Section: Miscellaneous

Original Research Article

A NOVEL TECHNIQUE FOR IMAGE GUIDED PERCUTANEOUS DRAINAGE OF LIVER ABSCESSES IN A RESOURCE LIMITED SET UP: A PILOT STUDY.

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Abstract

Background: Liver abscesses are a significant cause of morbidity and mortality particularly in developing countries where treatment resources are limited. Percutaneous methods such as ultrasound guided pigtail catheter drainage and surgical interventions are often a significant financial burden for resource limited settings. This study aims to introduce a novel percutaneous drainage technique, which utilizes simple, universally available materials and offers acceptable results without causing financial burden in these settings. **Materials and Methods:** This is a pilot study conducted at a tertiary care government hospital over a period of three months. It included 20 patients with liver abscesses meeting specific criteria (abscess volume>300mL, intervening liver parenchyma<5cm and skin-to-abscess distance<10cm). **Result:** The average age of the patients was 37.7 years and there were more men than women. Most patients presented with abdominal pain and fever, nausea/vomiting was observed in some, and jaundice was noted in a few. Mean abscess volume was 760 mL. The procedure effectively drained over 91% of the abscess volume and only two patients required additional aspirations. Post-procedural pain decreased significantly from an average of 3.35 on a visual analog scale at 0 hours to 0.88 before discharge. The average hospital stay was 5.4 days. No complications or mortality were reported. **Conclusion:** This novel technique is a reasonable alternative in resource poor settings to treat liver abscesses without causing financial burden on the poor patients. The study shows that the results of this technique are acceptable and satisfactory and hence it can be universally used by simple available materials in average government hospitals of India.

INTRODUCTION

Liver is the most common site of abdominal visceral abscess due to exposure of portal venous bacterial load on regular basis. Liver abscess is a common infection of the liver and gastro-intestinal tract in India caused by a bacterial, parasitic, or fungal infection.[1] It is estimated that annually approximately 40-50 million people become infected globally with a preponderance in the developing world with resource limited settings. In endemic areas, infection rates exceed 5-10% and in some cases can reach up to 55 %.[2,3] Pyogenic liver abscesses account for the majority of cases (75%) in the developed world whereas nearly two third of liver abscesses in the developing world are amoebic liver abscesses.[4,5] Routes of infection of pyogenic liver abscesses are by bile duct(example biliary duct stones, cholangio carcinoma), portal vein(example diverticulitis, appendicitis, inflammatory bowel disease, acute pancreatitis etc.), hepatic artery(example Infective endocarditis), direct spread(example suppurative cholecystitis, empyema thorax, subdiaphragmatic abscess etc.), trauma and cryptogenic(example undiagnosed abdominal infections, resolved infectious process, diabetes, malignancy etc). Amoebic liver abscesses are usually caused by feco-oral contamination in endemic areas and predominantly in low socioeconomic status or immunocompromised patients.

The treatment of a liver abscess depends on the presentation, general condition of the patient, size of the abscess, pathology and whether the abscess is intact or ruptured. Medical treatment with intravenous or oral antibiotics and analgesia may

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suffice for small uncomplicated abscesses with mild symptoms. However for large volume abscesses complicated abscesses and severe life threatening symptoms will invariably require some sort of intervention which may be percutaneous or by surgery. Surgical drainage of liver abscess can be via laparotomy or laparoscopy.[6-9]Percutaneous needle aspiration(PNA) or percutaneous catheter drainage (PCD) under image guidance ultrasonography or computerized tomography(USG or CT) is now preferred over surgical drainage due to lower morbidity and mortality, shorter hospital stay, lesser pain and no surgery related complications.[10-12]

McFadzeanetal described the percutaneous drainage method for liver abscess in HongKong in1953.[13]

PCD can bridge the gap between noninvasive and surgical intervention with minimally invasive, image-guided drainage.[14,15] In resource limited settings, however these traditional methods of drainage such as surgical interventions or pigtail catheters are often unavailable or cause sizeable financial burden on the patients. This novel method of PCD is a cheap, viable alternative that makes use of universally available materials and simplicity of the procedure makes it replicable by all with a small learning curve. The purpose of this study was to examine the viability and effects of applying this technique in resource limited healthcare settings.

