

Original Research Article

Pyogenic Liver Abscess : Revisiting With New Pattern

Mriganka Ghosh¹, Soumita Ghosh Sen Gupta^{2*}, Suman Saha³¹Associate Professor, Dept. Of General Surgery, Medical College and Hospital, Kolkata, India²Associate Professor, Department of Pathology, College of Medicine & Sagore Dutta Hospital, Kolkata, India³Assistant Professor, Dept. Of General Surgery, Medical College and Hospital, Kolkata, India

Received: 03-01-2020 / Revised: 23-02-2021 / Accepted: 08-03-2021

Abstract

Introduction : Pyogenic liver abscess is a typical tropical disease which is mostly polymicrobial and pain abdomen and systemic symptoms like weakness and anorexia and fever are common modes of presentation. With the changing demographic pattern, new and effective modes of treatment has also evolved. Presently, image guided minimally invasive needle aspiration or indwelling catheter placement and drainage is best option for its resolution, making conventional surgery the last resort in failed cases. **Methods & materials :** We selected 50 patients with radiological proof of simple uncomplicated pyogenic liver abscess and put them into two modes of management, i.e. percutaneous needle aspiration and pigtail catheter drainage and analysed all the findings with modern statistical gadgets. **Results :** We found male preponderance even in the changing pattern in incidence with good results in both techniques, i.e. 96% in pigtail drainage and 79% in needle aspiration. **Conclusion :** Percutaneous Catheter drainage is definitely superior modality but can be reserved for large cavity while Needle aspiration can be equally effective in small and multiple non communicating abscess cavities with liquefied contents.

Keywords : Pyogenic liver abscess, treatment, percutaneous methods.

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Introduction

Pyogenic liver abscess, a rarer disease in western countries, is a typical tropical disease. While the other variety, amoebic liver abscess, used to predominate the tropical scenario, but in last two decades, the paradigm shifted significantly with the increasing number of cases of pyogenic liver abscess (PLA), thanks to sharp rise in gall stone disease & malignancy and biliary interventions like stenting, liver biopsy. The infection is caused by bacteria and is usually polymicrobial. Previously, surgery was the mainstay of treatment. [1] But for last one decade or two, minimally invasive procedures like image guided aspiration and drainage with a indwelling catheter, took the centre stage and encouragingly both treatment modalities ensured rapid clinical relief within the first few days of the procedure sending debilitating surgery to the backseat. [2] Moreover, these minimally invasive procedures can be done as day care basis and hence does not require hospital admission all the time unless specially indicated. So there is no extra burden over bed crisis. A randomized study was undertaken over symptomatology, diagnosis and therapy of PLA with particular care devoted to comparing the efficacy and safety of percutaneous needle aspiration (PNA) and percutaneous catheter drainage (PCD), thereby defining the first line management of PLA and assessing new trends in treatment.

Methods and Materials

All patients with USG proved pyogenic liver abscess, attended, admitted and received treatment on OPD/IPD basis in our hospital between February 2018 and March 2019 were considered candidates for the study. A patient was enrolled if he or she had symptoms and

signs of pyogenic liver abscess and if liver abscess was confirmed at sonographic or CT examination. Initially all uncomplicated patients were put on intravenous antibiotics and only patients with the following criteria were taken for percutaneous drainage: (1) Patients who continued to be febrile even after 48-72 h of adequate medical treatment; (2) Liver abscess more than 5 cm in size; and Clinical or ultrasonographic features suggest impending perforation. [3] Open surgical drainage was reserved for cases with (1) Thick content which could not be aspirated; (2) Patients with multiple liver abscess; (3) Patients with ongoing sepsis even after antibiotic therapy and percutaneous drainage; (4) Multiloculated abscess; (5) Abscess in the left lobe; and (6) Ruptured abscesses. [4] Only single cavity or multiple communicating abscess cavities (with size more than 5 cm in its largest diameter) with liquefied or partially liquefied content were included in the study. We also excluded patients with coexisting malignant disease, immunocompromise and diabetes mellitus, amoebic serology positivity and recent history of intervention. Eventually, 50 patients with radiologically diagnosed PLA satisfying aforesaid criteria were taken as candidates for the present study and they gave written informed consent, and the study was approved by the local ethical committee.

