

# Drainage of Liver Abscess: Comparison between 20 Fr Polyvinyl Chloride versus 10 Fr Pigtail Catheter

Vipin Kumar<sup>1</sup>, Harpreet Singh<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of General Surgery, Teerthankar Mahaveer Medical College, Teerthankar Mahaveer University, Moradabad, Uttar Pradesh, India, <sup>2</sup>Associate Professor, Department of General Surgery, Teerthankar Mahaveer Medical College, Teerthankar Mahaveer University, Moradabad, Uttar Pradesh, India

## Abstract

**Background:** Liver abscesses, refractory to medical therapy requires percutaneous drainage by catheter placed under ultrasonography guidance is considered as the treatment of choice. Pigtail catheter is most commonly used for this purpose which gets repeatedly blocked, requires regular flushing and takes a long time to evacuate the abscess.

**Materials and Methods:** In this study, we compared the relative safety and efficacy of a new procedure of draining the large peripheral right lobe liver abscesses using wide bore 20 Fr polyvinyl chloride (PVC) catheter in place of 10 Fr pigtail catheter on 50 patients. Student's *t*-test was used to assess the quantitative and Chi-square test for qualitative differences. The  $P < 0.05$  was considered statistically significant.

**Results:** About 20 Fr PVC wide bore catheter is found to be more efficient in draining the pus of large liver abscess as compared to the pigtail. Complications and recurrence rate were more common with pigtail. The hospital stay and hence expenditure was more with the pigtail catheter.

**Conclusion:** Wide bore (20 Fr) PVC catheter is safe, valuable and rapid way of evacuating the massive solitary peripheral liver abscesses and should be favored to narrow bore 10 Fr. pigtail catheter.

**Key words:** Drainage, Liver abscess, Pigtail catheter, Polyvinyl chloride catheter

## INTRODUCTION

A liver abscess is a pus-filled mass inside the liver. Common causes are abdominal infections such as appendicitis or diverticulitis due to hematogenous spread through the portal vein. A large pyogenic liver abscess presumed to be the result of appendicitis.<sup>1</sup>

There are three major forms of liver abscess, classified by etiology: (1) Pyogenic liver abscess, which is most often polymicrobial, accounts for 80% of hepatic abscess cases. (2) Amoebic liver abscess due to *Entamoeba histolytica*

accounts for 10% of cases. (3) Fungal abscess, most often due to *Candida* species, accounts for <10% of cases.<sup>2</sup>

Major bacterial causes of the liver abscess include *Streptococcus*, *Escherichia*, *Staphylococcus*, *Klebsiella*, anaerobes including *Bacteroides*, *Pseudomonas*, and *Proteus*. However, most of the cases are polymicrobial.<sup>1,3</sup>

Around 15% of amoebic liver abscesses (ALA) may be refractory to medical therapy. In such cases, percutaneous drainage by 10 Fr pigtail catheter placed under ultrasonography (USG) guidance is presently considered as the treatment of choice. Pigtail catheter is a tubular, flexible instrument, passed through body channels for withdrawal of fluids from body cavity.<sup>4,5</sup>

The disadvantage with the pigtail catheter is that it gets repeatedly blocked, requires regular flushing and takes a long time to evacuate the abscess.<sup>6</sup> Hence, in this study, we compared the relative safety and efficacy of a new

### Access this article online



www.ijss-sn.com

Month of Submission : 12-2016

Month of Peer Review : 01-2017

Month of Acceptance : 01-2017

Month of Publishing : 02-2017

**Corresponding Author:** Dr. Vipin Kumar, Assistant Professor, Department of General Surgery, Teerthankar Mahaveer Medical College, Teerthankar Mahaveer University, Moradabad, Uttar Pradesh, India. E-mail: vipinanu1963@hotmail.com

procedure of draining the large peripheral right lobe liver abscesses using wide bore 20 Fr polyvinyl chloride (PVC) catheter in place of 10 Fr pigtail catheter.

