

Different Modalities of Management of Liver Abscess and its Surgical Outcome - An Observational Study

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Abstract: **Background:** Liver abscess is a common condition in India. India has 2nd highest incidence of liver abscess in the world. Pyogenic abscess accounts for three quarters of hepatic abscess in developed countries. While amoebic liver abscess cause two third liver abscess in developing countries. Amoebiasis is presently the third most common cause of death from parasitic disease. The world health organisation reported that *Entamoeba Histolytica* causes approximately 50 million cases and 100000 deaths annually liver abscess continues to be disease with considerable mortality in India. Liver abscess has an increasing incidence rate in United States and Europe Modern treatment has shifted towards IV broad spectrum antibiotics and image guided percutaneous needle aspiration or percutaneous catheter drainage and surgical drainage. Treatment of liver abscess were improved significantly with the introduction of ultrasound and computed tomography. **Methodology:** This was A prospective observational Study was conducted in department of surgery GMC Bhopal, from March 2017 to august 2018 entitled "Study of Different Modalities of Management of Liver Abscess and Its Outcome. Total number of 250 patients was included in this study with the diagnosis of liver abscess. **Results:** Out of 250 patients, 54(84.6%) patients responded to drug therapy alone. 55 (86%) required ultrasound guided needle aspiration, 105 (91.4%) patient responded to ultrasound guided pigtail placement and 6 (85.2) patient with ruptured liver abscess treated successfully with surgical drainage. Most common signs and symptoms, pain in abdomen (n=216), fever (n= 214), nausea and vomiting (n = 175) and weight loss (n= 175). Among the successfully treated patient the average time of mean hospital stay and average time for clinical improvement were slightly different among groups. Early alleviation of symptoms and resolution of abscess cavity present in surgical drainage and pigtail catheter drainage. **Conclusion:** Majority of patients with unruptured liver abscess can be managed without conventional surgical drainage with image guided percutaneous catheter drainage as modality of choice.

Keywords: Liver abscess, percutaneous needle aspiration (PNA), percutaneous catheter drainage (PCD), surgical drainage, amoebic liver abscess, pyogenic liver abscess

1. Introduction

A liver abscess occurs when bacteria or protozoa destroy hepatic tissue, producing a cavity, which fills with infectious organisms, liquefied liver cells, and leukocytes. Necrotic tissue then walls off the cavity from the rest of the liver. The differential diagnosis of liver abscess includes amoebic liver abscess, pyogenic liver abscess, fungal liver abscess, necrotic adenoma, and echinococcal cyst.

Up to 40% of patients develop complications from pyogenic liver abscesses, with the most common being generalized sepsis. In addition to sepsis, morbidity can include pleural effusions, empyema, and pneumonia. Abscesses may also rupture intraperitoneally, which is frequently fatal. Usually, however, the abscess does not rupture, but develops a controlled leak resulting in a perihepatic abscess. Pyogenic abscesses also can cause hemobilia and hepatic vein thrombosis. (1)

Amoebic liver abscess (ALA) is a common infection caused by parasite *entamoebahistolytica* which is capable of invading virtually every organ in the human body(2) ALA is the third leading cause of death due to parasitic diseases after malaria and schistosomiasis(3). 10% of the world's population is infected with *E. histolytica*(4). 40 million develop invasive disease and 40000 deaths occur annually

From the 1950s to 1990, mortality rates varied from as low as 11% to as high as 88%(2). The high mortality rates came from delay or failure to diagnose the abscess, failure to detect smaller intrahepatic abscesses, ineffective surgical drainage, lack of source control, associated malignancy, immune

insufficiency, or other major comorbidities.

Failure to establish a diagnosis and achieve adequate drainage was major factors that contributed to high mortality rates. No general consensus has been achieved regarding risk factors due to the variability of the patient population being studied and the presence of malignancy in the population

Complications from liver abscesses occur secondary to rupture of the abscess into the peritoneum, pleural cavity, or pericardium. Ruptured liver abscesses occur in 2–17% Patients and are associated with mortality rates between 12% and 50% according to the present literature.⁵

Currently these patients are treated with antibiotics along with percutaneous needle aspiration (PNA) or percutaneous catheter drainage (PCD) or surgical drainage being used only in patients who fail to respond to such treatment. Thus, this study aims to evaluate the outcome associated with different treatment strategies of liver abscess

2. Methodology

The present study " study of different modalities of management of liver abscess and its outcome " was carried out in the department of surgery, Gandhi medical college and associated Hamidiya Hospital, Bhopal (M.P.) India from march 2017 to august 2018. Total number of 250 patients was included in this study with the diagnosis of liver abscess admitted in the surgery ward. It was an Observational, Prospective and Retrospective study.

Patients with following symptoms and signs were selected

for screening of liver abscess fever, abdominal pain, diarrhea, weight loss, anorexia, nausea and vomiting, history of chronic alcoholism and smoking, tender hepatomegaly, jaundice all this patient were subjected to ultrasound abdomen examination. All the liver lesions suggestive of liver abscess were examined in detail. Computed tomography is also used alternative to ultrasound.

Detailed morphology of liver for abscess was examined like size of abscess cavity, number of abscess, lobe of liver involved, volume of abscess cavity. X-ray upper abdomen and chest was done. Routine blood investigation was done like complete blood count, random blood sugar, liver function test, renal function test, coagulation profile, pus for culture & sensitivity and microscopy urine and stool examination.