(A) For needle aspiration : With proper antiseptic precautions, aspiration was done after localization of cavity or cavities and choice of cavity. The appropriate place of prick and appropriate route was chosen according to shortest route from skin site to the cavity, that traverses minimum liver tissue and avoids important structures bowel, pleura and others. Under Local anaesthesia (2% xylocaine) at and around the site of puncture, a small nick was given on the skin and the 18G needle was passed towards the abscess cavity with predetermined angle and up to the predetermined depth when patient was asked to hold his breath. A give way sensation confirms needle in the abscess cavity and the free flow of pus. Pus sample as collected in a sterile specimen bottle was sent for microscopy and

*Correspondence

Dr. Soumita Ghosh Sen Gupta

Associate Professor, Department of Pathology, College of Medicine & Sagore Dutta Hospital, Kolkata, India

E-mail: soumitaghosh723@gmail.com

culture sensitivity and the pus was drained till the cavity collapsed (as confirmed by ultrasound) or till no more pus is aspirated, even after manipulating the needle. Sonography was performed every 3 days, and the size of the abscess cavity was compared with the control. If there was no significant reduction in the abscess cavity or if no clinical relief was noted, aspiration was repeated. Aspiration is done up to maximum of three times, lack of response to a third aspiration attempt was considered failure of treatment, and a catheter for continuous drainage was introduced. Patients who needed this treatment were not included in the PCD group.

(B) Pigtail catheter drainage: Salinger technique was adopted. Trocar of pigtail set was slowly inserted through pre-determined prick site until it reaches in abscess cavity (confirmed by ultrasound),

then a guide wire was passed through it, then over guide wire trocar was removed, the tract was dilated by serially passing the dilators (of increasing caliber) over the guide wire and then a Pigtail catheter drain was kept in abscess cavity (Figure 1). The draining catheter was properly secured in its place and connected to a collecting system. At this point first USG is done and if abscess cavity is completely resolved, catheter is removed. If a residual cavity is still present, catheter is flushed with normal saline which is aspirated back, and catheter is left in situ. From this point USG is done every third day until abscess cavity disappears, decreases in size or remains static compared with previous USG and catheter is removed if it was not draining much (<30ml) for two consecutive days.



Fig 1: Placement of pigtail catheter in an intercommunicating abscess cavity under USG guidance.

Pus obtained from all 50 patients was sent for C/S and the antibiotics were adjusted accordingly. Patients with negative culture results were continuously treated with a combination of cefazolin and gentamicin. If antibiotic therapy was changed according to the results of sensitivity testing, new antibiotics were administered for 10 days. Patients were discharged earlier with an IV catheter inserted for completion of therapy if fever had subsided for at least 48 hours. IV antibiotic therapy was followed by a 4-week course of appropriate oral antibiotics. Criteria for successful treatment were clinical subsidence of infection and sonographic evidence of abscess resolution, such as disappearance or marked decrease in the abscess cavity (more than 50% reduction of longest diameter before treatment). Patients were followed up for a period of 6 months. Data was collected and recorded in the printed proforma by the investigator.

Statistical analysis: The effectiveness of treatment was measured in terms of: tenure of hospital stay; number of days to achieve clinical improvement including sense of well being; number of days to achieve 50% reduction in abscess cavity size in longest diameter; and number of days to achieve total/near total resolution of abscess

cavity. Independent t-test, McNemar test (paired proportion) were mainly used to analyse these parameters. Mann-Whitney test (independent sample) was also used in particular cases. Categorical variables were analyzed by Chi-square test. The level of significance was set at $P < 0.05$. Volume of abscess cavity and duration of drainage were also analyzed and range and mean values were calculated for both the parameters. All demographic features, relevant history, clinical symptoms and signs, laboratory parameters and other investigations were recorded.

Result

Age of the patients included in this study varied from 15 to 70 years. The highest incidence was noted in age groups 31-40 years (32%) and 41-50 years (24%).

Onset of disease: The onset of disease can be acute (2 months) depending upon the type, location and size of liver abscess. In our study, majority of patients 30 (60%) cases subacute presentation after 7 days of onset of illness. Acute presentation was noted in 18 (36%) cases and chronic presentation was observed in 2 (4%) cases. In an Indian study conducted by Kapadia et al. most of the cases presented between 7 days to 2 months of onset of illness.

