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ORIGINAL RESEARCH

Evaluating percutaneous needle aspiration vs pigtail catheter in liver abscess drainage: A comparative study

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ABSTRACT

Background: This study was intended to assess the effectiveness of percutaneous needle aspiration (PNA) and pigtail catheter drainage (PCD) in the treatment of liver abscess.**Methodology:** A prospective randomized comparative study conducted at the Department of Surgery. The inclusion criteria are patients with liver abscess who were older than 16 years with a cavity size of more than 5 cm or more than 60mL in volume. The study was conducted on 510 patients with liver abscess were included for the study. The patients with the signs & symptoms of liver abscess were admitted and detailed history and physical examinations were carried out. Certain laboratory investigations include – complete blood counts, renal function test, liver function test, prothrombin time, viral markers, blood culture and amoebic serology were taken. All the patients were randomly assigned into two groups using computerized randomization method. **Results:** The PCD group had statistically significant rate of duration of antibiotics need, days for clinical improvement and time for 50% reduction in abscess cavity and treatment success rate with comparable long-term outcomes.**Conclusion:** PCD is more efficient than PNA and can be used primarily in the treatment of both amoebic and pyogenic liver abscesses along with systemic antibiotics. PNA can be considered as an effective alternative when PCD cannot be performed due to unavoidable situations.

INTRODUCTION

Liver abscess can be defined as a collection of suppurative material in the liver parenchymal cells [1]and is one of the differential for cystic lesions of the liver. It may result from invasion and multiplication of microorganisms, entering directly from an injury through the blood vessels or by the way of the biliary ductal system. Liver abscesses are most commonly due to pyogenic, amoebic or mixed infections. Less commonly these may be fungal in origin. Liver abscess is found more commonly in men between 20 and 40 years of age.

The organism can reach the liver via three distinct routes namely via blood stream, biliary tree or by direct extension in case of pyogenic liver abscess. However, amoebic liver abscess occurs by faeco-oral transmission of one of the two species namely Entamoeba histolytica and Entamoeba dispar. Liver abscess mainly affects the right lobe (~65%) much more commonly than the left lobe (10–15%) and can also be bilobar (~20–25%). [2] Diagnosis of liver abscess is usually delayed due to non-specific and subacute symptoms. Classic triad of fever, jaundice and right upper quadrant pain is seen in less than 10% of cases. Diagnosis is made by combination of clinical symptoms, laboratory investigations and imaging.

The primary mode of treatment of amoebic liver abscess is medical however 15% of amoebic abscesses may be refractory to medical therapy. [3] Surgical drainage has been the traditional mode which is associated with significant 10 – 47% morbidity and mortality. [4] In recent years, image guided percutaneous drainage has been used to treat liver abscesses greatly which showed the success rate of 70 – 100% [5-7]

METHODS

This was a prospective randomized comparative study conducted at the Department of Surgery. The inclusion criteria are patients with liver abscess who were older than 16 years with a cavity size of more than 5 cm or more than 60mL in volume. The Exclusion criteria are ruptured abscess, cavity smaller than 5 cm, uncorrectable coagulopathy, concomitant

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malignancy.

The study was conducted after getting the approval from the institutional ethical committee and 65 patients with liver abscess were included for the study. The patients with the signs & symptoms of liver abscess were admitted and detailed history and physical examinations were carried out. Certain laboratory investigations include – complete blood counts, renal function test, liver function test, prothrombin time, viral markers, blood culture and amoebic serology were taken. Chest x ray has been taken for confirming the pulmonary pathology. Ultrasound abdomen was done to confirm the diagnosis and in certain doubtful cases computed tomography can also be carried out.

All the patients were randomly assigned into two groups using computerized randomization method. Group I included 32 patients of liver abscess in which percutaneous needle aspiration (PNA) was done and Group II included 33 patients of liver abscess where pigtail catheter drainage (PCD) was performed. The procedures were carried out after obtaining an informed consent from the patients.