**MATERIALS AND METHODS**

This prospective study was conducted in the Department of General Surgery, Teerthankar Mahaveer Medical College and Research Centre for 1 year. 50 patients after written informed consent with single large liver abscess were admitted in our hospital and were considered candidates for this study. The age group selected for the study is 18-70 years. The patients reported with the complaint of right upper quadrant pain, hepatomegaly and low-grade fever. These patients were admitted and were subjected to USG and if it showed a single, large (size >7 cm in any dimension or volume >250 cc), liquefied and peripheral (liver parenchyma <1 cm on USG or no discernible parenchyma) liver abscess in right lobe of liver, patient was enrolled in the study.

Patients with ruptured amoebic liver abscess, vitally unstable patient, multiple non-communicating abscess cavities, abscess in the left lobe of liver, abscess having thicker peripheral parenchyma, and patients lost to early follow-up were excluded from the study.

Patients were randomly selected to undergo percutaneous drainage of abscess by 10 Fr pigtail catheter or 20 Fr PVC catheter (25 patients in each group). Percutaneous treatment was performed within 48 h after admission. 10 Fr pigtail catheter drainage was done by standard procedure by ultrasonologist under USG guidance. 20 Fr PVC Catheter was inserted under vision by open technique in the 8<sup>th</sup> intercostal space as seen on CT plates to provide a window to the abscess with thinnest area of surrounding liver parenchyma. Following the catheter insertion, X-ray chest and abdomen were done. For the first 12-24 h, hourly watch was kept on the temperature, pulse, respiration, and abdominal girth to check for signs of hemorrhage or peritonitis. This procedure is done in operation theater; this caution is taken so that if there is pneumothorax, we can immediately insert an ICD tube. The pus collected was sent for culture and antibiotics were given accordingly.

After discharge from the hospital, patients underwent follow-up evaluations in the outpatient clinic at least once a week during treatment and biweekly until 6 months from the beginning of the treatment. Patients outcome, including length of hospital stay, complications related to the procedure and treatment failure were recorded.

Student's *t*-test was used to assess the quantitative and Chi-square test for qualitative differences. The *P* < 0.05 was considered statistically significant.

**RESULTS**

The prospective study was conducted in our medical college for the duration of one year in which 50 patients of liver abscess were treated by two different catheters (10 Fr pigtail and 20 Fr PVC) with 25 each. The male to female ratio was 2:1.

Table 1 shows comparison of mean percentage reduction in dimension of the abscess between the two groups. On 3<sup>rd</sup>, 6<sup>th</sup> and 9<sup>th</sup> days after surgery the reduction in size of abscess was significantly more with PVC catheter as compared to pigtail catheter. This shows that the 20 Fr. PVC wide bore catheter is more efficient in draining the pus of large liver abscess as compared to the pigtail.

Figure 1 describes the complications related to both the procedure, where there was pneumothorax in three patients of 20 Fr. PVC catheter group as compared to one patient in which pigtail catheter was used. Bilous fistula formation was found only in pigtail catheter patients. The recurrent blockage was mainly present in pigtail catheter because of narrow diameter as compared to PVC catheter.

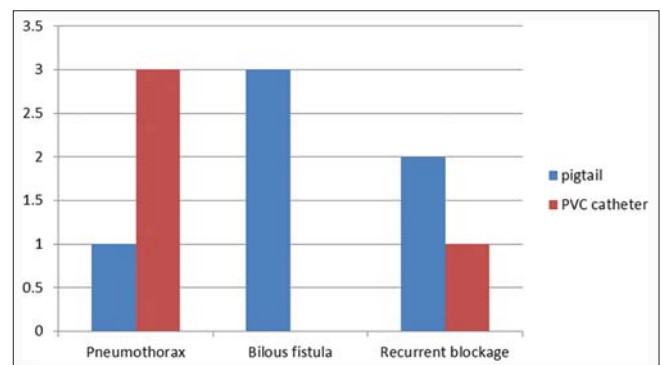
Table 2 shows mean duration of stay in hospital was 11.02 days among pigtail group that was comparable with 10.44 days among PVC drain group, and the difference was not statistically significant.