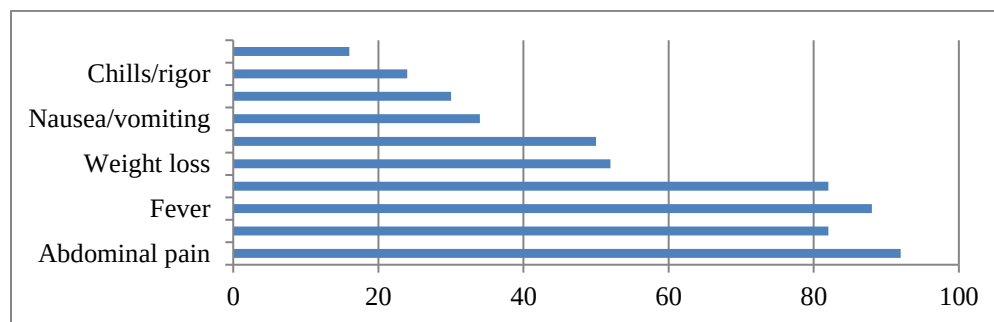


Fig 1: Presenting symptoms

Table 1: Clinical signs present in enrolled cases

Signs	Number(N)	Percentage (%)
Jaundice	8	16
Pallor	12	24
Fever (>38.5°C)	45	90
Abdominal tenderness	48	96
Hepatomegaly	25	50
Respiratory findings	31	62
Shock	2	4

Microbiology: Among the pus culture positive cases klebsiella spp. was isolated most frequently followed by Escherichia coli.

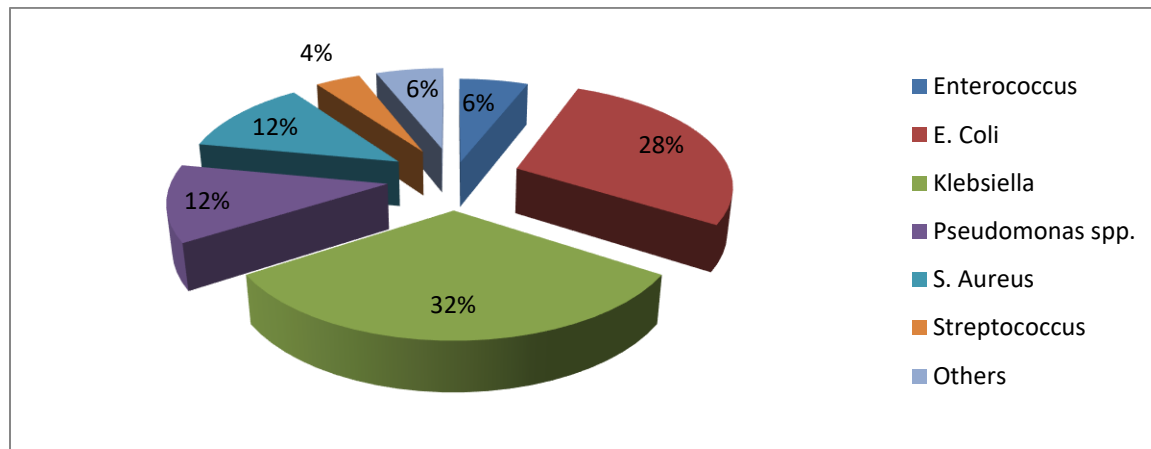


Fig 2: Pus culture analysis

Location of the Abscess: The majority (about 82%) of the abscesses were located in the right lobe of liver, 10% in the left and 8% in both lobes.

Volume of the Abscess: It was observed that the volume of the abscess cavities was mostly between 150-350mL with a range of 80cc to 760cc.

Outcomes of interventional procedure: A total of 50 patients underwent either of the two percutaneous procedures randomly and their response to treatment was recorded and analysed. Pigtail

catheter drainage was successful in the 24 cases (96%). On the other hand, image-guided needle aspiration was successful only in 19 of 25 patients which is 76% ($P < 0.0001$). Out of these 19 patients successfully treated, 6 patients required only one aspiration, 10 required two aspirations, and 3 required three aspirations. Overall, these 19 patients required an average of 1.8 aspirations. The mean duration of time taken for clinical improvement was 5.0 days in this modality of treatment.