PERCUTANEOUS NEEDLE ASPIRATION (PNA)

The procedure was done in aseptic conditions. Local anaesthesia solution (2% lignocaine) was infiltrated at the proposed site of puncture and 16/18-gauge long needle was guided into the cavity using real time ultrasonogram. Pus was aspirated and colour, nature of pus was noted followed by culture and sensitivity test. Cavity was aspirated to its maximum and an USG should be done on the third day to look for the reduction in the cavity size. If the size remains 5 cms or more then repeat aspiration has to be done eventually. Inability to achieve 50% reduction in the cavity size and/or clinical improvement after three aspirations was considered as treatment failure which has to be treated with PCD or laparotomy.

PIGTAIL CATHETER DRAINAGE (PCD)

Likewise, the procedure was done in aseptic conditions. Local anaesthesia solution (2% lignocaine) was infiltrated at the proposed site of puncture. A tiny stab was made in the skin at the proposed site. A 14-F pigtail catheter was then inserted via incision into the cavity under USG guidance. After aspirating the pus, it was sent for culture and sensitivity testing. A collection bag was attached and the inserted catheter was fixed to the skin. Daily output of the catheter was calculated and it was flushed regularly with normal saline to avoid blockage. Repeat USGs were taken to assess the size of the cavity. Catheter was then removed when it stopped to drain and noted clinical improvement was observed. Laparotomy might be needed when the signs showed were in correspondence to treatment failure.

POSTPROCEDURE ASSESSMENT AND FOLLOW-UP

All the patient's clinical parameters were recorded daily. They were then switched to oral antibiotics on improvement on clinical symptoms. Time to achieve clinical improvement,50% reduction in the cavity size, number of days ofIV antibiotics used, any complications in due course of treatment, success rate of treatment and their stay in the hospital were further recorded. A repeat USG was done at 2 weeks and then every month for at least 6 months.

Data were collected analyzed using chi-squared and independent t-test. P-value of <0.05was considered as significant.

RESULTS

General characteristics

The age of the patients falling within the range from 31-40 years (23 patients) mostly followed by 21-30 years (20 patients) and few in extreme ages. There were 55 males and 10 females with the male to female ratio of 6:1.

Symptoms and signs

Pain felt in the right upper quadrant of the abdomen was the most common symptom which is found in 93% cases followed by weakness (90%) and fever (88%). Almost half of the patients had anorexia, weight loss and night sweats. Pain in right shoulder was observed in22% cases and 27% had frequent cough. Only 10% gave a history of diarrhoea prior to these illnesses. (Table – 1)

Table-1:Symptoms in order of decreasing frequency

Symptoms	No. of patients	Percentage (%)
Anorexia	58	97
Rightupperquadraticpain	56	93
Weakness	54	90
Fever	54	88
Weight loss	30	50
Night sweats	29	48
Nausea/Vomiting	19	31
Chills/rigors	18	28
Cough	16	27
Rightshoulderpain	13	22
Diarrhoea	6	10

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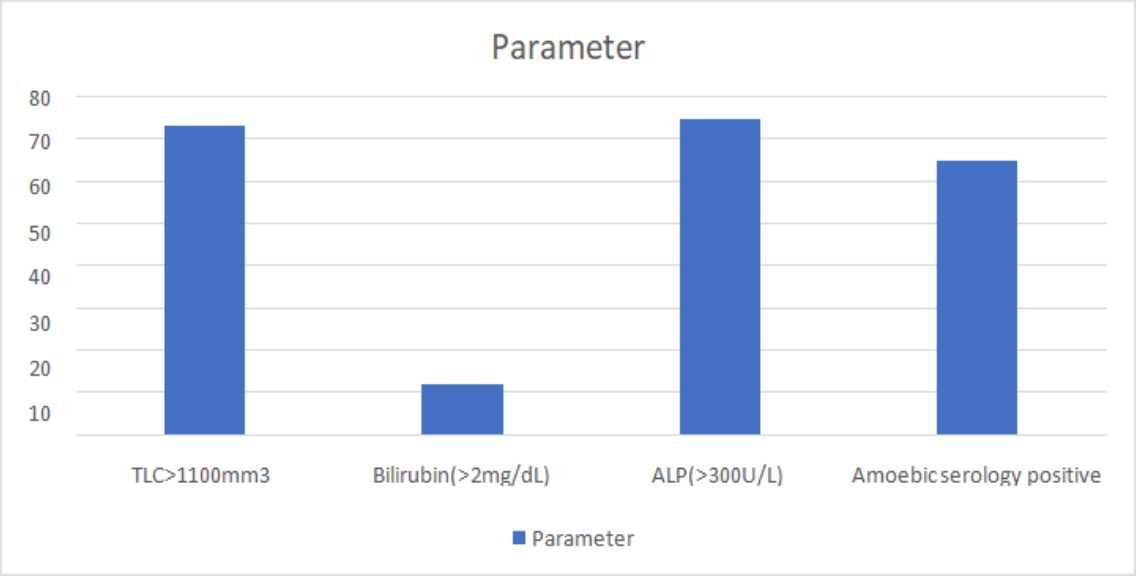
Dyspnea	4	7

