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Original Research Article

Study of laparoscopic drainage of liver abscess

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ABSTRACT

Background: Open surgical drainage was the initial treatment method for liver abscess until 1980s when image guided percutaneous aspiration in combination with antibiotic therapy became the standard of care, although open surgical drainage of liver abscess becomes necessary in some cases. Laparoscopic drainage can be considered as an alternative to surgical drainage as it reduces the morbidity and mortality and improves recovery when other treatment modalities fail. The current study is undertaken to assess the efficacy in short & long-term considering the complications, morbidity & mortality.
Methods: In this study, we will describe the procedure and clinical outcome of laparoscopy guided drainage of liver abscess.
Results: 38 cases with liver abscess were treated by laparoscopic drainage. Mean age in the study was 42 years. Mean operating time was 88 minutes. Laparoscopic drainage was uneventful in majority (78.94%). Conversion to open surgery was noted in 6 patients. No postoperative mortality was noted.
Conclusions: Laparoscopic drainage of large liver abscess is a safe treatment option. Rapid drainage & early recovery are the well-known advantages, although some limitations will require conversion for safety of the patient.

Keywords: Liver abscess, Laparoscopic drainage, Amoebic liver abscess, Pyogenic liver abscess

INTRODUCTION

Liver abscess is a suppurative cavity resulting from invasion and multiplication of microorganisms, which can enter directly from blood vessels or biliary tree. Amoebic liver abscess (ALA) and pyogenic liver abscess (PLA) are commonly seen in India and other tropical countries. The historical mortality rate of liver abscess was close to 100%, in the absence of percutaneous or surgical treatment.[1] Since late 80's, there has been an immense contribution by more advanced imaging techniques like ultrasonography and multi slice computed tomography which reports even small lesions in their initial stages. Open surgical drainage was the initial treatment until 1980s when image guided percutaneous aspiration along with antibiotic therapy came to be known as the standard of care. But lately, percutaneous technique has been limited due to complications and significant failure rates ultimately requiring multiple aspirations. Thus, open surgical drainage of liver abscess becomes necessary in some cases.

Laparoscopic drainage can be considered as an alternative to surgical drainage. The first use of diagnostic laparoscopy for hepatic cyst was documented in 1955.[2] In fact, laparoscopic ultrasonography was used for diagnosis of liver disorders as early as in 1989.[2] Since then many studies have established the feasibility and safety of laparoscopic liver surgery. As laparoscopy reduces the

morbidity and mortality which is seen in open surgery, there has been a shift in interest towards minimal access surgery which can benefit in liver abscess management and improve the recovery when other treatment modalities fail. Laparoscopic drainage has been reported with some success, and this can be considered a reasonable option to pursue in select cases.[3] With this background, in days of minimal access surgery, the current study is undertaken to assess the efficacy in short & long-term considering the complications, morbidity & mortality. In this study, we will describe the procedure, intraoperative course, complications and clinical outcome of laparoscopy guided drainage of liver abscess in a tertiary care hospital.

METHODS

Study design, location, duration and participants

A prospective observational study was carried out in the department of Surgery at Indira Gandhi Government Medical College, Nagpur, for a period of 30 months from June 2018 till November 2020. A total of 38 patients were included in the study (n=38). Approval to conduct the study was taken from hospital ethical committee. Patients were subsequently enrolled after prior consent. The study included all patients who underwent laparoscopic liver abscess drainage on the basis of following inclusion criteria- liver abscess diagnosed sonographically with cavity more than 400 ml, multiple abscesses with at least one cavity of 400 ml, significant liquefaction of abscess, subcapsular rupture with localized perihepatic or subdiaphragmatic collection, surface abscess with liver parenchymal thickness <0.5 cm from the surface.

