicated cases of liver abscesses. Percutaneous continuous catheter drainage avoids the problem of incomplete evacuation and re-accumulation with high success rates. Indications includes, lack of improvement with subsidence of symptom and signs in 48-72 hours after medical line of treatment, incomplete evacuation of the abscess cavity or rapid re-accumulation of abscess contents following percutaneous aspiration, left lobe abscesses, abscess >8 cm (amoebic), >5 cm in pyogenic abscess, evidence of threatening rupture in sonography of liver (<1 cm or no discernible hepatic parenchyma around any part of the abscess), multiple liver abscesses, presence of jaundice due to large abscess or abscess at porta hepatis.^{14,15} Open surgical treatment is now reserved for failure of needle aspiration or catheter drainage, in big abscesses where there is risk of rupture in pericardium or where there is perforation of Abscess with features of peritonitis

We in the present prospective study on 126 patients report our experience of percutaneous catheter drainage both amoebic and pyogenic liver abscesses.

METHODS

In this study, 126 patients (108 males & 18 females) of liver abscesses were undertaken for percutaneous image guided pigtail catheter drainage of liver abscess. Patients with hydatid cysts of liver, uncorrectable coagulopathy, tumors of liver were excluded from the study group. Before contemplating the procedure all baseline investigations like CBC, Blood Sugar levels, PTI, RFT, LFT, Blood grouping and X-ray chest were done.

All patients were followed-up after discharge at 1 week, 2 weeks, 1 month, 3 and 6 months for the presence of residual liver abscess, return of previous symptomatology and newer problems in context with and sequel of liver abscess.

Materials used

1. 16 G I/V cannula.
2. 20 No Lumbar puncture needle.
3. 8 to 14 F pigtail catheters.
4. Suction drains.

Methodology

Patient was kept in supine position, 2% lignocaine was used for local infiltration using modified Seldinger's technique; trocar along with cannula is introduced into the cavity of liver abscess under ultrasound guidance and contents aspirated. A small nick was made at entry site of

trocar; the trocar is removed keeping cannula in the cavity and a guide wire was passed well inside the cavity through the cannula, slowly withdrawing the needle. The tract was dilated using dilators of appropriate sizes. The pigtail catheters of 8-14 Fr size was introduced in the cavity, slowly withdrawing the guide wire; catheter was fixed to the skin and connected to a suction drain. Initially supernatant fluid, later thick fluid was obtained; colour varying from reddish or chocolate brown to brownish yellow color was noted. All the samples of pus were subjected to microscopy for EH trophozoites, Gram stain and for pus culture and sensitivity.

Patient's vitals were monitored for 24 hours. Daily estimation of volume, colour and consistency of the drainage fluid was recorded. Majority of the patients except laparotomy patients were discharge after 48 hours with Catheter in situ with advice to monitor quantity of daily output in the drain. The catheter was kept in site for an average period of 7.2 days, maximum of 26 days. Follow-up was done by clinical examination for disappearance of symptoms and signs and improvement in general condition. Follow-up USG was done on average of 5th postoperative day to assess the shrinkage of cavity and the amount of residual fluid. Removal of catheter was decided based on; the amount of pus drained (<50 ml for three consecutive days); disappearance of symptoms & signs; and USG abdomen showing signs of resolution. Patients were followed up for a period of 45 days.

The technique was successful in 96.82% (n=122) with abscess volume ranging from 300 ml to 1600 ml as evidenced by USG abdomen. In 04 patients (3.17%) laparotomy had to be done. From amongst the laparotomy patients, in 03 patients' pigtail catheter drainage failed to evacuate the pus from the cavity in first 72 hrs and in 01 patient of left lobe liver abscess there was failed pigtail catheterization and due to pain procedure was abandoned.

RESULTS

Table 1: Age wise distribution of patients.

Age group (in years)	Number of patients	Percentage (%)
21-30	16	13.8
31-40	46	39.6
41-50	22	19.0
51-60	22	19.0
61-70	10	8.6
Total	126	100.0

A total number of 126 patients of liver abscess were studied with reference to clinical, radiological and ultrasound features at Government Medical College, Jammu during the one year period. The observations and results of the study are presented below:

Age and sex distribution

The age of the patients in this study ranged from the 21 years to 70 years. 77.6% of patients (n=90) were found to be between 31 to 60 years of age. In the study group there were 108 males (93.1%) and 18 females (6.9%), with M:F ratio of 13.5: 1 (Table 1 and 2).

Table 2: Sex wise distribution of patients.

