



ROLE OF ULTRASOUND GUIDED PERCUTANEOUS PIGTAIL CATHETER DRAINAGE IN THE MANAGEMENT OF LIVER ABSCESS

Radiodiagnosis

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ABSTRACT

Background: Liver abscess is a frequently encountered disease in developing countries like India and may be caused by various pathogens such as bacteria, protozoa, fungi or mixed infections. Ultrasound guided percutaneous drainage of liver abscess has emerged as a primary modality in management of uncomplicated liver abscess in the recent years. The aim of the study is to evaluate the role of ultrasonography and percutaneous pigtail catheterization in the management of liver abscess.

Methods: Prospective study was conducted on 36 patients of liver abscess who underwent percutaneous pigtail catheter drainage at the Department of Radiodiagnosis, Dr. Susheela Tiwari Memorial Hospital, Haldwani, Uttarakhand over a period of one year.

Results: Out of 36 patients, 33 were males and only 3 were females with majority of patients in 3rd decade of life. The common clinical features were pain abdomen, fever and hepatomegaly. 29 patients had a solitary liver abscess while 7 had multiple lesions with a pattern of right lobe predominance. The maximum number of patients were found to have mixed echogenicity lesion with irregular shaggy wall (63.8%). The mean amount of pus drained was 420 ml (approx.) on an average of 3 days. The outcome was successful in 35 patients. One patient developed pyothorax due to the transdiaphragmatic rupture of the abscess into the pleural cavity. The minor complications encountered were leakage from the site of catheter insertion, catheter displacement, hemorrhage and wound infection.

Conclusion: Percutaneous pigtail catheter drainage was found to be beneficial and minimally invasive technique for the management of liver abscess. It is associated with low morbidity and mortality, with faster relief of symptoms and overall high success rate in treating liver abscess.

KEYWORDS

Liver abscess, Pigtail catheter, Percutaneous drainage

INTRODUCTION

Liver abscess is a localized collection of necrotic, inflammatory tissue caused by various pathogens such as bacteria, protozoa, fungi or mixed infections.⁽¹⁾ It has been recognized since Hippocrates (circa 400 B.C.) who speculated that the prognosis of the patients were related to the type of fluid within the abscess cavity.⁽²⁾ It is a frequently encountered disease in developing countries like India. Parasitic abscesses are more common in developing countries whereas bacterial abscess are more common in developed countries.⁽³⁾ It can occur at any age but is more commonly seen in males between 20 and 40 years of age. The majority of liver abscess are solitary and mainly located in the right lobe of the liver, because major part of the hepatic volume is in the right lobe and right lobe is predominantly supplied by the superior mesenteric vein through streaming of portal blood flow. The patients usually present with pain in the right hypochondrium and fever. When multiple abscesses are present, pyogenic or mixed is the most probable type.

Ultrasonography is widely used as an initial investigation of choice in evaluation of liver abscess and aids in early diagnosis and treatment. In earlier times, the standard therapy for liver abscess was operative drainage which was associated with higher rate of complications. The primary mode of treatment of amoebic liver abscess is medical; however as many as 15% of amoebic abscesses may be refractory to medical therapy.^(4,5) Also, secondary bacterial infection may complicate 20% of amoebic liver abscesses. During the last few decades, the evolution of newer radiological techniques like computed tomography (CT) and ultrasonography (USG) along with the advancement of interventional radiology are not only the prescribed tools for accurate localization of these abscesses but have also created the possibility for their safe aspiration and drainage in majority of the instances obviating the need for surgical intervention.⁽⁶⁾

Percutaneous drainage (needle aspiration or catheter drainage) of liver abscess is now considered a standard method in the treatment of liver abscesses. Surgical exploration now has very few indications such as in ruptured liver abscess. Needle aspiration is less expensive and multiple abscesses can be aspirated through different tracts in the same sitting. However it has lower success rate than catheter drainage and repeated needle aspirations may be required due to inadequate drainage in a single sitting, especially in partially necrotic lesions.⁽⁷⁾ This can cause pain and discomfort for the patients and hence may not

be acceptable to them. To overcome these problems associated with needle aspiration, percutaneous pigtail catheter drainage is now used as an important tool in the management of liver abscesses. The advantage of catheter drainage is that it provides a continuous outlet to the pus and hence the problems of incomplete and repeated evacuations are not encountered.⁽⁸⁾

The aim of this study is to evaluate the role of percutaneous pigtail catheter drainage in management of uncomplicated liver abscess in patients of Kumaon region of Uttarakhand.