After history, clinical examination and radiological investigations, all the patients with diagnosed with liver abscess and needs hospitalization were hospitalized and started on third generation cephalosporin and metronidazole therapy then depending on the size of abscess cavity ultrasound guided needle aspiration or percutaneous needle aspiration was done in case of ruptured liver abscess emergency laparotomy was done and for smaller abscess responding to drug therapy conservative management was done.

Techniques of Percutaneous Needle Aspiration

The patient is made to fast for six hours. To counteract vagal shock atropine is injected in a dose of 0.6mg half an hour before procedure. The site of aspiration is next determined. The selected area after being subjected to meticulous surgical toilet is infiltrated with 4 to 5 ml of 2% Xylocaine using a 4 inches 24 G needle a small puncture with stab knife may be made in the skin at the site of needle puncture. Percutaneous aspiration may be done with a large bore cannula (No.18) or lumbar puncture needle. While the needle is being withdrawn or introduced, the patient is asked to take shallow breath throughout the procedure and hold his breath to minimize the liver trauma and hemorrhage. The puncture wound is sealed and covered with dressing. Analgesics should be given to relieve the pain and intravenous antibiotic or amoebicidal should be given as necessary if not given at the start of the procedure. For the first twelve to twenty four hours a half hourly watch is kept on the temperature, pulse, respiration, and abdominal girth so that signs of haemorrhage or peritonitis may not be missed.

Techniques of Pigtail Catheterization

Catheter drainage was performed using the Seldinger technique as described in the literature. Injectable atropine 0.5 mg was given intramuscularly half an hour before the procedure. Abscess was localized by USG and a safe drainage route planned to avoid the bowels and costophrenic recess. Under all antiseptic precautions, the site was marked and infiltrated with 2% lignocaine. A 4 mm stab incision was made 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 depending upon the viscosity of the pus. A pigtail catheter of size smaller than the last dilator was passed over the wire and positioned in the center of the abscess cavity under sonographic guidance.(5) The guide wire was then withdrawn and the pigtail catheter was connected to a closed drainage bag and fixed to the skin. Sterile dressing was applied. The pus was sent for aerobic culture. (FIGURE 7)

Catheter Care and Follow Up

The daily output was monitored. The catheter was flushed daily with 10 ml of normal saline to prevent its blockage with debris. Alternate day USG studies were done to monitor the cavity size and volume and to confirm the position of tip of the catheter. The pigtail catheter was removed when drainage become serous and it either ceased or was minimal (<10 ml in 24 hours) and USG was suggestive of reduced size / collapsed cavity without any residual pus (2). On removal of the catheter, sterile dressings were applied. All patients were called for monthly follow up and were assessed clinically and ultrasonographically. (FIGURE 6)

Inclusion Criteria

All cases of liver abscess diagnosed clinically as well as ultrasonographically or computed tomographically.

All cases of diagnosed liver abscess being referred to our hospital

Older than 12years

Hospitalized and outpatient patients of both genders

Patients received the complete treatment

Patients who come for follow up as advised

Exclusion Criteria:

Abdominal neoplastic antecedents

Age group < 12 years

Congenital cysts

Abdominal or biliary surgery antecedents

Patients lost in early followup

3. Results

- Incidence of liver abscess was more in age group 20- 40 years with Mean age of presentation of liver abscess was 38 years
- Out of 250 patients 227 were male patient (90.8) and 23 were females patient (9.2) with a male to female ratio of 10:1
- History of regular alcohol intake presents in 136 patients (54.4%), while the other 114 patients (45.6) gave no history of alcohol intake or occasional alcohol intake
- Right Lobe of Liver Is Most Commonly Involved In Liver Abscess i.e 172 Patients (68.8%) followed by both lobes 22% followed by left lobe 9.2%
- Solitary abscess found in 195 patients i.e. 78% and multiple liver abscesses found in 55 patients i.e. 22%
- Amoebic liver abscess is more common than pyogenic liver abscess out of 250 patients 174 patients i.e. 69.6 % are amoebic and 74 patients i.e. 29.6% are pyogenic, 0.8% are fungal abscess, 7% of the amoebic liver abscess is

Secondary bacterial infected

- Amoebic liver abscess were predominantly from the rural areas . Pyogenic and fungal liver abscess were predominantly from the urban areas
- Patients presented acutely with onset of symptoms < 7 days in 146/250 on cases. Sub-acute, presentation between 7 days to 2 months was noted in 92/250 and those with chronic duration of onset > 2mnths was seen in 12/250 patients
- Most common presenting symptom in amoebic liver abscess is abdominal pain (94.8%), fever (88.5%) and nausea vomiting (78.1%)

Most common presenting symptom in pyogenic liver abscess is fever (81%) pain in abdomen (68.9%), weight loss (58%) (GRPAH 9 AND TABLE 9)