Sex	Number of patients	Percentage (%)
Male	108	93.1
Female	18	6.9
Total	126	100.0

Socio-economic status

In present study, almost all patients were from low socio-economic group, 110 patients (87.3%) belonged to low income group whereas; 16 patients (12.7%) belonged to middle income group.

Table 3: Distribution of symptoms in patients of liver abscess.

Symptoms	Number of patients	Percentage (%)
Pain abdomen	114	90.47
Fever	94	74.60
Weight loss	84	66.66
Anorexia	54	42.85
Diarrhoea	36	28.57
Cough	34	26.98

Alcohol consumption

In this series, history of alcohol consumption was present in 68 patients (53.96%), while in 58 patients (46.04%) such history of alcohol consumption was not present.

Table 4: Distribution of signs in patients of liver abscess.

Signs	Number of patients	Percentage (%)
Tender hepatomegaly	110	87.30
Intercostal tenderness	92	73.01
Anaemia	80	63.49
Right basal crepitations	18	14.28
Icterus	10	7.93

Clinical manifestation

Pain upper abdomen was dominating symptom in 114 patients (90.471%), Fever was the next common

symptom seen in 94 patients (74.60%), whereas weight loss was present in 84 patients (66.66%) and anorexia in 54 patients (42.85%). Furthermore, 36 patients gave history of diarrhoea and 30 patients had history of chest pain in association with dyspnoea. Cough was present in 34 patients, in most cases cough was dry in nature. Tender hepatomegaly was seen in 110 patients (87.30%), intercostals tenderness was the next sign observed in 92 patients, anaemia was seen in 80 patients, whereas in 10 patients clinical jaundice was also noticed (Table 3 and 4).

Table 5: Percentage alteration routine investigations in patients of liver abscess.

Routine investigations	Number of patients	Percentage (%)
Leucocytosis ($>10,000/\text{mm}^3$)	100	79.36
Hypoalbuminaemia	84	66.66
Abnormal PTI	24	19.04
Anaemia	80	63.49
Alkali phosphatase	48	38.08
Serum bilirubin	10	7.93

Investigations

On routine haematological and biochemical examination, anaemia was found in 80 (63.49%) patients [$\text{Hb} < 10\text{gms/dl}$], leucocytosis in 100 (79.36%) patients. Neutrophils were predominantly increased in these patients. Bleeding time and clotting time were normal in all the patients. Abnormal values with respect to raised bilirubin were seen in 10 (7.93%) patients, raised alkaline phosphatase in 48 (38.08%) patients. One significant finding in our study was low serum levels of albumin in 84 (66.66%) of patients. Low PTI was seen in 24 (19.04%) cases. 46 (40%) cases had elevated right dome of the diaphragm, 14 (12%) of the cases had pleural effusion, 18 (15.5%) patients showed features of right basal pneumonitis.

Table 6: Causes of liver abscesses.

Causes	Number of patients	Percentage (%)
Amoebic	66	52.38
Pyogenic	18	14.28
Indeterminate	42	33.33

Table 7: Site of abscess as per USG in patients.

Site of abscess	Number of patients	Percentage (%)
Right lobe	94	74.60
Left lobe	14	11.11
Abscesses of both lobes	18	14.28

Table 8: Size of catheter used for drainage in patients of liver abscess.

Catheter size	Number of patients	Percentage (%)
8-12 Fr	8	6.9
13 Fr	38	27.6
14 Fr	76	65.5

Causes of liver abscess and lobe involved

66 patients (52.38%) were diagnosed as having amoebic liver abscesses in view of drainage of typical "anchovy sauce pus". 18 patients (14.28%) were diagnosed as having pyogenic liver abscess. The culture from aspirate was positive in all 18 cases and revealed *Staphylococcus aureus* as the offending organism. 42 (33.33%) cases were diagnosed as having indeterminate liver abscesses in view of the fact that neither pus cultures of all 42 cases were negative nor none drained typical anchovy sauce pus. Right lobe abscess was more common constituting 74.60% ($n=94$) of patients, whereas in 14.28% ($n=18$) patients both lobes were affected by the abscess. Solitary abscesses were seen in 110 patients (87.3%), whereas; multiple abscesses were found in 16 (12.69%) cases. The smallest abscess was 300cc and the largest measured 1600cc as per findings of USG abdomen.

Figure 1: Large liver abscess on ultrasonography.

Figure 2: CECT image of large liver abscess in right lobe of liver.