METHODS AND MATERIAL

This is a prospective study conducted on 36 patients who were diagnosed with liver abscess at the Department of Radiodiagnosis, Government Medical College and Dr. Susheela Tiwari Memorial Hospital, Haldwani, Uttarakhand over a period of 1 year from December 2017 to November 2018.

Patients included in the study were ultrasonographically diagnosed cases of liver abscess with a volume of >200ml, without any surgical complications such as rupture and having a normal coagulation profile. The written and informed consent was taken before the procedure from all the patients.

MATERIALS

The various instruments, equipments and other materials used in this study are as described below:

1. Ultrasound Machine: Aloka Prosound Alfa 6. Procedures were performed with real time ultrasound guidance using curvilinear transducer (frequency range 3-5MHz).
2. Pigtail catheter set (12 to 14 F)
3. Trolley settings: Towel, sponge holder, sterile gloves, kidney tray, scalpel blade, iodine, spirit for cleaning local parts, injection lignocaine 2% (LA), sterile pads and gauze pieces.

Technique

Depending upon the location of the abscess to be drained the patient was made to lay either in supine or left lateral position. The appropriate area of the upper abdomen and lower chest was cleaned thoroughly with spirit and betadine. The cleaned part was then draped with sterile cut-sheet. The abscess cavity was localized and the most appropriate

and shortest route was selected that can cause minimal liver parenchymal trauma. The depth of abscess from skin, appropriate angle of the approach and exact site of incision was determined. Under all aseptic precautions local anesthesia with 2% xylocaine was given so as to raise small wheal and then at the site of puncture a small incision (0.5cm to 1.0cm) was given on the skin with the help of scalpel through which an 18 G guide wire introducer needle was passed under sonographic guidance till it reached the center of the cavity. A guide wire was then introduced through the needle and positioned inside the cavity following which the needle was removed keeping the guide wire in situ. Serial dilators were then passed over the wire to dilate the tract. The tract was dilated to an adequate size and finally a pigtail was passed over the wire and positioned in the center of the abscess cavity. The guide wire was then withdrawn and a sample of pus was aspirated for microbiological investigation. The draining catheter was properly secured in its place and connected to urobag. Non absorbable silk suture of size 1-0 was used to seal the incision wound. Sterile dressing was done with the help of sterile gauze piece and adhesive bandage. Metronidazole and ciprofloxacin were given in therapeutic doses for a period of 2 weeks. Gentamycin was given for 5 days. Ultrasonography was done every third day to check the size of the abscess and position of the tip of the catheter. Catheter was removed when no output of pus was noted for 3 consecutive days. Clinical improvement in the patient condition was noted in terms of relief from pain, fever and decreased WBC count. Patient was discharged on satisfactory resolution of symptoms. Follow up was done in all patients after 15 days, 1 month and 3 months. They were assessed clinically and ultrasonographically to look for residual cavity and recurrence or non-resolving abscess.

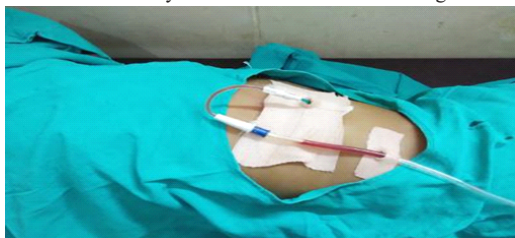


Figure 1: Patient with pigtail catheter in situ

RESULTS

Thirty six patients were included in prospective study out of which 33 were males and only 3 were females. The age of patients ranged from 23yrs to 70yrs with maximum patients in 3rd decade (Table 1).

TABLE 1: AGE WISE DISTRIBUTION OF PATIENTS

AGE GROUP	NUMBER OF PATIENTS	PERCENTAGE
21 – 30	9	25
31 – 40	17	47.2
41 – 50	6	16.6
51 – 60	3	8.3
61 – 70	1	2.7

The mean duration of symptoms at the time of presentation was found to be 4 weeks (range 2-6 weeks). Most common clinical features were found to be pain abdomen (97.2%), Hepatomegaly (83.3%) and fever (80.5%). Other features included nausea, vomiting, weight loss and jaundice (Table 2).