Following patients were excluded from the study- age less than 15 years, seropositive & HBsAg positive patients, abscess cavity volume less than 300 ml, caudate lobe abscess, deep seated abscess with liver parenchymal thickness >1 cm from the surface**,** non-liquefied abscess, rupture with generalized peritonitis, chronic liver disease with portal hypertension. Detailed history was taken and clinical examination was done. Complete hemogram, liver and kidney function tests, coagulation profile, HIV & HBsAg status was sent. Preliminary chest X-ray & ultrasonography (USG) of abdomen was done on the day of admission. Computed tomography (CT) scan of abdomen was done in selected patients. Empirical management was started in all patients; injection metronidazole 1gm intravenous (IV) 3 times a day (TDS), injection ceftriaxone 1g IV twice a day (BD), injection amikacin 1g IV once daily (OD) and specific antibiotics according to pus culture sensitivity reports were considered later. Complete hematological and radiological features were noted. Preoperative percutaneous intervention if any, were noted. A written informed consent of all the patients & relatives were obtained after explaining the details of laparoscopy, possibility of conversion and complications of laparoscopic drainage.

Procedure

Under general anesthesia, surgery was performed with a carbon dioxide pneumoperitoneum at 12-15 mmHg pressure. Reverse Trendelenburg position with right side up was given intraoperatively if required. Peritoneal access was usually achieved through umbilicus by open Hassan's technique under direct vision. Alternately veress needle was inserted through Palmer's point and intra-abdominal placement of needle confirmed. Abdomen was then insufflated with CO2 and umbilical port access achieved. A 10 mm port with 30^{o} telescope was passed through umbilicus. Subsequent port positions were chosen according to location and size of liver abscess after the initial peritoneal exploration. Next, a 10 mm trocar was placed in the epigastrium for 10mm suction cannula. A third 5 mm trocar was generally placed 2-3 cm below the right costal margin in mid clavicular line. The fourth trocar was located in a variable position. Adhesions between the liver and anterior abdominal wall were freed and diaphragmatic surface was exposed to identify the bulge of liver abscess. Confirmation of abscess was done with 18G spinal needle passed subcutaneously under vision. Abscess fluid was sent for gram staining and culture. Findings of fluid were noted. Thereafter, partial deroofing of cavity was done with electrocautery or ultrasonic shear, to enable simultaneous drainage of contents with suction cannula. Curettage & debridement was done by gentle scraping of abscess cavity followed by irrigation with normal saline with help of a suction-irrigation cannula. Proper hemostasis was secured. Closed drainage tubes were placed both into the abscess cavity and one in the pelvis for optimal drainage, which was exteriorized through one of the port sites in the abdominal wall. Ports were removed & closure of port sites were done; 5 mm ports closed with ethilon 2-0 RC & 10 mm ports closed with vicryl 2-0 RB and ethilon 2-0 RC.

Statistical tool

No statistical methods were used as this was a prospective observational study. All data are presented in tabular form in numbers and percentages.

RESULTS

A total of 38 cases of liver abscess were selected and all factors related to the disease were studied in the subjects. Patients were posted for laparoscopic drainage of liver abscess after prior informed consent. All intraoperative steps right from port insertion till closure were noted. Intraoperative findings of abscess, difficulties encountered, post operative recovery, complications & outcomes were noted. Age range was 18-74 years with a mean age of 42.34 years. Male dominance with a male to female ratio of 18:1 was seen.

Table 1: Abscess cavity findings during laparoscopy (n=38).

Status of abscess cavity	N	%
Right lobe involvement	29	76.31
Left lobe involvement	7	18.42
Deep seated/non-visualized	2	5.26
Intact	28	73.68
Subcapsular rupture	8	21.05
Total	38	100

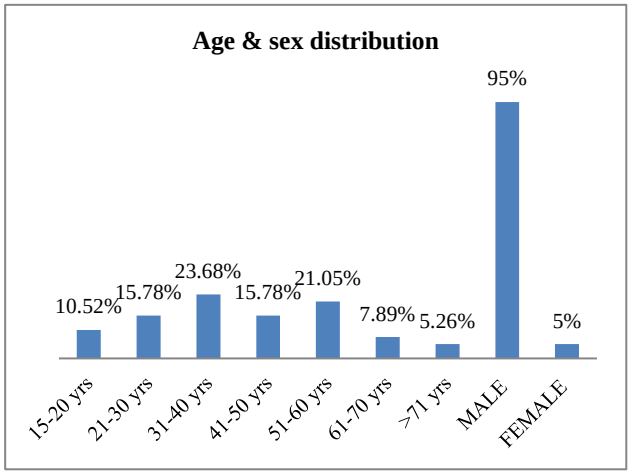

Figure 1: Distribution of demographic data of study patients.

