

Liver abscess: contemporary presentation and management in a Western population

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ABSTRACT

AIM: Historically, liver abscesses (LA) affected elderly, immunocompromised patients and were characterised by high morbidity and mortality, however there are no data pertaining to a New Zealand population with little information surrounding recent management trends.

METHODS: A retrospective review of demographic characteristics, clinical management and microbiological data on patients presenting with liver abscess between 2005–2014 was conducted.

RESULTS: Fifty-seven patients [37 males, median age 64 (range 15–87)] presented with LA and most patients were not comorbid. Ethnicity included European (47%), Chinese (16%) and Pacific Island (11%). Twenty-six patients had primary abscesses, 31 patients had secondary abscesses [biliary disease, appendicitis, diverticular disease]. Presenting symptoms were non-specific. Admission white cell count was raised in 50 (88%) of patients and 43 (75%) had a CRP \geq 200mg/L. All patients were investigated with CT scan with 34 LA located in the right lobe, 14 in the left and eight bi-lobar. *Klebsiella pneumoniae* was the commonest pathogen (26% of aspirates). Percutaneous drainage (PD) was used to treat 36 of 37 patients, 17 patients were treated with intravenous antibiotics alone and three patients required open drainage for loculated collections despite PD (n=1), intra-peritoneal rupture or sepsis (n=2). Thirteen patients were readmitted within 30 days for ongoing symptoms requiring intravenous antibiotics/further PD (9) or further investigations (4). The median PD duration was 10 days (range 3–53). Twenty-six patients required follow-up imaging over one month with 16 requiring follow-up over six weeks.

CONCLUSION: In a New Zealand setting, LA affect fit patients, and primary abscesses account for almost half of all presentation. PD is effective treatment in most LA although prolonged drainage and treatment with antibiotics may be necessary.

Liver abscess is an important condition that presents acutely to surgical and medical services in both district and metropolitan hospitals. Historically it was described as occurring in comorbid, immunocompromised patients and was the result of portal pyemia from a septic focus elsewhere in the abdomen and associated with a high mortality.¹ However, the demographics of this condition have undergone a number of changes. A recent study in the US reported a national mortality rate of 6%,² although the incidence has increased to 3.6/100,000 with nearly 10,000 acute admissions annually. Other recent series report a similar

worldwide increase incidence and mortality rates between 11–31%.^{3,4}

The management of liver abscess has also evolved in the last 25 years. Historically, surgical drainage was the only definitive treatment available and was supplemented with antimicrobial therapy.⁴ With advances in cross-sectional imaging and localization, percutaneous drainage has now become the treatment of choice and surgical intervention is generally reserved as a salvage therapy.⁴ There is a general perception that less invasive procedures are more beneficial to the patient and may be associated with lower complication rates, hospital stay and

overall cost in comparison to operatively treated patients. However, there is a lack of standardised information pertaining to the percutaneous treatment of liver abscess, in particular the optimal duration of drainage and timing of drain removal, the investigations necessary to establish complete drainage as well as protocols relating to follow-up cross-sectional imaging to confirm resolution. Currently no international guidelines or protocols exist.

This investigation was undertaken to review our contemporary experience with liver abscess and to establish management protocols with regard to the optimal type of drainage, drain type, drain management and monitoring as well as the type and schedule of follow-up imaging required in these patients.

Methods

A retrospective review was conducted of all adult patients presenting with liver abscess between January 2005 to December 2014. Patient demographics, clinical presentation, haematological and biochemical data, microbiological results, daily ward management and clinical outcomes were collated. Comorbidities were graded using the Charlson index.⁵ If no underlying cause for the liver abscess was identified, the patients were considered to have a primary liver abscess, while those patients having an identifiable precipitating cause were defined as having a secondary liver abscess. Cross-sectional imaging was reviewed and the size and distribution of the abscesses was recorded. The management for each patient was recorded as intravenous (IV) antibiotics only, percutaneous drainage with IV antibiotics or surgery. Antibiotic therapy was commenced on admission with the support of the Infectious Disease Service. Initial therapy was with a broad-spectrum agent and this was further refined based on the culture results of blood and aspirated abscess fluid. Hospital policy dictated that patients with bacteremia received antibiotic therapy for four weeks and often this was administered at home via a central venous line. The duration of antibiotic therapy, duration of drain placement as well as the indications for drain removal and the results of subsequent cross-sectional imaging were also recorded.