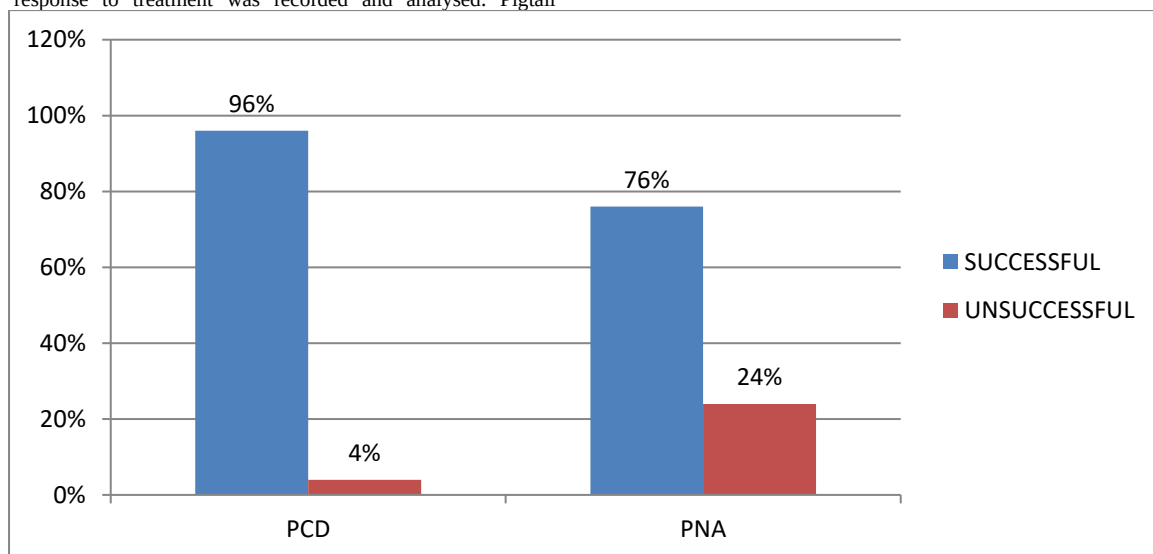


Fig 3: PCD and PNA

The 7 patients who did not show clinical improvement and/or decrease in cavity size despite 3 aspirations were taken as failures. Now clinical improvement ($P=0.0003$) and 50% decrease in abscess cavity volume ($P<0.0001$) and the time required for total or near-total resolution of cavity ($P<0.0001$) seen in the patients in PCD groups compared to those who underwent PNA. However, there was no significant difference between the duration of hospital stay.

Follow up and recurrence: All the patients were followed up for a period of 6 months. Recurrence was observed in 3 (6%) cases of whom 2 cases were given conservative management for small liver abscess. Only a single case who received USG guided pigtail drainage for large liver abscess developed recurrence.

Table 2: Treatment groups and p value

Treatment Group					
Parameter (procedure test)	Pigtail Catheter Drainage (Group A) (n=25)		Percutaneous Needle Aspiration (Group B) (n=25)		P Value
	No. of patients	Value Min-max	No. of patients	Value Min-max	
Volume of the largest cavity (c.c) (Independent T-test)	25	208-460 Mean +/-SD 330.8+/-71.7 SE of mean 14.35	25	190-416 Mean +/-SD 329.1+/-67.8 SE of mean 13.5	0.9326
Success (%) (McNemar test)	25	96%	25	76%	< 0.0001
Hospital Stay (days) (Mann-Whitney test)	25	4-15 Median 7 Avg. rank 27.28	25	3-13 Median 7 Avg. rank 23.72	0.3852
Clinical improvement (days) (Mann-Whitney test)	25	2-8 Median 5 Avg. rank 18.04	25	4-12 Median 7 Avg. rank 32.96	0.0003
Time for 50% reduction in cavity size (days) (Mann-Whitney test)	25	3-8 Median 5 Avg. rank 15.14	25	Median 8 Avg. rank 35.86	< 0.0001
Time for total or near total resolution of cavity (weeks) (Mann-Whitney test)	25	6-14 Median 10 Avg. rank 16.62	25	9-15 Median 13 Avg. rank 34.38	< 0.0001