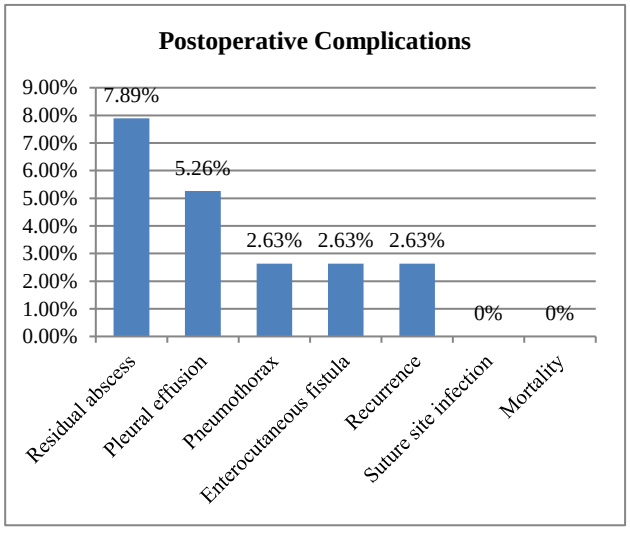

Figure 2: Postoperative complications after laparoscopic drainage.

On USG, right lobe involvement was seen in majority (71.05%), left lobe in 13.15% and both lobes in 15.78%. Preoperatively 7.89% underwent percutaneous drainage. Failure to localize during laparoscopy was seen in 5.26%, hence drainage procedure was abandoned. Conversion into open surgery was noted in 15.78% due to liver surface bleeding (5.26%), diaphragmatic adhesions (5.26%), diaphragmatic injury (2.63%) and perisplenic collection (2.63%).

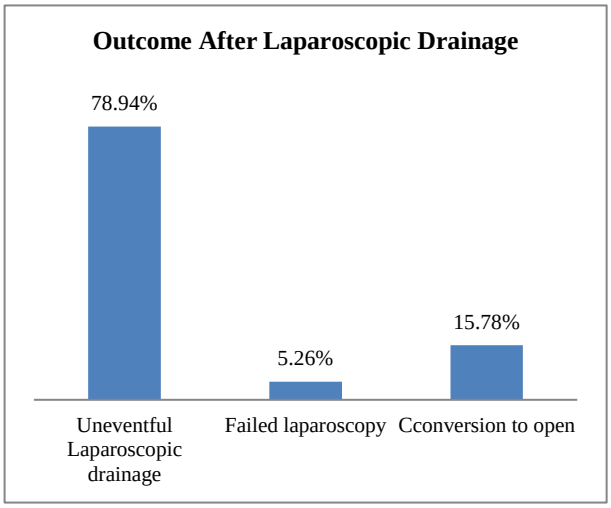

Figure 3: Outcomes after laparoscopic drainage.

Figure 4: CT image showing multiple right lobe liver abscess.

Figure 5: Port placement.

The intraoperative findings are depicted in results. Clear purulent pus was seen in 71.05% & 18.42% had turbid drainage. Volume of initial aspirate ranged from 200-

1000 ml during drainage. Operative time ranged from 45-135 minutes with mean of 88.42 minutes.