- Outcomes were associated with following derangements in the routine blood investigation total leucocyte count > 10000 /mm³ increased alkaline phosphate level, decreased serum albumin < 3 GM/DL, hematocrit <36%, raised serum bilirubin > 2MG/DL, disarranged prothrombine time – INR > 2
- Average size of abscess at the time of presentation is 400-500 ml
- Abscess culture is positive for growth in 35.2% patient's kebsiella, E.coli and bacteriod are most common organism, While 64.8% of culture show no growth
- Diabetes mellitus and cirrhosis is most common predisposing factor in liver abscess other predisposing factors include chronic pancreatitis, peptic ulcer disease, inflammatory bowel disease, jaundice, unsanitary condition, immunodeficiency.
- Most common complication associated with amoebic liver abscess is sepsis 36.2% and pleural effusion 10.3%. Most common complication associated with pyogenic liver abscess is sepsis 40.5% and pleural effusion 32.4%
- Treatment modalities delivered in 64 patients Antibiotic alone, ultrasound guided aspiration with antibiotics in 64 patients, ultrasound guided Pigtail with antibiotics in 115 patients, Surgical drainage with antibiotic in 7 patients.
- Persistence of liver abscess present in 30 (12%) cases. Persistence in Drug therapy alone in 10 (15.6%), 9 (14%) ultrasound guided aspiration with antibiotics, 10 (8.6%)ultrasound guided Pigtail with antibiotics, Surgical drainage with antibiotic in 1(14.28%) cases.
- Patients required percutaneous aspiration only once for resolution of the abscess while, 8.1% patients require 2 aspiration, 2.7% patient require three aspiration, persistence of Liver abscess present in 10.8 % patient.
- With surgical drainage 71.4% and pigtail catheter drainage 64.4% of cases had early resolution as shown on follow up ultrasound as compared to drug therapy 28.1%, percutaneous needle aspiration 35.9%. (GRAPH 18 AND TABLE 15)
- There is no significant difference in duration of hospital stay in different modalities.
- Reoccurrence of liver abscess occur in 21 cases (8.4%), no reoccurrence in 217 (86.4%) cases and cases lost in follow up 12 (4.8%).

4. Discussion

Percutaneous treatment (needle aspiration or catheter drainage) is now a standard management for liver abscesses.(7-10) It has replaced surgical exploration which now has very limited indications. Needle aspiration is less expensive, avoids problems related to catheter care and long-term hospital care. Multiple abscesses can be aspirated through different tracts in the same sitting. However, needle aspiration has lower success rate than catheter drainage(5-9) Another problem with aspiration is that repeated needle aspirations (average number per patient ranging from 1.4 to 5) may be required in a single patient over a short period of time from 5 to 14 days(11). This may be painful and unpleasant for the patients and hence may not be acceptable to them. To avoid these problems associated with needle aspiration, percutaneous pigtail catheter drainage is now used as the first 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. Therefore this procedure has a high success rate reported in the earlier studies and also in this present series (95%).

The problem of failure of this procedure as reported by earlier studies (11,12) has been due to the thick and viscid pus, which cannot be easily drained by percutaneous drainage or early premature withdrawal of the catheter. These problems can be avoided by using adequate sized pigtail catheters depending on the viscosity of pus (5 Fr. to 12 Fr.) and following a strict protocol for catheter flushing and removal. One of the major problems is a prolonged duration of the catheter. This led to some authors considering this procedure as slow.¹⁵ Sonographic resolution of an abscess cavity following this procedure may occur at any time between 2 weeks to 6 months (13,14). Small residual cavities may persist indefinitely. 40 % of our patients had small residual cavities (< 2 cms) at 6 months of follow up.

Percutaneous catheter drainage is a safe procedure with very few reported complications (15,16,17). which includes hemorrhage, perforation of hollow viscera, peritoneal spillage, catheter displacement or blockage and septicemia. But recent studies show very low complication rates (6, 18, 19). Our study did not have any major complication although the incidence of minor complications was 36%.

Table A: Comparison of Duration of Onset with Previous Studies

Onset of Disease	Sumit Kapadia, Dipesh Dattaroy Et Al(25)	Present Series
<7Days (Acute Onset)	-	Most patients (52%)
7days-2months (Sub Acute Onset)	Most patients	46%
>2months (Chronic)	-	2%

Table B: Comparison of Symptoms and Signs with Previous Studies

Symptoms	Hyo Min Yoo Et Al(26)	Khee Siang, Ching Ming (21)	Shyam Mathur (20)	Rajak et al (17)	Satishchritopher et al(24)	Present Series	
						Amoebic	Pyogenic
PainInAbdomen	85.0%	57.0%	80.0%	100%	95.7%	94.8%	68.9%
Fever	71%	97.2%	70.0%	92%	84%	88.5%	81%
Diarrhea	13%	-	7.0%	-	4.28%	68.3%	9.4%
Nausea / Vomiting	-	-	-	-	25.71%	78%	52.7%
Weakness	-	-	-	-	-	68.9%	74%
Weight Loss	-	-	-	-	-	38.5%	58%

Table C: Comparison of Laboratory Investigation with other Studies

Laboratory Investigations	Hyo Min (26)	Satishchritopher et al (24)	Present Series
Increased Alkaline phosphatase (> 115 IU/L)	78.0%	84.28%	82.1%
Leukocytosis (>10x10 ³ /L)	55%	90%	71%
Albumin (<3.0gm/dl)	68%	82.85%	55.15%
Hematocrit <36%	-	-	54.3%
Prothrombin Time (>20 sec)	14%	-	32.15%
Bilirubin >2 mg/dl	-	72.85%	19.8%

Table E: Comparison of Pus Culture Analysis with Various Other Studies

Studies	Klebsiellapneumoniae	E.coli	Enterococcus	Bacteriods species
KheeSiang, Chin(21) Mingetal	82.3%	2.5%	-	-
Hiroshi Okana(27)	62%	-	-	-
Hyo Min Yoo(26)	28%	63%	9%	-
Presentseries	12.8%	11.2%	5.26%	10.8%

Table D: Association of Alcoholism with Other Studies

Study	Alcoholism
Shyam Mathur(20)	70%
Satishchritopher et al(24)	74.3%
Present Series	54.4%