Laboratory data

It was seen that 45 of 65 patients (73%) had profound leucocytosis. 75% of the study samples had elevated level of serum alkaline phosphatase and Amoebic serology positivity was found in 65% of the patients. (Fig – 1)



PUS culture

Pus samples which were sent to culture & sensitivity were tabulated with 20 out of 65(30%) cases found to be positive

Microbiology

Among the positive pus culture, Escherchia coli was isolated most commonly i.e., 9 of 30 cases followed by Klebsiellaspp in 6 cases and Pseudomonas spp. & Staphylococcus aureus were isolated from 2 patients each. (Table – 2)

Table – 2: Microbiology (Amoebic cultures were considered negative after 48h of incubation)

	Microbiology	**Number**	**Percentage (%)**
Culture positive	No growth	42	70
	Klebsiellaspp	6	10
	E. coli	8	13.3
	Pseudomonasspp	2	3.3
	S.aureus	2	3.3

Type of abscess

Amoebic liver abscesses were found most commonly in 58% cases compared to pyogenic in 23% followed by amoebic liver abscesses withsecondarybacterial infection and abscesses of indeterminate etiology with 7% and 12% respectively. (Table 3A, 3B)

Table–3A: Type of abscess (showing amoebic serology and pus culture)

Biology	**Amoebic serology result**	**Pus culture result**
Amoebic	+	-
Pyogenic	-	+
Amoebic with secondary infection	+	+
Indeterminate	-	-

Table–3B: Type of abscess in each group

	Amoebic	**Pyogenic**	**Mixed**	**Indeterminate**
PNA	19	5	2	4
PCD	16	9	2	3

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Volume ofabscess

It was verified that the volume of the abscess cavities was mostly between 150–350 mL.

Table–4: Volume of the abscess

Volume of cavity(mL)	Number of patients
51-100	1
101-150	5
151-200	11
201-250	13
251-300	9
301-350	10
351-400	5
401-450	0
451-500	2
501-550	2
551-600	1
601-650	0
651-700	0
701-750	0
751-800	1

Interventions and their results

Out of 65 patients who underwent either one of the two percutaneous procedures randomly and their response to treatment was recorded and analysed (Table – 5). Pigtail catheter drainage was found to be successful in all 32 cases and on the other hand, image guided needle aspiration was found to be successful in only in 25 out of 33 cases (p=0.006).

From those 25 cases successfully treated, 9 cases required only one aspiration followed by11 required two aspirations and 5 required three aspirations.7 patients were considered as failure where they did not show any signs of clinical improvement and/or decrease in cavity size. In the PNA group, the mean cavity volume being 403.6 cc (P<0.011). The patients in PCD group showed visible signs of clinical improvement (P=0.039) and 50% decrease in abscess cavity volume.