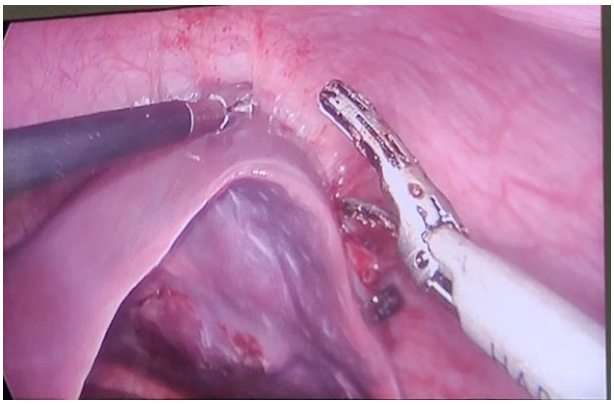

Figure 6: Laparoscopic adhesiolysis.

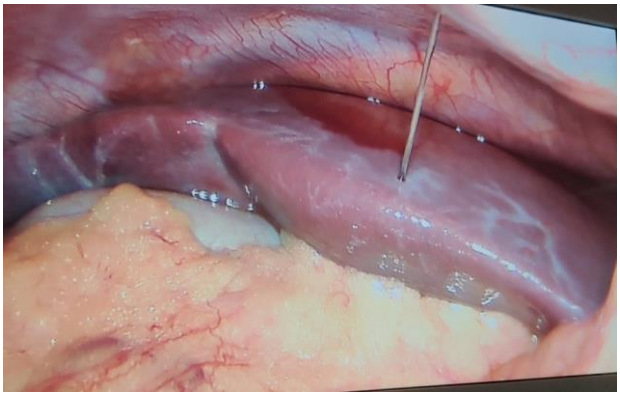

Figure 7: Laparoscopic view of pus confirmation with spinal needle.

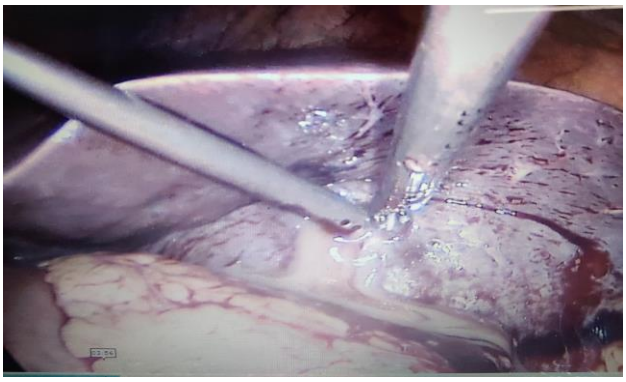

Figure 8: Laparoscopic pus aspiration with suction cannula.

Adhesions (44.73%) followed by localized rupture (21.05%) were the most common intraoperative difficulty. Major limitations of laparoscopic drainage were bleeding in 5.26%, non-visualization of abscess in 5.26% and diaphragmatic injury in 2.63%. Post operative complications were seen in only 21.05%. In majority, drains were removed within 5 postoperative days. Average hospital stay was 11.23 days. Laparoscopic drainage was uneventful in 78.94%. No surgical site infection or mortality was noted in present series.

Figure 9: Port site closure & abdominal drain fixation.

DISCUSSION

The 20th century has seen a major shift in etiology, presentation and treatment of liver abscess. At present the most common source of a pyogenic liver abscess is biliary tract obstruction and the current treatment includes antibiotics, usually with a percutaneous drainage procedure.[4] Most patients require some form of abscess drainage whether it is surgical, percutaneous or closed aspiration. Surgical treatments, although effective, do have associated morbidity like prolonged ileus, small bowel obstruction, surgical site infection and pleural effusion. The role of surgical drainage in the treatment of hepatic abscesses has changed greatly with the development of percutaneous aspiration techniques; however, surgery still plays a vital role in complicated hepatic abscesses. Percutaneous and surgical drainage are not considered competitive but rather complementary techniques.[4] Percutaneous needle aspiration and catheter drainage are more effective than conservative medical management in the treatment of liver abscess.[5] A shift has occurred in treatment of liver abscess about four decades ago and with it the mortality associated with this disease condition has drastically decreased by help of minimal access surgery with systemic antibiotic therapy.[6]