Procedure outcome

In initial phase of the study we used small pigtail catheter 8/9F and we experienced blockage of catheter in 03 patients. Later 12 Fr, 13 Fr and 14Fr catheters were successfully used in most cases with low incidence of blockage. Common problems encountered were local pain or discomfort due to catheter, peri-tubal leak in 02 patients, and local wound infection after removal of catheter in 7 patients. All these minor complications were managed. The average period of continuous catheter drainage was around 7.2 days (7-26 days). Average duration of hospital stay is 2.45 days (2-21 days). Prolonged hospital stay was observed in conversion groups as well as patients who had large abscess 1200-1500ml, that took long time to drain. The patient had symptomatic recovery from fever, pain and intercostals tenderness etc. in 48-72 hours.

Figure 3: Pig tail catheter set.

Figure 4: Pig tail catheter In Situ with suction drain.

DISCUSSION

It was as early as in 400 BC that Hippocrates described liver abscess and went on speculating that the prognoses of the patients were related to the type of fluid within the abscess cavity.¹⁶ As of now liver abscess, both amoebic & pyogenic is a major tropical disease of the gastrointestinal system. Pyogenic liver abscess is noted

more frequently in U.S whereas, amoebic liver abscess is commonly seen in tropic countries like India.^{17,18}

The clinical presentation of the patients studied in our series was similar to the descriptions in previous reports. The common symptoms and signs of liver abscess in our study were fever (74.6%), right upper quadrant pain (90.4 %) and tender hepatomegaly (87.3%). These clinical manifestations are similar to those described in previous studies.¹⁹⁻²² In our study, 74.6% of the abscesses were located in the right lobe of liver, similar to previous studies and 87.3% of our patients had solitary abscesses, little more than what has been reported in other studies, similarly we encountered multiple liver abscesses in 12.69% of the patients, in contrast to similar to the 20-25% incidence of multiple liver abscesses reported by Sharma et al.^{16,19,21,23,24} In the present study we found 52.3% of the abscesses to be amoebic in etiology, 14.28% to be pyogenic, 13.3% to be indeterminate. Khan et al in their series reported 68% amoebic, 21% pyogenic, 8% indeterminate, and 3% MLA.²⁵ The indeterminate abscess formed larger percentage in the present study probably due to the reasons that the patients might have taken antibiotics/antiamebics before reporting to the referral centre like ours. In present study pus culture was positive in all 18 patients, staphylococcal aureus being offending microorganism. This is again in sharp contrast to the microorganism reported in the other studies.²² In most of the western series, the most frequently isolated bacteria on pus culture was *Escherichia coli* (44%) closely followed by *Klebsiella* species (33%).^{25,26} However, Asian series have reported *Klebsiella* to be the most frequently isolated bacteria.²⁷⁻³⁰

CECT abdomen was performed in 13 cases in present series and showed no additional benefit. Amoebic serology was performed, because of endemicity of amoebiasis in our region and because of financial constraints, as most of our patients belonged to poor economic status, comparable with the available studies.³¹⁻³³

In the beginning of the study 8-10F pigtail catheters were used to drain the abscess percutaneously, but in 03 out of 05 patients the catheter drainage failed owing to small bore catheter and very thick pus leading to laparotomy. Later we switched on to using 12-14F pigtail catheter with good results. Few series in the literature have experienced similar problem with the small bore pigtail catheters.³⁴⁻³⁸ We recommend that 12-14 F pigtail catheters are adequate size to be used for the procedure. The overall success rate of the procedure was 94%.

CONCLUSION

Liver abscess used to be a high morbidity disease requiring open surgical drainage with quite high mortality. But last quarter century has witnessed a major paradigm shift in the management of liver abscess, both pyogenic & amoebic with sharp decrease in morbidity &

mortality. Advances in interventional radiology have influenced management of liver abscess. Percutaneous drainage in combination with targeted antimicrobial therapy has almost become gold standard of liver abscess management without any mortality and negligible morbidity. We in our series of 126 pts of liver abscess have observed that in this part of the globe, the most common liver abscess is amoebic followed by indeterminate, probably due to excess use of antibiotics as well as antiamoebic drugs before reporting to the referral centre. Added to it is the fact that liver abscess is a disease of low socioeconomic strata patients. It is concluded that image guided percutaneous pigtail drainage of liver abscess is a safe, effective minimally invasive procedure with negligible morbidity and no mortality. Procedural success rate is high and it has almost replaced conventional laparotomy in uncomplicated liver abscess whether it amoebic, pyogenic or indeterminate.

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Ethical approval: The study was approved by the institutional ethics committee

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