Results

Fifty-seven patients (37 males, median age 56 years [range 15–87 years]) were admitted with a diagnosis of liver abscess between 2005–2014. The majority of patients were New Zealand European (n=26). Other ethnicities were Chinese (n=9), Pacific Island (n=11), Indian (n=5), Maori (n=2) and other (n=4).

Patient comorbid status classified using the Charlson index is shown in Table 1. The median hospital length of stay was 13 (range 3–51) days. Thirteen (23%) patients were readmitted to hospital within 30 days of discharge for issues primarily related to drain blockage (n=5) or accidental dislodgement (n=8).

Thirty patients presented with a primary liver abscess. Of the 27 patients with secondary liver abscess, underlying biliary disease (cholecystitis, cholangitis, cholangiocarcinoma and post-cholecystectomy) was the cause in 14 patients. Other causes included appendicitis (n=5), diverticular disease (n=4), gastric/duodenal ulcers (n=3) and one patient presented intra-abdominal sepsis following a laparotomy to treat a spontaneous hepatic haemorrhage.

Table 1: Summary of patient Charlson Index scores.⁵

| Charlson Index | Number of patients |
|----------------|--------------------|
| 0 | 29 |
| 1 | 11 |
| 2 | 6 |
| 3 | 3 |
| 4 | 4 |
| 5 | 0 |
| 6 | 2 |
| 7 | 1 |
| 8 | 1 |

Abdominal pain and fevers were noted on presentation in 44 (77%) patients with other symptoms being less common—nausea and vomiting (n=14), rigors/chills (n=8), malaise (n=7), anorexia (n=6) and night sweats (n=6). White cell count was raised in the majority (n=50; 88%) of patients while c-reactive protein (CRP) was greater than 100mg/L in

Table 2: Bacterial isolates from 57 primary and secondary liver abscesses (LA).

| Microorganism | Primary LA | Secondary LA |
|------------------------------------|------------|--------------|
| <i>Klebsiella pneumoniae</i> | 8 | 7 |
| <i>E.coli</i> | 1 | 6 |
| <i>Streptococcus Milleri</i> | 2 | 5 |
| <i>Enterococcus Faecalis</i> | 0 | 6 |
| <i>Entamoeba histolytica</i> | 4 | 0 |
| <i>Bacteroides Fragilis</i> | 0 | 3 |
| <i>Staphylococcus aureus</i> | 0 | 2 |
| <i>Klebsiella oxytoca</i> | 0 | 2 |
| <i>Citrobacter braaki/freundii</i> | 0 | 2 |
| <i>Fusobacterium nucleatum</i> | 0 | 2 |
| <i>Pseudomonas aeruginosa</i> | 0 | 2 |
| <i>Raoultella ornithinolytica</i> | 0 | 1 |
| <i>Morganella morganii</i> | 1 | 0 |
| <i>Actinomyces israelii</i> | 1 | 0 |
| <i>Candida albicans</i> | 0 | 1 |
| <i>Enterobacter clocae</i> | 1 | 0 |
| <i>Streptococcus sanguinis</i> | 0 | 1 |

all patients on admission and over 200mg/L in 45 patients.

Thirty-eight (67%) patients had a solitary liver abscess while 19 (33%) had multiple liver abscesses. Thirty-four (60%) patients had a liver abscess involving the right lobe only, 14 (25%) involving the left lobe only and eight (14%) that were bi-lobar with the location of one patients abscess not specified. *Klebsiella pneumoniae* was the species most commonly cultured and was found in 15 (26%) patients. The incidence of cultured microorganisms in relation to primary and secondary liver abscesses is highlighted in Table 2.

All patients were treated with IV antibiotics for a median of 32 days (range 28–61 days). Seventeen patients were successfully treated with antibiotics alone. This choice of therapy was at the discretion of the treating clinician and only utilised in patients who demonstrated rapid clinical improvement. Review of these 17 patients showed that the abscesses treated in this way tended to be small (median diameter 3.5cm, range 1.5–4cm) and eight were multiple. In

addition, a further 37 (65%) patients were treated with percutaneous drainage of the liver abscess (median diameter 6cm, range 3–16cm). Open surgical drainage was utilised in three patients (5%). In one patient surgical drainage was elective for a multiloculated collection that could not be fully drained percutaneously. A further two patients underwent emergency surgical procedures after presenting with intraperitoneal abscess rupture and septic shock. Both abscesses were right sided and these latter two patients died within 24 hours of their surgical procedure from overwhelming sepsis. Seventeen patients (30%) were treated with intravenous antibiotics alone and did not require drainage.