Laparoscopic drainage of liver abscess is the preferred method of choice in case of difficulty in approach to pigtail drainage, failed pigtail drainage and in case of residual or recurrent abscess. Further, improvement in laboratory parameters like serum bilirubin and total leukocyte count is more marked and earlier in laparoscopic drainage group than image guided pigtail drainage group.[7] In addition to the usual benefits associated with any minimally invasive approach like less postoperative pain, shorter hospital stay, better cosmesis and wound related problems, laparoscopy offers some other additional advantages. A significant benefit of laparoscopic approach is the avoidance of a large,

disabling sub costal incision, responsible for early and late complications and inconvenience (pain, infection and dehiscence). Laparoscopic surgery has advantages of both open and minimal invasiveness of drainage.[8] It provides faster recovery, shorter hospital stay, less surgical site infection and better cosmesis than open surgical drainage does.[9] Moreover, the laparoscopic placement of large-bore drain tubes is superior to percutaneous placement and the septum of septated abscesses can be destroyed laparoscopically instead of percutaneously.[10] Laparoscopy helps in early return of gastrointestinal function and faster recovery; achieves a better abscess drainage due to adequate abdominal cavity washout.[11] Patients are started on oral and are ambulating by the day following surgery.[12] Lastly, laparoscopic drainage has been shown to be safe as there was neither mortality nor conversion to open surgery in many series in the literature.[13,14]

Color sonography and harmonic scalpel made laparoscopic management of multiple/lobulated liver abscesses more efficacious in terms of precise localization, adequate deroofing/drainage and better hemostasis.[15] And when laparoscopic drainage is unsatisfactory, conversion to open surgical drainage is recommended.[16] With proper selection of patients and type of liver disease and meticulous and aggressive surgical techniques, the laparoscopic approach appears to be a good treatment option for patients suffering from liver disease. In the present study, it was found that laparoscopic drainage was uneventful and successful in 78.94%. Out of these, primary treatment failure in the form of residual abscess was seen in 7.89% which was managed conservatively with antibiotics and percutaneous drainage. Secondary treatment failure in the form of recurrence was seen in only 2.63% for which patient underwent a second surgery. However, in 5.26% cases drainage was abandoned due to failed laparoscopy. Non-visualization of abscess on laparoscopy was the major concern in these cases. This could be attributed to non-availability of facilities of intraoperative laparoscopic USG at our institute. Also, CT abdomen was not done in all patients, which could have given a better idea regarding location of abscess preoperatively. Finally, conversion to open surgery was seen in 15.78% due to various intraoperative complications. Patient factors, inevitable complications, surgeons' expertise and laparoscopic skills did play a role in this conversion.

In a study by Liza et al 88.9% patients experienced resolution of sepsis after primary laparoscopic intervention & only 11.1% experienced treatment failure in laparoscopy. Success rate with laparoscopic drainage in study by David et al was 83.3% (recurrence in 16.6%) and success rate in study by Luigi et al was 100% (no recurrence).[12-14] Thus, the overall findings in our study support laparoscopic drainage in management of liver abscess.

Limitations

Major concerns of multiple/lobulated liver abscesses managed by laparoscopic approach are inadequate deroofing/drainage and hemorrhage. The reasons for slow progress of laparoscopic liver surgery are the associated technical difficulties and concern about the intraoperative hazards of bleeding. Hemorrhage control from large intrahepatic vessels may be difficult. Due to such unforeseeable difficulties during laparoscopy, sometimes conversion to open surgical drainage is the last resort.

CONCLUSION

Laparoscopic drainage of large liver abscess is a safe method of treatment option and an attractive alternative to open surgery. Minimally invasive liver surgery is safe, feasible and reproducible. Rapid drainage and early recovery are the well-known advantages, but bleeding, adhesions, failure to locate are its limitations which will require conversion for safety of the patient. Even after laparoscopic drainage, one or two deep seated abscesses may escape drainage requiring ultrasonography follow up & aspiration.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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