Table F: Comparison of USG Findings of Liver Abscess

Lobar Distribution	Hyo Min Yoo et al (26)	Chaturbhul Lal Rajak et al(28)	World J Gastroenterol 2008 April7; 14(13):2089-2093	Satishchritopher et al(24)	Present Series
Solitary abscess	89.0%	84.0%	76.29%	58.6%	78.0%
• Right lobe abscess	69.0%	72.0%	74.12%	82.9%	68.8%
• Left lobe abscess	20.0%	12.0%	14.28%	8.6%	9.2%
• Multipleabscess	11.0%	20.0%	23.7%	41.4%	22.0%
• Size of liver abscess (ems)					
• <5cms	45.0%	-	34.16%	-	46.4%
• >5cms	55.0%	-	65.83%	-	53.6%

Table G: Comparison of Treatment with Previous Studies

Treatment Modality	HyoMin Yooetal (26)	Satishchritopher et al(24)	Present Series
OpenLaparotomy	21.0%	-	2.8%
Percutaneous needle Aspiration + antibiotics	79.0%	21.4%	25.6%
PigtailCatheterDrainage + antibiotics	-	38.57%	46.0%
Antibioticsalone	-	40%	25.6%

Table H: Comparison of Recurrence and Mortality with Various Studies

	HyoMin Yooetal (26)	Khee-Siang, ChinMintetal (21)	Present Series
Recurrence	9.0%	-	8.4%
Mortality	11.0%	6.5%	0.0%

5. Conclusion

Our study concluded that in view of greater volume of pus drained in first sitting early clinical recovery. Percutaneous pigtail catheter drainage is a safe and effective mode of

treatment of liver abscesses, both amoebic and pyogenic. It results in an early relief of symptoms and faster resolution of abscess cavity. The low morbidity and high successrate in treating liver abscesses, which otherwise would have a fatal outcome if untreated, by this minimally invasive method suggests that this therapy should be the first line of management in liquefied moderate to large sized liverabscesses.

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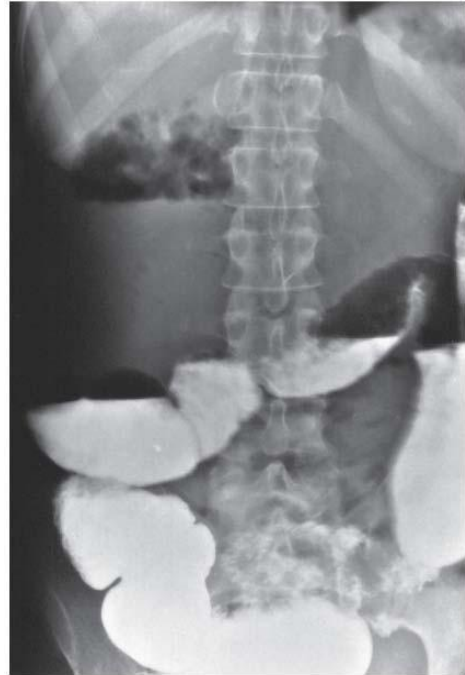


Figure 1: Plain film of a barium enema with a large gas-filled abscess located in the right hepatic lobe

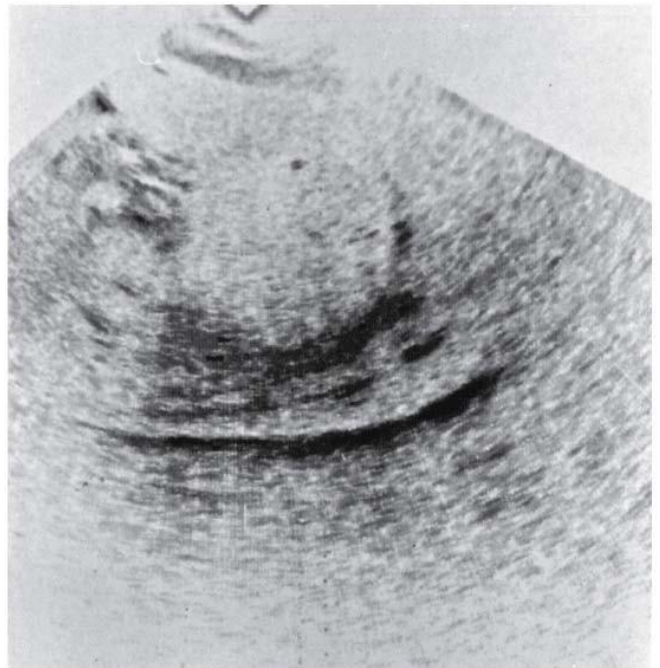


Figure 2: Sagittal abdominal ultrasound demonstrating a pyogenic liver abscess. The lesion appears as a low-density collection with small internal echos



Figure 3: Liver abscess. (A) Non-contrast and (b) Contrast-enhanced CT scan demonstrates a large, lobulated, well-defined cystic mass in the right hepatic lobe

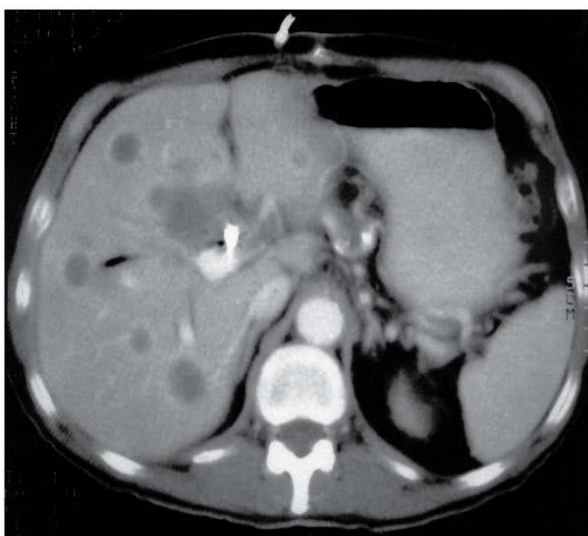
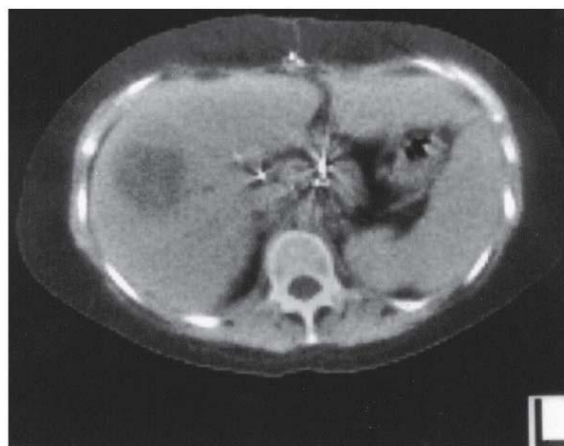