MATERIALS AND METHODS

This is a pilot study which was conducted at a tertiary care hospital over a period of three months (from July 2024 to September 2024) after obtaining approval from institutional ethical committee. As this is a novel technique that is in the early stages, the authors developed a patient selection and method application criteria based on safety and reproducibility while keeping in mind the principles of PCD in the literature.[16]

Inclusion criteria: [Figure1]

- Abscess volume>300mL
- Intervening liver parenchyma<5cm
- Distance between skin to the Centre of the abscess<10cm
- No clinical and radiological signs of rupture of abscess.

Materials required for this technique are mentioned in the [Table 1 and Figure 2] shows the materials i.e.5mm laparoscopic trocar with ryle's tube no. 14Fr and pigtail no.14Fr also shown for comparison.

Surgical Technique

After obtaining the written informed consent and stable coagulation profile parameters, patient is screened by USG for accessing the feasibility of PCD (anatomical feasible site, liquefactive component, inclusion criteria parameters etc.), the procedure is performed under USG guidance. Parts are prepared with betadine and draped under sterile sheets. The site for incision is marked and after infiltrating lignocaine 2% at the marked site of the skin and till liver capsule, a small incision of around 5 mm is made by 11 no. blade and deepened by an artery forceps to create safe pathway for the trocar [Figure3,4].

A 5mm laparoscopic trocar is inserted percutaneously through the incision by gradual controlled screwing movements and guided into the abscess cavity under ultra- sound guidance. A 20cc syringe is attached to the air vent at the side and pus is aspirated to confirm that the trocar is in the abscess cavity as well as to send for culture and sensitivity. The presence of pus confirms correct placement of the trocar. The obturator, which is the inner solid portion of the trocar is removed subsequently. A 14Fr Ryle's tube is inserted through the trocar into the abscess cavity [Figure 5].

Once the Ryle's tube is in place, the trocar is carefully removed, leaving the Ryle's tube in position. Free flow of pus through the Ryle's tube confirms its correct position.

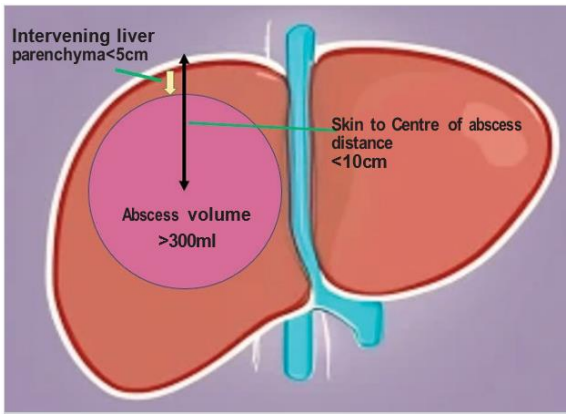

Figure 1: Pre-requisites.

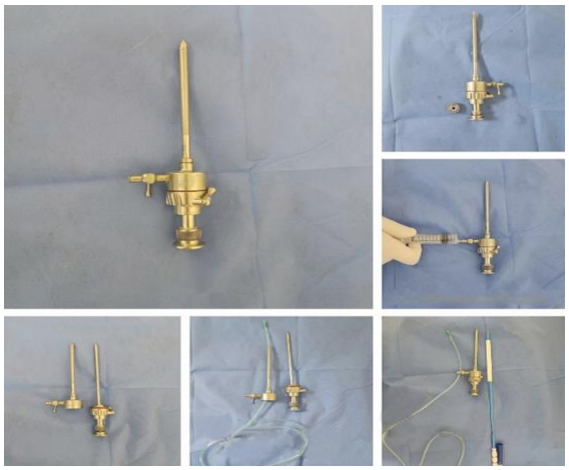

Figure 2: The laparoscopic metallic trocar and Ryle's tube required for insertion.