Table 3 shows the difference in the rate of recurrence after percutaneous catheter drainage. It was observed that 9 cases in Pigtail group had recurrence as per the USG

**Table 1: Comparison in change in size of abscess by two catheters**

No. of days	Reduction in size (cm)		P value
	Pigtail	PVC catheter	
3 <sup>rd</sup>	24.68±20.1	40.14±11.29	Significant
6 <sup>th</sup>	34.12±10.7	60.13±12.14	Significant
9 <sup>th</sup>	42.96±15.2	52.76±3.12	Significant

PVC: Polyvinyl chloride



**Figure 1: Comparison of complications by two catheters**

**Table 2: Comparison of mean duration of hospital stay**

Mean±SD		P value
Pigtail	PVC catheter	
11.02±4.30	10.44±3.1	Non-significant

PVC: Polyvinyl chloride, SD: Standard deviation

**Table 3: Comparison of recurrence rate (%)**

Mean±SD (%)		P value
Pigtail	PVC catheter	
9	1	Significant

PVC: Polyvinyl chloride, SD: Standard deviation

findings at 1 month, whereas there was only 1 recurrence seen in 20 Fr. PVC catheter group.

## DISCUSSION

The main difference in the treatment of pyogenic and ALA is that the pyogenic abscess is usually multiple and small, whereas amoebic liver abscess is solitary and large.<sup>7</sup> Amoebic abscess has a lot of necrotic liver parenchyma, and therefore, is not drained efficiently by the 10 Fr pigtail catheters. Hence, this study was conducted to find out whether large size catheter would be the better option and would drain the pus faster with less chances of blockage of tubes. Radiological imaging (computed tomography [CT] scan, USG) was done for all the patients of the PVC-catheter arm to demarcate the three dimensional anatomy of the abscess.

According to literature,<sup>8-10</sup> the preliminary size of the abscess cavity never affects the ultimate result. However, in this study, we found that large abscesses are more difficult to evacuate completely in one attempt. The reasons for failure of percutaneous catheter drainage, as reported in some of the earlier series, have been either thick pus not amenable to percutaneous drainage. This problem can be overwhelmed by using larger bore catheters like 20 Fr PVC.

Patients treated with pigtail stayed for a longer time than PVC catheter in the hospital. The shorter hospital stay could also be related to the fact that, unlike the practice in previous studies, we did not wait for total radiologic resolution (nonvisualization of the abscess cavity) before discharge.

In our study, complications occurred in ten patients out of 50 (10%). Three patients had recurrent blockage (2 with pigtail and 1 with PVC catheter) and had to be flushed regularly. Three patients developed a bilious fistula post pig-tailing which resolved without any

active intervention in 15 days. Four of the patients developed pneumothorax (1 with pigtail and 3 with PVC catheters). These patients had to undergo ICD insertion intraoperatively. With the help of CT scan the catheter was inserted through the eighth intercostal space in the mid-axillary line which is considered as a safe way of avoiding such complications.<sup>11</sup>

The flow of various body fluids through catheters has been demonstrated to follow the Poiseuille's law. According to this law, catheter diameter is a theoretic component of flow rate, with wide bore catheters having an advantage over the ones with smaller diameter.<sup>19</sup> Our review of the literature suggests similar success for small- and large-diameter catheters. Park *et al.*<sup>12</sup> tabulated the average number of days of drainage for small and large catheters from reported series. Unexpectedly, drainage times were less with the small-diameter catheters than with the large-diameter catheters. The most plausible explanation for this paradox is that less-viscous collections were drained with small catheters. In the other cases, the viscosity of the material drained was great enough so that even the large-diameter catheters did not enhance drainage proportionately.