Figure 4: Abdominal CT demonstrating multiple pyogenic abscesses which are of low-density with characteristic peripheral rim enhancement

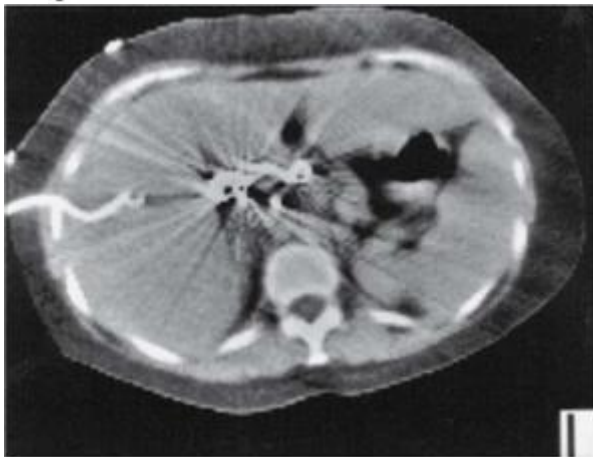


Figure 5: Cholangiogram via a transhepatic stent in a patient with biliary obstruction secondary to recurrent gastric cancer. It shows a communicating liver abscess





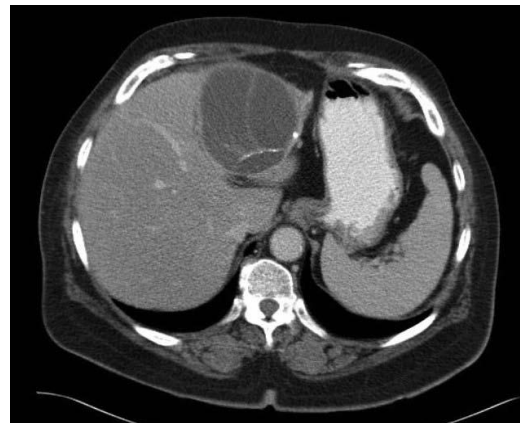
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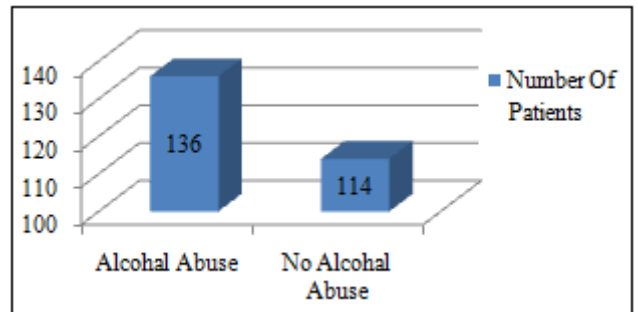
Figure 7: U.S.G. Guided Pigtail Insertion



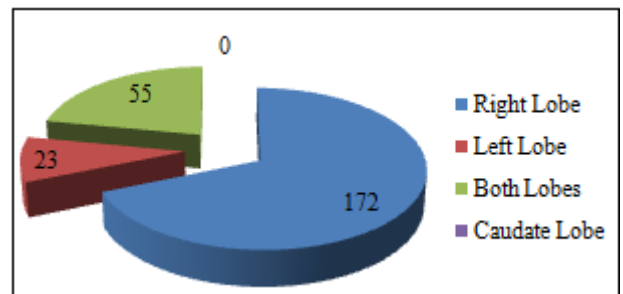
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Figure 6

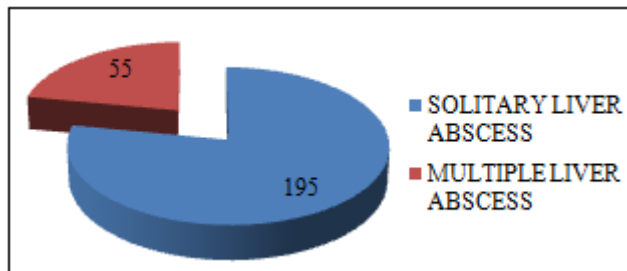
- A. CT demonstrating a pyogenic abscess in the right hepatic lobe.
- B. Contrast injected into the abscess cavity through a percutaneously placed drainage catheter.
- C. Sinogram performed 2 weeks later revealing a decrease in the size of the abscess cavity.
- D. CT after 4 weeks demonstrating complete resolution of the abscess.