Follow-up imaging modalities varied according to clinical context and included computed tomography (CT) and ultrasound (US). Fifty patients required follow-up imaging for over two weeks, 27 patients required follow-up imaging for greater than one month and 17 patients required follow-up imaging up to six weeks or more after initial diagnosis (Table 3).

Table 3: The frequency and timing of post-drainage cross-sectional imaging in each treated group.

| Treatment | 14 Days | 30 Days | 60 Days |
|--------------------------------------|------------------|------------------|------------------|
| Intravenous antibiotics alone (n=17) | 12 (9 US, 3 CT) | 5 (5 CT) | 2 (2 CT) |
| Percutaneous drainage (n=37) | 37 (6 US, 31 CT) | 22 (2 US, 20 CT) | 15 (1 US, 14 CT) |
| Surgical drainage (n=1)* | 1 (1 CT) | - | - |

*n=1 in the surgical group since two patients died within 24 hours of surgical drainage.

Only 24 patients had duration of drainage noted (median 10 days [range 3–53 days]). The primary indication for drain removal included radiological resolution (n=6), clinical and biochemical improvement (n=19) and decreasing drain output (<30ml/24hrs; n=5) and there were no standardised protocols to assess the completeness of abscess drainage and resolution.

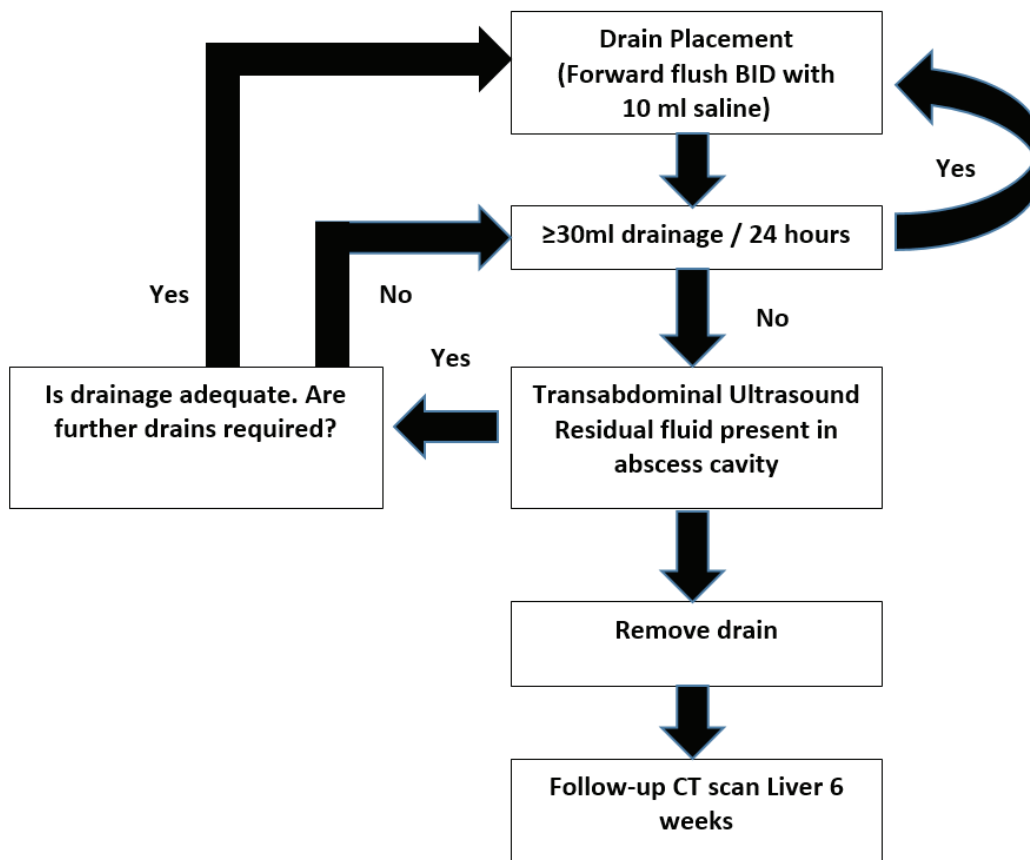
Discussion

This investigation has confirmed that liver abscesses frequently develop in otherwise well patients and often present without a preceding cause in almost half those affected.^{2,4,6} Clinical presentation is usually non-specific but all patients are likely to have raised inflammatory markers with variable microbiology and hepatic sectional distribution. Most patients can be managed with antibiotics and percutaneous drainage without significant morbidity. In comparison to earlier reports,¹ liver abscesses are no longer seen only in elderly, comorbid and immunocompromised patients. This may reflect improved acute management of intra-abdominal pathology such as diverticulitis or appendicitis, thereby reducing the overall incidence in the susceptible population cohort.⁷ Previous studies¹ have also described primary liver abscesses in a high proportion of cases and shown them to be associated with the presence of metastatic cancer and diabetes. In the current series, patients with primary and secondary liver abscesses had similar microorganisms cultured and there was no obvious preponderance of diabetes or malignancy. The incidence of primary liver abscesses is equivalent to Ochsner's series suggesting the pathophysiology may be blood borne or intrahepatic sepsis without a readily diagnosed, visible septic focus.¹

The treatment strategies employed confirmed recent international trends.⁶ Thirty percent of patients were treated successfully with antibiotics alone. These patients tended to present with smaller (diameter \leq 4cm), multiple abscesses that were widely distributed. A recent investigation⁶ specifically sought potential factors predictive of failure of antibiotic therapy alone but were unable to confirm that this therapy is more effective in smaller abscesses and suggest that if clinical response is rapid, the antibiotics are continued and percutaneous drainage is reserved for those patients who don't respond. This 'step up' approach was used at North Shore Hospital and a further 65% of patients were treated with percutaneous drainage in addition to antibiotic therapy. It must be emphasised that percutaneous drainage is an effective minimally invasive therapy but hospital stays were long with a median of 13 days and 23% of patients required readmission at some point due to drain blockage or dislodgement. Patients were generally mobile and eating during the admission but remained in hospital for regular intravenous antibiotics and drain care. Other investigators have noted this trend.