Discussion

Thanks to the absence of distinguishing clinical signs & symptoms and laboratory results, pyogenic liver abscess (PLA) is still a serious illness and a diagnostic challenge. Imaging techniques like ultrasound and CT scan have made the differential diagnoses clearer but cannot always rule out parasitic abscesses or primary and metastatic hepatic malignancy. While the epidemiology of PLA is changing, so is the approach to its resolution. Minimally invasive techniques have surely taken over the more debilitating surgery, making the latter as last resort in failed cases. [5,6 & 7] Although most studies show a male

majority, recent reports suggest a trend to an equal sex incidence thanks to the increase in the proportion of cases with underlying biliary disease, which is more prevalent in women. Our study however contradicted the aforesaid trend, reflecting male preponderance (male : female ratio 5.2:1) as seen in other Indian studies conducted by Arpit Bansal et al [8] and Sukhjeet et al on PLA. [9] Quite interestingly, Enver Zerem et al and Ajaz A Malik et al reported a surprising female preponderance in their case series. [1,9] The most frequently affected age group in our study was 30-40 years and same results were seen in studies by Sukhjeet Singh et al [10] and other studies mentioned below (Table 3).

Table 3: Results as seen in studies by Sukhjeet Singh et al and other studies mentioned below

Studies	Most common age group affected (yrs)	Male : Female	Range of ages (yrs)
Arpit Bansal	31-40	10: 1	20-75
Chaudhary et al.	31-60	7:1	19-69
Ojha et al	21-50	5:2	2.5-70
Present study	31-60		15-69

Abdominal pain mainly in the right upper quadrant (RUQ) was the predominant symptom in our study followed by fever (88%) and respiratory symptoms (62%). Comparative finding of most common symptom among different studies are as below (Table 4).

Table 4:Comparative finding of most common symptom among different studies

Studies	Most common sympyoms	Percentage
Rajak's et al (1998)	RUQ pain	96%
Sukhjit Sing et al	Anorexia / RUQ pain	97% / 93%
Simon Yu's et al (2003)	Fever	83%
Zarem and Hadzek et al (2006)	RUQ pain	93.22%
Present study (2018)	Abdominal pain	92%

There was no statistically significant difference between the patients of two groups in respect to white blood cell count, bilirubin level, serum level of alkaline phosphatase which are commonly elevated in patient with liver abscess. In our study 78% of total patient had leukocytosis ($TLC >11,000/cu/mm^3$), where as in Rajak's and Simon's study the figures were 83% and 89% respectively. [2,9] The most frequently isolated bacteria on pus culture was Klebsiella species (32%). followed by Escherichia coli (28%). Asian series have reported Klebsiella to be the most frequently isolated bacteria. [11,12,13] Percutaneous drainage under coverage of antibiotics (intravenous initially then orally) has now been established as safe standard treatment modality. [11,14,15] Several prior studies show a similar or decreased mortality rate, compared with open surgery, without significant differences in recurrence rates. [16,17]. Although few have treated PLA with <2 weeks of intravenous antibiotic therapy, the optimal duration intravenous therapy—as well as the duration of subsequent oral therapy—remains unclear. In Taiwan, therapy has become somewhat standardized, with 3 weeks of intravenous therapy followed by 1 or 2 months of oral therapy. [18] The two main methods, PNA and PCD have their merits and demerits. The controversy, however, still swings between them in regards to which should be the 1st line and which is safer and which is more acceptable or whether they are replacement of each other or mutually complementary. PNA is definitely safe, less traumatic and hazardous. The major advantages of PNA over PCD are: 1) it is less invasive and less expensive; 2) avoids problems related to catheter care; and 3) multiple abscess cavities can be aspirated easier in the same setting but repetition is more often the rule, which is often nonacceptable [19,20]. PCD, on the other hand, is more demanding in terms of technical expertise and patient cooperation and compliance. Going by the predecessors, one trend has been choosing PA as first line with coverage of antibiotics, most needing two consecutive aspirations for a reasonable amount of success. PCD is rather reserved for failed cases. Surgical drainage is usually reserved for patients who have failed in or got complicated after percutaneous drainage, those who require surgery for management of underlying problems or in case huge yet accessible or those one with impending rupture. [3,4,21] In our study we treated 25 patients with PNA along with systemic antibiotics. Of these 25 patients, 19 were successfully treated, requiring an average of 1.8 aspirations. The success rate in our study after single aspiration was 24%, after second aspiration 64% and after third aspiration it was 76%. Even after repeated aspirations the success rate was far from being 100%. Therefore, those patients who failed after a third aspiration attempt were offered pigtail catheter drainage. Giorgio et al performed on an average 2.2 aspirations in 115 patients and reported resolution of clinical symptoms and radiological signs in 98% of the patients. [21] Rajak et al reported a success rate of 60% with needle aspiration. [2] However, in their study only two attempts of aspiration were made and failure to attain clinical, hematological and radiological improvement was taken as failure of therapy. The average size of abscess in our study was 330.8 ± 71.7 mL and 329.1 ± 67.8 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 success rate after the second aspiration in our study, i.e. 64%. Subsequent aspirations seem to improve the success rate of therapy. In contrast to some of the earlier studies that showed the initial size of the abscess cavity did not affect