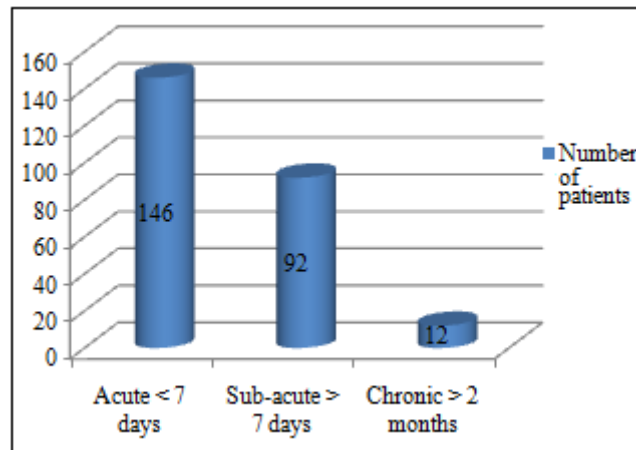
Graph 1: Number of Patients with History of Alcohol Abuse



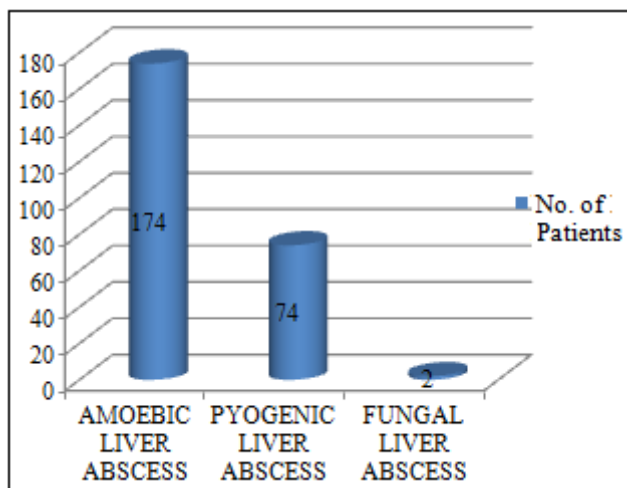
Graph 2: Relation of Liver Abscess with Liver Lobe Involvement



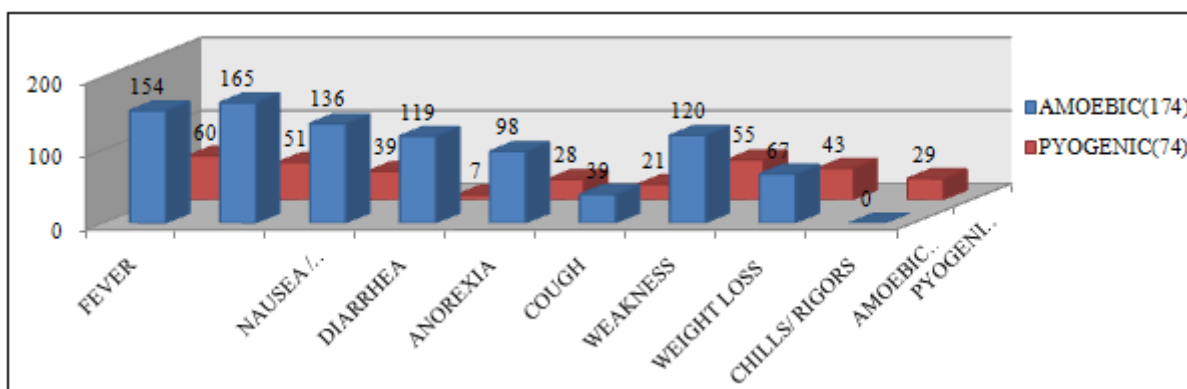
Graph 3: Solitary and Multiple Liver Abscesses