TABLE 2: CLINICAL MANIFESTATIONS

Clinical Features	Number Of Patients	Percentage
Pain abdomen	35	97.2
Hepatomegaly	30	83.3
Fever	29	80.5
Nausea/Vomiting	15	41.6
Weight loss	10	27.7
Jaundice	12	33.3

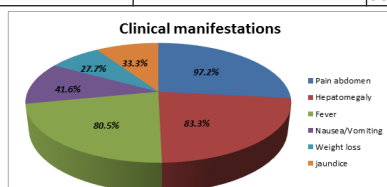


Figure 2: Clinical manifestations at the time of presentation

Hematological investigations were done in all patients which revealed leukocytosis in 62% patients, bilirubinemia in 11%, elevated liver enzymes in 20% patients. Out of 36 patients special precautions were taken in seropositive patients which included 3 HBSAg reactive and 1 HIV positive patients. Bleeding time, clotting time, prothrombin time (PT) and activated partial thromboplastin time were found to be within normal range in all patients.

Detailed ultrasonographic characteristics of liver abscess were evaluated in terms of site, size, number, echotexture, wall of abscess and distal acoustic enhancement. Out of 36 cases, 7 patients had multiple abscess involving both lobes of liver. Of the remaining 29 cases, right lobe was involved in 25 cases (69.4%) and left lobe was involved in 4 patients (11.1%) (Table 3).

TABLE 3: SITE AND NUMBER OF ABSCESS

SITE	NUMBER OF PATIENTS	PERCENTAGE
Right lobe	25	69.4
Left lobe	4	11.1
Both lobes	7	19.4
NUMBER		
Single	29	80.5
Multiple	7	19.4

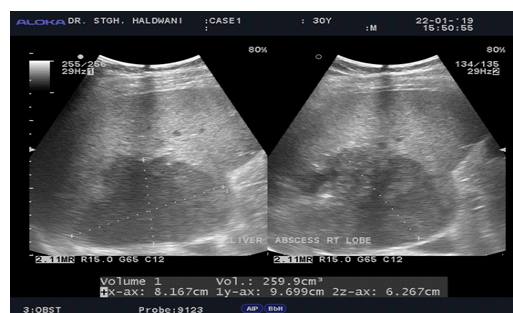


Figure 3: An irregular shaggy walled hypoechoic lesion in right lobe of liver suggestive of necrotic liver abscess

The initial volume of abscess was found to range from 210 cc to 650 cc. Maximum number of patients were found to have volume in range of 401 cc to 500cc (41.6%) (Table 4).

TABLE 4: VOLUME OF LIVER ABSCESS

VOLUME OF ABSCESS(cc)	NUMBER OF PATIENTS	PERCENTAGE
200-300	7	19.4
301-400	10	27.7
401-500	15	41.6
>500	4	11.1

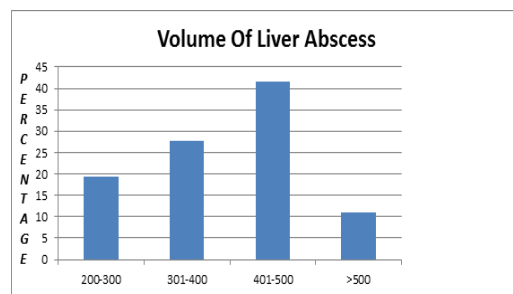


Figure 4: Volume of Liver Abscess

The echotexture of the abscess varied from predominantly hypoechoic to predominantly echogenic. Maximum number of patients was found to have mixed echogenicity lesions with irregular shaggy wall (63.8%). Predominantly hypoechoic lesions were found in 33.3%. Only 1 patient was found to have predominantly echogenic lesion with strong posterior reverberations consistent with Gas forming pyogenic liver abscess (GPLA) (Table 5). Distal acoustic enhancement was found (in 70% cases) to a variable degree in necrotic lesions. Associated right sided pleural effusion was found in 27.7% and minimal to mild peritoneal free fluid in 10% cases.

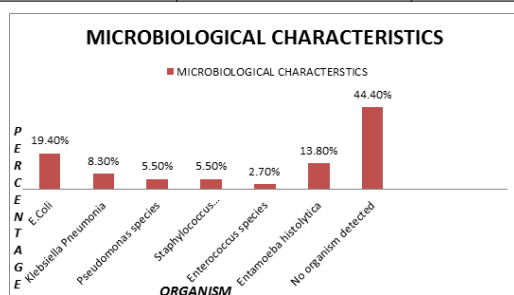
TABLE 5: ECHOTEXTURE OF LIVER ABSCESS

PATTERN OF ECHOTEXTURE	NUMBER OF PATIENTS	PERCENTAGE
Predominantly hypoechoic	12	33.3
Mixed echogenicity	23	63.8
Predominantly echogenic	1	2.70

The mean amount of pus drained was 420ml in 3 days duration. Pig tail catheter was removed after an average period of 5-7 days when no drainage of pus was observed for consecutive 3 days. A microbial organism could be isolated in 20 out of 36 cases (Table 6). Bacterial culture was found to be positive in 15 cases out of which E.Coli was the most common organism, accounting for 7 cases followed by klebsiella, pseudomonas, staphylococcus and enterococcus. Entamoeba histolytica was demonstrated in 5 patients of liver abscess.