In a preclinical and *in vitro* study by Niinami *et al.*,<sup>13</sup> 19 Fr tubes were compared with 28 Fr tubes. When the ability to catheter water at a set pressure of 10 mmHg was measured, the larger tube had a drainage capacity nine-fold higher than the smaller. Demonstration of cavity lesion on imaging after completion of treatment and on follow-up does not mean to re-start the treatment rather relies on symptoms and appearance of new lesion.

## CONCLUSION

We conclude that 20 Fr PVC drainage of large hepatic abscesses provides quicker aid to the patient and diminishes the total expenditure as well as duration of treatment and thereby the related morbidity. Wide bore (20 Fr) PVC catheter is safe, valuable and rapid way of evacuating the massive solitary peripheral liver abscesses and should be favored to narrow bore 10 Fr pigtail catheter.

## REFERENCES

1. Thompson JE Jr, Forlenza S, Verma R. Amebic liver abscess: A therapeutic approach. *Rev Infect Dis* 1985;7:171-9.
2. Rajak CL, Gupta S, Jain S, Chawla Y, Gulati M, Suri S. Percutaneous treatment of liver abscesses: Needle aspiration versus catheter drainage. *AJR Am J Roentgenol* 1998;170:1035-9.
3. VanSonnenberg E, Mueller PR, Schiffman HR, Ferrucci JT Jr, Casola G, Simeone JF, *et al.* Intrahepatic amebic abscesses: Indications for and results of percutaneous catheter drainage. *Radiology* 1985;156:631-5.
4. Saraswat VA, Agarwal DK, Bajjal SS, Roy S, Choudhuri G, Dhiman RK,

- et al.* Percutaneous catheter drainage of amoebic liver abscess. *Clin Radiol* 1992;45:187-9.
5. Baek SY, Lee MG, Cho KS, Lee SC, Sung KB, Auh YH. Therapeutic percutaneous aspiration of hepatic abscesses: Effectiveness in 25 patients. *AJR Am J Roentgenol* 1993;160:799-802.
  6. Giorgio A, Amoroso P, Francica G, de Stefano G, Fico P, Lettieri G, *et al.* Echoguided percutaneous puncture: A safe and valuable therapeutic tool for amoebic liver abscess. *Gastrointest Radiol* 1988;13:336-40.
  7. Stain SC, Yellin AE, Donovan AJ, Brien HW. Pyogenic liver abscess. Modern treatment. *Arch Surg* 1991;126:991-6.
  8. Bertel CK, van Heerden JA, Sheedy PF 2<sup>nd</sup>. Treatment of pyogenic hepatic abscesses. Surgical vs percutaneous drainage. *Arch Surg* 1986;121:554-8.
  9. Attar B, Levendoglu H, Cuasay NS. CT-guided percutaneous aspiration and catheter drainage of pyogenic liver abscesses. *Am J Gastroenterol* 1986;81:550-5.
  10. Singh JP, Kashyap A. A comparative evaluation of percutaneous catheter drainage for resistant amoebic liver abscesses. *Am J Surg* 1989;158:58-62.
  11. Ralls PW, Quinn MF, Boswell WD Jr, Calletti PM, Radin DR, Halls J. Pattern of resolution in successfully treated hepatic amoebic abscess: Sonographic evaluation. *Radiology* 1983;149:541-3.
  12. Park JK, Kraus FC, Haaga JR. Fluid flow during percutaneous drainage procedures: An *in vitro* study of the effects of fluid viscosity, catheter size, and adjunctive urokinase. *AJR Am J Roentgenol* 1993;160:165-9.
  13. Niinami H, Tabata M, Takeuchi Y, Umezu M. Experimental assessment of the drainage capacity of small silastic chest drains. *Asian Cardiovasc Thorac Ann* 2006;14:223-6.

**How to cite this article:** Kumar V, Singh H. Drainage of Liver Abscess: Comparison between 20 Fr Polyvinyl Chloride versus 10 Fr Pigtail Catheter. *Int J Sci Stud* 2017;4(11):33-36.

**Source of Support:** Nil, **Conflict of Interest:** None declared.