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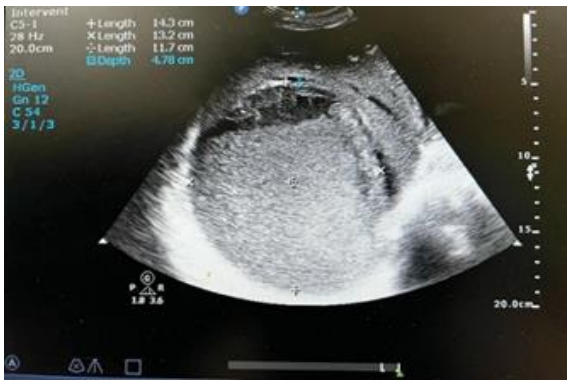

Figure3: Ultrasoundtoassessthevolume.

This placement is doubly confirmed by ultrasound imaging. The Ryle's tube is then secured to the skin by silk no. 2-0 on cutting needle and adhesive dressing done to prevent movement and connected to a drainage bag or similar collection device to allow for gravity drainage of the pus (Figure6).

All patients were received prophylactic intravenous antibiotics and other supportive medications starting from admission as per the hospital's antibiotic policy, deescalated/changed after the culture and sensitivity report and continued till the patients were completely afebrile for 48hours. Patients were discharged when the sepsis was resolved and patient were stable on oral medicines.

Ryle's tube was removed when the residual pus was<20 ml on USG and in case of non-drainage of pus, additional aspiration was attempted under USG guidance. Patients were kept on outpatient follow up for a period of at least 2 months.

Figure 4: Steps for introduction of metallic trocar in liver abscess. A. Marking of incision site under USG guidance. B. 2% lignocaine, a local anesthetic, is infiltrated into the skin and deep to anesthetize the area. C. Small incision of around 5 mm is made on the skinsurfaceandincisionisdilatedslightlyusingartery forceps to create a pathway for the trocar.D.Intoducing 5mm metallic trocar under USGguidance.

RESULTS

During the study period, 65 patients were diagnosed with liver abscess and 20 of them met the inclusion criteria and were included in the study. The study yielded the following results and observations.

The youngest patient in this study was 15 years old and the oldest patient was 78 years old, with the study population having a mean age of 37.7 years. Most of the patients were between the ages of 30 and 50. There were sixteen males and four females in our study. The clinical features observed in this study included fever, pain abdomen, nausea/vomiting and jaundice. The most common symptoms were fever and pain abdomen with only two patients showing jaundice. In the study population, twelve patients had no comorbidities, three had hepatitis and two had hepatitis C. Three patients had diabetes, three had hypertension, one had chronic kidney disease, and one had a history of coronary artery disease. In the study population, eleven patients had a history of alcohol abuse. The highest total leukocyte count (TLC) observed in the study was 31,600/ mL, while the lowest count was 7800/mL. The average TLC count observed in the study was14,746/mL. As per the inclusion criteria for our study, the procedure was performed on patients with a minimum abscess volume of 300mL.The smallest liver was 380 mL, while the largest abscess drained was 1100 mL. The average liver abscess volume was 780 mL.

On average, 91 % of liver abscesses were drained after the drain was inserted, with only two patients requiring needle aspiration of pus later due to a separate cavity and non- resolution of symptoms. The study found no complications with the procedure and there was no mortality.

Figure 5. Steps for confirmation and inserting RT. A. Aspiration of pus through port to confirm entry inside abscess cavity. B. Removal of trocar from the port after entry into the abscess cavity. C. Passing the ryles tube through the trocar into abscess cavity. D. Removing the trocar after confirming the position of Ryle's tube in abscess cavity.