^{6,7} It should be noted that the exact indications for surgical or percutaneous drainage have never been clarified. A number of investigations have shown that surgery has a higher success rate and a lower rate of secondary procedures in comparison to percutaneous drainage⁸ although this is controversial. However, percutaneous drainage has now been accepted as the standard of care.⁶

In this investigation, surgical drainage was utilised in only three patients. Two patients presented acutely in septic shock with ruptured abscesses and both died early in their post-operative course

Figure 1: Current unit protocol for the management of drains placed for the treatment of pyogenic liver abscess.



from severe sepsis. One patient with a multiloculated abscess failed 14 days of percutaneous drainage but made a good recovery following open surgical drainage. Rismiller et al⁶ have emphasised that surgical drainage should be reserved as a 'step up' treatment for patients who fail to respond to percutaneous drainage and as a primary treatment for those who present with ruptured abscesses or signs of other intra-abdominal emergencies.

One of the principle aims of this investigation was to establish best practice around monitoring the effectiveness of drainage, drain removal and follow-up imaging. However, even with detailed patient-by-patient review, no clear hospital protocols appeared to exist. Our unit practice is presented in Figure 1. Drains are forward flushed twice-daily with 10ml of normal saline to maintain patency. When total daily drainage is 30ml or less, a follow-up ultrasound is undertaken to assess drainage of the abscess cavity concentrating particularly on the presence of residual cavity fluid. The state of collapse of the abscess cavity is also assessed but many abscesses have a fibrous

wall and this may take some time to occur.⁹ Drains are removed when imaging confirms no residual fluid. Follow-up imaging is undertaken 6–12 weeks later, usually with CT scan, to verify resolution and to look for any rare complications such as segmental biliary obstruction or atrophy, or pseudoaneurysm. It is also important to document the presence of a persisting hepatic parenchymal scar if one is present.

This investigation confirms that percutaneous drainage is now the mainstay of liver abscess treatment. While it is successful in most patients, surgical drainage is required in those patients who present with ruptured abscess or who fail percutaneous drainage. Percutaneous drainage is well tolerated, minimally invasive and has few documented long-term complications, but is associated with significant hospital stays. Other minimally invasive abscess drainage techniques have been described, including percutaneous aspiration alone¹⁰ and laparoscopic drainage.¹¹ In the future, both of these techniques may achieve abscess drainage but reduce overall hospital stay.

Competing interests:

Nil.

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