TABLE 6: MICROBIOLOGICAL CHARACTERISTICS

ORGANISM	NUMBER OF PATIENTS	PERCENTAGE
E.Coli	7	19.4
Klebsiella pneumonia	3	8.3
Pseudomonas species	2	5.5
Staphylococcus aureus	2	5.5
Enterococcus species	1	2.7
Entamoeba histolytica	5	13.8
No organism detected	16	44.4

**Figure 5: Microbiological Characteristics**

The outcome of percutaneous pigtail catheterization was successful in 35 patients with near complete resolution of lesion on ultrasonography, clinical improvement and relief of symptoms in patients. Pyothorax with rupture of abscess in pleural cavity occurred in 1 patient in which intercostal chest drain was subsequently placed. Minor complications included leakage from the site of catheter insertion in 3 patients, catheter displacement in 2 patients, hemorrhage and wound infection in 2 patients.

**Figure 6: Liver abscess in right lobe with pigtail catheter seen in situ.**

DISCUSSION

The present prospective study was conducted to evaluate the role of percutaneous pigtail catheterization for management of liver abscess in the patients of Kumaon region of Uttarakhand. Liver abscess is a commonly encountered clinical problem in India and carries a high risk of morbidity and mortality if not managed promptly.⁽⁹⁾

In our study maximum number of patients were males and belonged to 3rd decade which is comparable to other Indian studies such as Khan A et al in which the commonest age group for occurrence of liver abscess was between 21 to 40yrs and male predominance was noted.⁽⁹⁾ In certain western studies the patient demographics showed higher incidence in elderly population with no male predominance.⁽¹⁰⁾ The most common clinical features in our study were found to be pain,

hepatomegaly and fever which is comparable to other studies.^(9,10,11,12)

On ultrasound evaluation of abscess characteristics, solitary lesions were more common as compare to multiple liver abscess with predominant right lobe involvement. This is in accordance with various previous studies.^(9,13,14,15) We found the liver abscess to have a variable echogenicity which included predominantly hypoechoic, mixed echogenicity and predominantly echogenic. Majority of patients in our study were found to have an irregular shaggy walled, predominantly mixed echogenicity pattern on ultrasonography.

The pus culture was negative in 16 out of 36 patients. Entamoeba histolytica was identified as the causative pathogen in 5 patients. The most frequently isolated bacteria was E.coli followed by Klebsiella pneumoniae. These findings are consistent with other studies such as Singh S et al.⁽⁸⁾

Most of the patients were seen to have volume of liver abscess between 400 ml and 500ml and the mean volume of pus drained was 420ml in an average duration of 3 days. Findings are consistent with study conducted by Italia et al and Singh S et al.^(8,13) The success rate of the procedure was found to be 97.2% in present study which is in conjunction with various past studies.^(8,9,13) The advantages of catheter drainage over percutaneous needle aspiration are continuous drainage, drainage of partially necrotic abscess having thick viscous contents and prevention of re-accumulation which accounts for the higher success rate of the procedure. Most of the patients showed rapid relief of clinical symptoms and early resolution of liver abscess on ultrasonography. In a prospective comparative study on catheter drainage and needle aspiration conducted by Singh S et al, it was found that pigtail catheter group showed earlier clinical improvement and early decrease in abscess cavity volume as compared to percutaneous needle aspiration group. Overall the procedure has been found to be safe in management of liver abscess with few complications which included pneumothorax, leakage from the site of catheter insertion, catheter displacement, haemorrhage and wound infection which is similar to other studies.^(8,13)

It has been established in the recent years that image guided percutaneous treatment has replaced surgical intervention as the primary treatment of the liver abscess.^(16,17)

CONCLUSION

Percutaneous pigtail catheter drainage was found to be beneficial and minimally invasive technique for the management of liver abscess. It is associated with low morbidity and mortality, with faster relief of symptoms and overall high success rate in treating liver abscess.

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