Mean pain visual analog score after the procedure at 0 hrs. and 2 hrs. was 3.35(3-5) and after 24hrs of

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procedure was1.39 (1-3) and on before discharge of the patient was 0.88(0-2).
The average hospital stay was 5.4 days with the longest stay being 11 days for one patient and the shortest being one day for one patient. Mean duration in reduction 50% cavity size in the study was 3.5 days (2-8)days.

DISCUSSION

Liver abscesses is one of the treatable diseases which are a significant cause of morbidity and mortality in the patients. Prompt timely diagnosis and treatment in the form of supportive treatment and some sort of drainage is the recommended management of liver abscess as life threatening complications such as rupture, septic shock and multi organ failure may eventually happen if not timely attended. Radiologically guided interventions such as USG or CT guided percutaneous catheter drainage(PCD) or percutaneous needle aspiration (PNA) in conjunction with intravenous antibiotics and other supportive therapy are the preferred treatment in the treatment of liver abscesses in the current era as it avoids the complications of a major surgery and thereby decreases the morbidity and mortality rates.[14-17] Surgical drainage is now reserved for very specific and few indications like a ruptured liver abscess or a patient with features of peritonitis.
The PCD has been preferred over the PNA due to better and more successful pus drainage (wide 14 Fr bore tube), earlier resolution of the pus cavity and fewer attempts required for the proper drainage of pus. However the limiting factor for PCD is its availability and cost, particularly in settings serving low socio economic status people who cannot afford such financial burden. Pigtail has a sizeable financial burden for poor people and not be a viable option for those population which are a majority. This results in opting PNA or surgical drainage PNA has high failure rates and hence poor results, needs multiple attempts and surgery is feasible only in medically optimized patients who get anesthetic clearance and is associated with its own complications. This novel method has been developed to overcome this limiting factor because the materials used in our method, such as Ryle's tube, are relatively inexpensive and widely available.

Figure 6: Confirmation and fixation of RT. A. Flow of pus through the Ryle's tube confirmed. B. Ryle's tube placement is also confirmed through ultrasound imaging. C. Fixation of Ryle's tube with skin. D. Pusdrainedvia Ryle's tube after fixation.

The cost of a onetime purchased 5 mm trocar is significantly reduced due to its repeated use and easy sterilization.
In this study involving 20 patients meeting the inclusion criteria, we used our method for drainage of liver abscess and the results were at par with the traditional PCD by pigtail catheter in terms of attempts required to drain the pus, resolution of symptoms, pain relief, hospital stay and complications. Additionally, it is common for small pig tail catheters to get blocked due to thick, tenacious pus, requiring periodic flushing with saline solution. However, this issue was not encountered in our cases with 14 Fr Ryle's tube.
We noted the time for 50% sonographic resolution of abscess cavities and that was also in concordance with the literature, which is around 3-9 days.[18]The time required for complete sonographic resolution of abscess cavities following percutaneous treatment can vary widely, ranging from two weeks to nine months.[19,20] However, 10% cases do not have total radiological resolution and small residual cavities may persist for years, often resembling simple hepatic cysts.[21]
The criteria which were set for this study for patient selection can be refined further by keeping the basic drainage principle in mind in studies with larger patient population.
Hence this novel technique is a feasible alternative of classical pig tail PCD with added advantage of being highly affordable by all. Its cost effectiveness, coupled with patient satisfaction, efficacy and acceptability gives it a potential to be universally adoptable.

CONCLUSION

Image guided PCD is the standard of care in the current era for the management of liver abscesses whenever feasible as it treats the disease without exposing the patient to the hazards of surgery. PCD by pig tail catheters are restricted due to financial burden in the low socio economic class population, which is the majority, in resource limited regions like our country. This novel technique attempts to address these issues. It is easy to learn, replicable,

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safe, efficacious and is performed by materials universally available in even basic health care set ups granting it a potential to be adoptable by all. However this is a pilot study and high volume randomized control trials are required to validate the efficacy of this method and establish it as an alternative to traditional PCD by pigtail catheter.

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