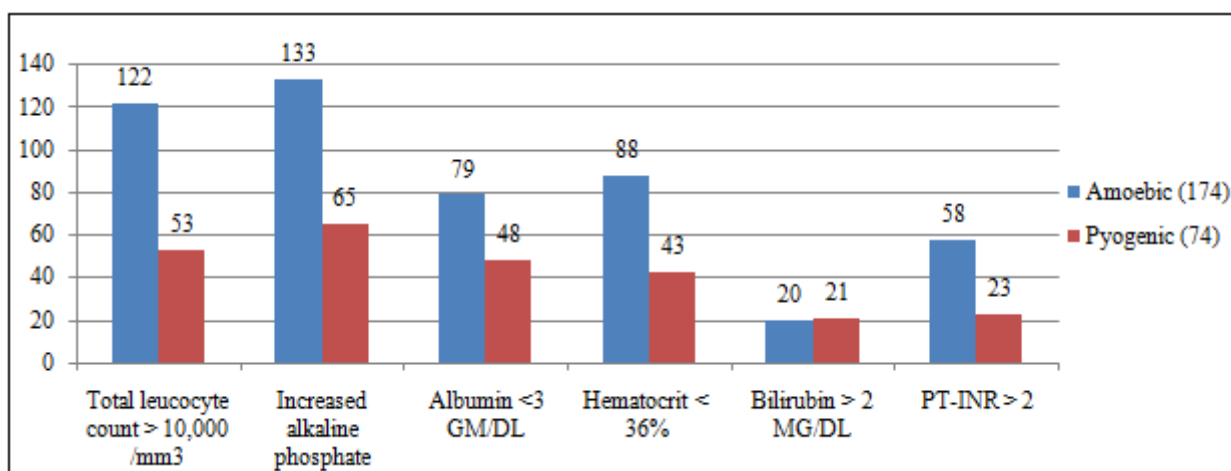
Graph 5: Duration of Illness



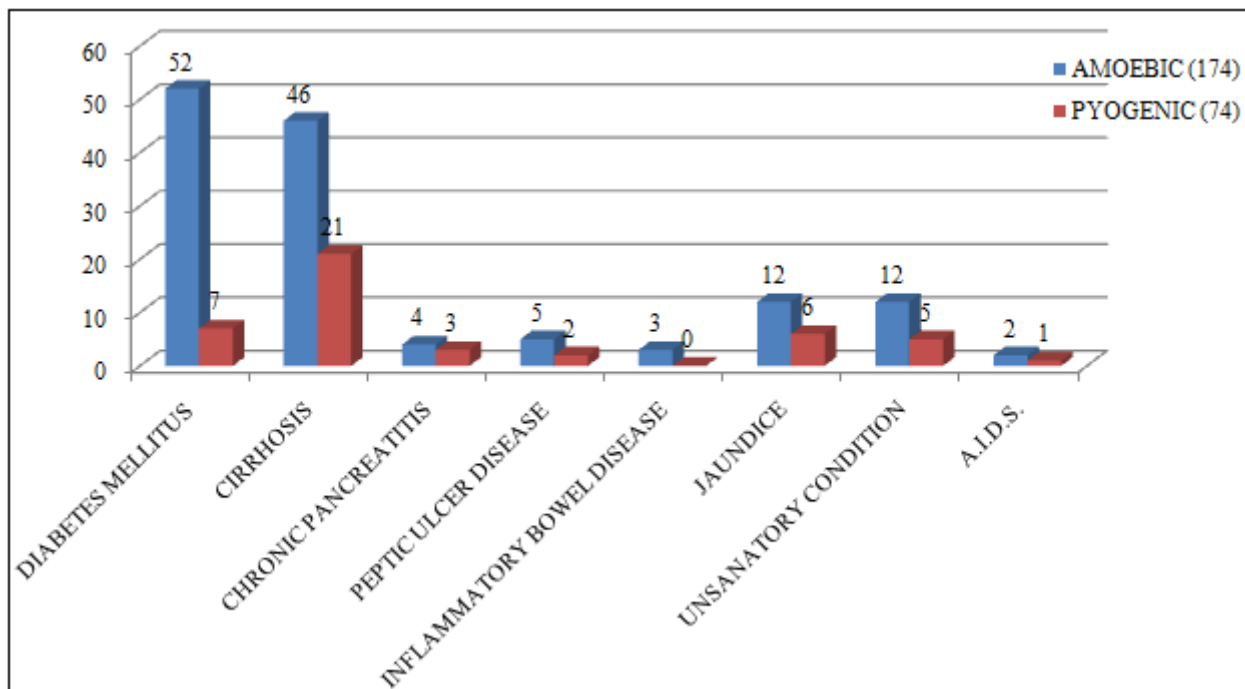
Graph 4: Type of Liver Abscess



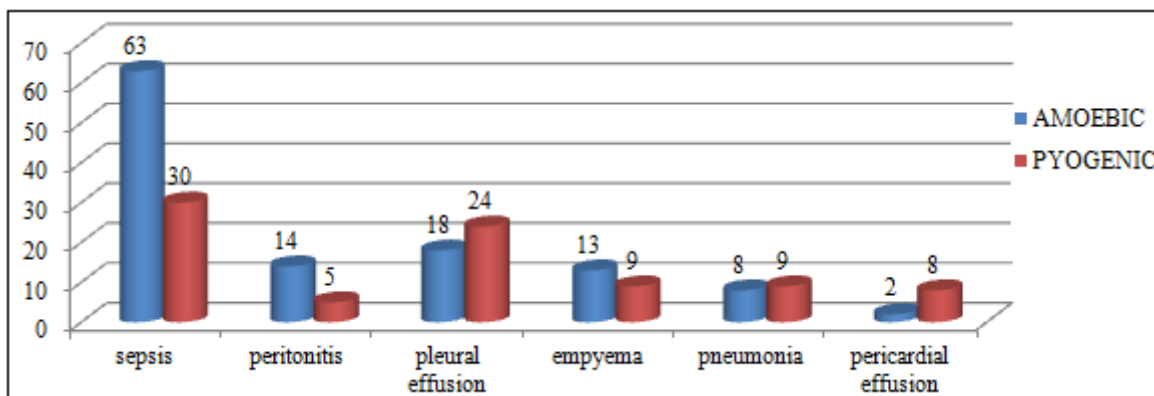
Graph 6: Clinical Presentations of Patients



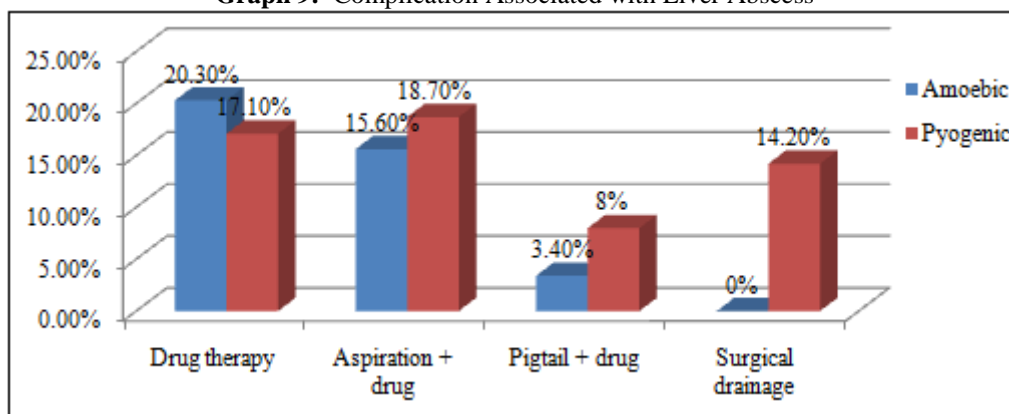
Graph 7: Derangements in Blood Investigation