the ultimate outcome, our present study showed that larger abscesses are more difficult to evacuate completely in one attempt, necessitating subsequent aspirations. [22] The average volume of the 6 patients in whom PNA failed was significantly larger than the average volume of the patients who could be successfully treated with PNA more than three aspiration. The time required for 50% reduction in the cavity size was significantly less in the PCD compared to PNA group (5.0 days and 8 days respectively, $P < 0.0001$). and time required for total or near-total resolution of the abscess cavity show in the two groups (PCD=10 weeks, PNA=13 weeks, $P < 0.0001$) analysed by Mann-Whitney test. The clinical improvement much better in PCD compared to PNA but there was no remarkable difference in hospitalization periods between two group as supported by numerous previous studies. [1,8,10]

The success rate of PNA in the literature varies from 79-100% [23]. It's been observed that even by increasing the number of attempt, success will invariably fall short of 100%. Common reason is inability to evacuate the thick viscous content. Another reason is rapid re-accumulation of pus which may be due to inter communicating cavities. [24] Placement of indwelling catheter specially of wider variety addresses all three of these issues as it provides continuous drainage, drains thick pus and prevents re-accumulation. This explains the higher success rates (100%) in PCD as reflected in our study and several previous studies. [11,25] The only reasons for failure of PCD as reported in some of the earlier series have been thick pus (duly overcome by placement of a wider bore catheter) or premature removal of drainage catheter. No recurrence occurred in any of our cases during the follow up period. However, both treatment modalities resulted in rapid clinical relief with most patients showing resolution of signs and symptoms within the first 3 days of the procedure. [26] Hemorrhage, pleural effusion/empyema, persistent bile drainage, catheter displacement, sepsis etc. are few of the complications reported by past workers, with PNA definitely scored better in regards to safety and untoward happenings. Baek et al reported 4% complications in PNA and 12% in case of PCD and almost same was reported by Giorgio et al, thus making PNA more acceptable over catheter drainage. [21,23] However, in our study and some recent studies (Rajak et al 1998 and Yu et al 2004) both the procedures were found to be relatively safe if performed properly with standard precautions. [2,9] There was no mortality in either of the study groups.

Conclusion

Image-guided percutaneous treatment (aspiration or catheter drainage) has replaced surgical intervention as the procedure of choice. If executed with strict adherence to all recommended precaution and asepsis, both the procedures are safe with little hazards. Percutaneous catheter drainage is surely a superior modality over percutaneous needle aspiration as even repeated excursion of the latter 100% is a distant possibility. Each repeated aspiration improved the success of treatment by percutaneous needle aspiration. And chances of failure of percutaneous needle aspiration increases with the increase in size of abscess cavity and viscosity of its content. Although, there was no significant advantage of catheter drainage over needle aspiration in terms of duration of hospital stay but time needed for total or near total resolution of abscess cavity is significantly less in the former. Safely, it can be concluded that Catheter drainage is better for large cavity while needle aspiration is

better suited for small and multiple non communicating abscess cavities with liquefied contents.

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Conflict of Interest: Nil

Source of support:Nil