Parameters	Treatment Group				
	ail Catheter Drainage (n=30)		ercutaneous Needle Aspiration		P-value
	No. of Patients	Value Min-max Mean±SD	No. of Patients	Value Min-max Mean±SD	
Volume of largest cavity	32	97-772 304±123	33	121-574 251±122	0.096
Success	32	100%	26	77%	0.007
Hospital stays (days)	32	6-25 12.2±3.9	33	6-23 10.7±5.3	0.505
Clinical improvement (days)	32	3-10 5.2±1.63	26	3-9 5.7±2.2	0.042
Time for 50% reduction in the cavity(days)	32	3-10 5.1-1.8	33	5-11 7.4±2.5	0.456
Duration of drainage(days)	32	7-24 10.6±3.9	NA	NA	NA

c.c., cubic centimeter;SD, standard deviation;NA, not applicable

DISCUSSION

Liver abscess is almost 3-10times more predilected towards men. In this study, we found the male predilection with a ratio of5:1. The most commonly affected age group was in the third and fourth decade. [8] The clinical manifestations of liver abscess were similar to the results observed in previous reports. The most common clinical symptoms that were encountered as fever (88%), right upper quadrant painandtenderness(93%)and hepatomegaly(80%).These clinical manifestations are similar to those described in previous studies [9,10].

The pus cultures showed negative results in 42 of 60 patients. Aerobic cultures were considered negative after 48 hrs of incubation. There were 8 patients (12%) in whom the amoebic serology as well as pus cultures were negative. Several patients who were included in the study reported to the hospital had given antibiotics &antiamoebic drugs which explains the findings of 12% indeterminate etiology cases.

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Similar findings have been reported by other researchers as well [11].The major reasons for performing why PNA over PCD are: 1) less invasive and less expensive; 2) avoids problems related to catheter care3) multiple abscess cavities can be aspirated easier in the same setting [12,13]. But, in this study we had a success rate which was significantly lower than with catheter drainage (77% versus 100%, P=0.006). There are some minor problems encountered with catheter drainage like nuisance to the patient, pain, cellulitesatthe insertion siteandsometimescatheter dislodgement. ThesuccessrateofPNA in the literature varies from 79-100% [12,14]. The success rate in our study after single aspiration was 30%, after second aspiration 63% and after third aspiration it was 77%. Although, needle aspiration is a much easier procedure when compared to catheter drainage repeated procedures are quite unpleasant and traumatic for the patients and may not be acceptable to many. Even after repeated aspirations the success rate was far from being100%. Therefore, those patients who failed after a third aspiration attempt were offered catheter drainage.

The average size ofabscess in our studywas 302±122 mL and 249±121 mL for the PCD and PNA group respectively, comparable to the study reported by Rajak et al (335 mL and 221 mL respectively). The success rate achieved by Rajak et al was 60%, comparable to the successrateafter thesecond aspiration in our study, i.e. 63%. Subsequent aspirations seemto improve the success rate of therapy. [15] An important reason for failure of needle aspiration is the inability to completely evacuate the thick viscous pus that may be present in some ofthe abscesses. Rapid re-accumulation of pus in the abscess is another reason described for failure of needle aspiration [14].

Placement ofan indwelling drainage catheter addresses allthree ofthese 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 [12,15,16,17]. Certain reasons which can attribute for the failure of PCD is either having a thick pus not suitable for percutaneousdrainageorprematureremoval of drainage catheter. [18,19]

One limitation of our study is that the etiology of abscesswas not uniform and formed a heterogeneous group with abscesses of both amoebic and pyogenic etiology existing in both groups. Also, about 12% of the abscesses were of indeterminate etiology. Anaerobic culture was not performed and no studies to detect fungus were done.

CONCLUSION

In conclusion, PCD is more efficient than PNA and can be used primarily in the treatment of both amoebic and pyogenic liver abscesses along with systemic antibiotics. PCD should be preferred over PNA when the cavity is large (>150 mL), has biliary communication and/orthe pus is thick in consistency. However, PNA can serve as a safe alternative when PCD isnot available, althoughparameterswherecatheterdrainage should beconsideredupfront over needle aspiration is a subject to further investigation.

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