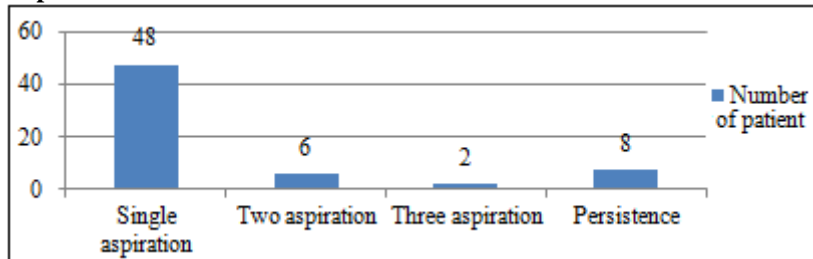
Graph 8: Predisposing Factors in Liver Abscess



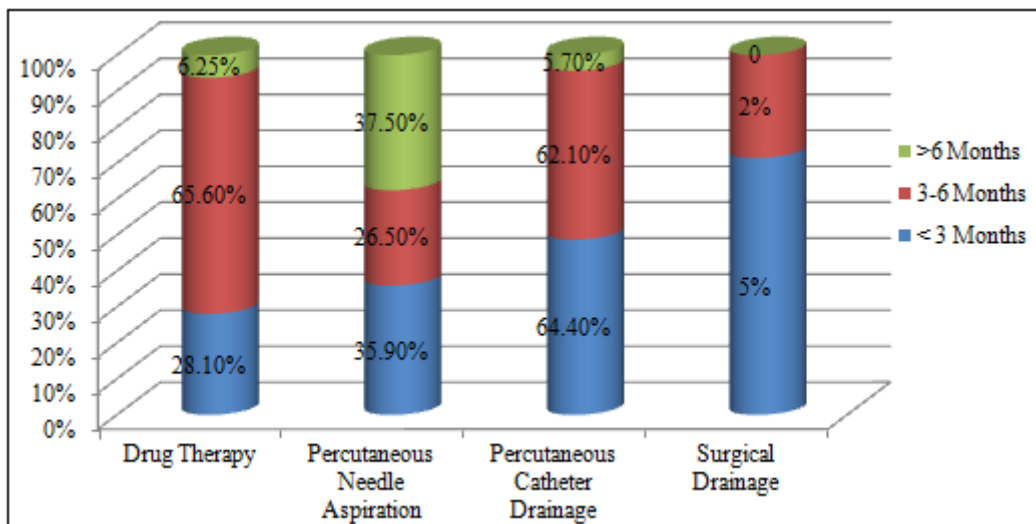
Graph 9: Complication Associated with Liver Abscess



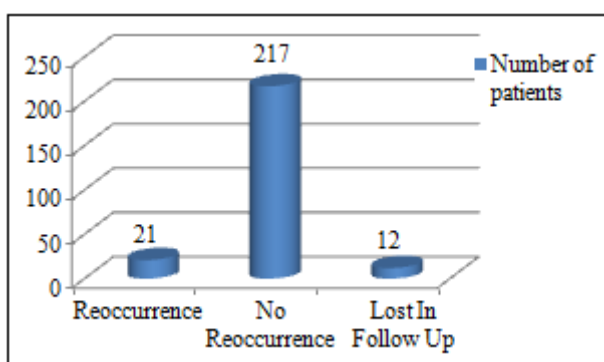
Graph 10: Persistence of Liver Abscess with Various Modalities Of Treatment



Graph 11: Number of Aspiration done in Needle Aspiration



Graph 12: Resolution Time of Abscess Cavity



Graph 13: Reoccurrence of Liver Abscess

Table 1: Regional Distribution of Liver Abscess

S. No	Type of Liver Abscess	Urban		Rural		Total Number of Patients
		Number	Percentage	Number	Percentage	
1	Amoebic	66	37.9%	108	62.0%	174
2	Pyogenic	57	77.0%	17	22.9%	74
3	Fungal	02	100%	00	00%	02

Table 2: Pus Culture Analysis in Pyogenic Liver Abscess

S. No.	Organism	Number	Percentage
1	Klebsiella	32	12.8%
2	Escherichia Coli	28	11.2%
3	Bacterioides Species	27	10.8%
4	Streptococcal Species	27	10.8%
5	Staphylococcus Species	21	8.4%
6	Pseudomonas Aeruginosa	18	7.2%
7	Proteus Spp.	15	6%
8	Enterococcus	14	5.6%
9	No Growth	162	64.8%

Table 3: Different Modalities Used in Management of Liver Abscess

S. No	Treatment Modalities	Number of Patients	Percentage
1	Antibiotic alone	64	25.6%
2	Aspiration + antibiotics	64	25.6%
3	Pigtail + antibiotics	115	46%
4	Surgical drainage + antibiotic	7	2.8%

Table 4: Persistence of Liver Abscess in Various Modalities

S.No	Modalities	Persistence Of Liver Abscess			
		Amoebic		Pyogenic	
		Number	Percentage	Number	Percentage
1	Drug Therapy	13	20.3%	11	17.1%
2	Aspiration + Drug	10	15.6%	12	18.7%
3	Pigtail + Drug	4	3.4%	14	8%
4	Surgical Drainage	0	0%	1	14.2%

Table 5: Duration of Hospital Stay

S.no.	Modality	Number of days average
1	Drug Therapy	10
2	Percutaneous Needle Aspiration	13
3	Percutaneous Catheter Drainage	11
4	Surgical Drainage	9