Pyogenic liver abscess: incidence, causality, management and clinical outcomes in a New Zealand cohort

Jan Kubovy, Shwan Karim, Steven Ding

ABSTRACT

AIMS: The determinants, management and outcomes of pyogenic liver abscess [PLA] are changing. We aimed to compare these in a New Zealand cohort.

METHODS: We have retrospectively reviewed all PLA cases presenting to Christchurch Hospital over 12 months between 2014 and 2015.

RESULTS: Twenty-five cases presented over this period. The incidence was 5/100,000. Eighty percent were Caucasian with overall 4:1 male preponderance. Commonest comorbidities were diabetes, hypertension, atrial fibrillation and immunosuppression. Underlying pancreatico-biliary disease featured in 20%, preceding Whipple’s or hepatic resection in 24% and inflammatory bowel disease [IBD] in 12%. Commonest complication was septic shock with intensive care unit admission in four cases. The evident cause was recent Whipple’s procedure or hepatic resection (24%), pancreatico-biliary (16%), diverticulitis (12%) and active IBD (8%). Cause remained cryptogenic in 28%. The commonest microorganism was Streptococcus intermedius. The management comprised of: antibiotics alone (n=6), needle aspiration (n=2), catheter drainage (n=14), biliary drainage (n=3), surgical drainage (n=2). These interventions were in accordance with current international recommendations. There were no deaths and the mean length of stay was 10.3 days.

CONCLUSION: PLA continues to carry significant morbidity. Demographics, including ethnicity, play an important role. Our tertiary centre cohort may account for higher incidence and better clinical outcomes.

Pyogenic liver abscess [PLA] is rare and it continues to pose both diagnostic and therapeutic challenge. Quoted incidence is around 2–3/100,000 in most developed countries,1 perhaps with the exception of Taiwan, where the incidence is as high as 17.3/100,000.2 Most studies suggest 2–3:1 male predominance.1

Despite its overall rarity, PLA is the most common visceral abscess.3 Its clinical presentation is non-specific, most commonly as fever and abdominal pain. Laboratory tests usually reveal elevation of inflammatory markers and bilirubin along with derangement of liver biochemistry.3 The mainstay of diagnosis is cross-sectional imaging, most frequently ultrasound [US] or computer tomography [CT].

Although the aetiology often remains cryptogenic, known risk factors are diabetes, previous liver transplant, malignancy, pancreatico-biliary disease (such as gallstones or malignant biliary obstruction), age and male gender.1,2,6,7,9

Pathogenesis is frequently polymicrobial and the causative organisms can be difficult to isolate, especially in the case of anaerobes. The most common pathogens, in no particular order, are Escherichia coli,
Klebsiella pneumoniae, viridans streptococci and bacteroides species. Klebsiella pneumoniae has recently emerged as a primary PLA pathogen in Taiwan and other Asian countries. Standard management consists of appropriate antibiotic treatment as well as aspiration and/or drainage of the abscess, according to the diameter of the collection.

Known predictors of an unfavorable outcome are age, underlying pancreatico-biliary disease, need for surgical drainage, underlying malignancy and anaerobic infection. Even with a timely diagnosis and appropriate treatment, reported mortality is still considerable, ranging from 2.5–12%. This has, however, greatly improved compared with older studies quoting mortality rates of up to 31%.

The ageing population and growing migration brings about progressive change in demographics. This, together with evolving diagnostic and treatment modalities, is likely to reflect on incidence, management and clinical outcomes of PLA patients. We aimed to review these characteristics in our New Zealand cohort.

**Methods**

Christchurch Hospital, Canterbury District Health Board is a tertiary referral hospital, serving a population of approximately 500,000. We have retrospectively reviewed all PLA presentations between May 2014 and May 2015 presenting to our centre. The key words ‘liver abscess’ and ‘liver collection’ as a diagnosis were searched in our clinical coding database. The results were cross-referenced by an independent radiological coding system. The final list of patients with a true diagnosis of liver abscess had their electronic records interrogated. Where possible, a most likely cause of liver abscess has been postulated.

**Results**

A total of 25 cases were identified during this 12-month period, equating an incidence of five in 100,000.

Our cohort was mainly Caucasian with 4:1 male preponderance (Table 1). The median age was 60 years with related medical comorbidities listed in Table 1.

We considered five patients (20%) as immunosuppressed (Table 1).

Table 1 also highlights relevant pre-existing intra-abdominal pathology. This

<table>
<thead>
<tr>
<th>Basic demographics</th>
<th>Number of pts</th>
<th>Median age by sex</th>
<th>Total median age</th>
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</thead>
<tbody>
<tr>
<td>Male</td>
<td>20</td>
<td>60 [36–84]</td>
<td>60 [36–84]</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>65.5 [51–80]</td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ/European</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indian</td>
<td>1</td>
<td></td>
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<tr>
<td>Fijian Indian</td>
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<tr>
<td>Filipino</td>
<td>2</td>
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<tr>
<td>Asian</td>
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includes six cases of recent surgery for underlying malignancy, either Whipple’s procedure or liver resection.

The IBD subgroup consisted of two patients with active, recently diagnosed Crohn’s disease and one with longstanding quiescent ulcerative colitis. However, the latter case had a background of recurrent flares of underlying diverticulosis.

The abscess was managed conservatively with antibiotics alone in six cases. The rest required some form of drainage, either a needle aspiration, US or CT guided drain insertion. Biliary drainage by the means of Endoscopic Retrograde Cholangiopancreatography (ERCP) was performed in two cases and one required percutaneous trans-hepatic cholangiogram (PTC) drainage. This patient had a background of Caroli’s disease, precluding a successful use of ERCP. There was a single primary surgical drainage for acute cholecystitis related PLA. Six cases required second intervention, including one secondary surgical drainage following failed US guided drainage (Table 2).
The predominant pathogen (cultured from the aspirate alone) was represented by Streptococcus intermedius (n=6), Escherichia coli (n=3) and mixed growth (n=3). There was only a single case of Klebsiella pneumoniae in a Filipino patient with a background of cirrhosis, previous cholecystectomy, but without diabetes. Our cohort included a case of abdominal tuberculosis as well as a case of amoebic liver abscess in a patient of Indian and Filipino ethnicity respectively. No organisms were isolated (n=4) and no specimens were collected in those six cases that were managed conservatively. In addition, blood cultures in those non-aspirated cases grew Escherichia coli in two patients.

Intravenous antibiotic treatment was initially empirical and then adjusted according to available antimicrobial susceptibility and clinical progress. Where specific microbiology wasn’t available (n=10), the empirical regimen included: cefuroxime with metronidazole (n=4); amoxicillin-clavulanate monotherapy (n=2); ciprofloxacin monotherapy (n=2) and ceftriaxone monotherapy (n=1). There was also one treatment with a standard first-line anti-tubercular combination regimen (n=1).

The most common complications were septic shock (n=6) and acute kidney injury (defined as doubling of baseline creatinine level) (n=2). Four out of six patients with septic shock required ICU admission. The ICU subgroup had slightly higher median age (63 vs 60 years), all were males and three of the four patients had significant medical comorbidities. None of the ICU patients were immunocompromised and the mean abscess diameter did not significantly differ from the non-ICU cohort.

Mean length of stay [LOS] was 10.3 days overall (19.5 days in ICU subgroup). There was one re-admission due to blocked PTC catheter. There were no inpatient deaths.

The likely aetiology in our cohort was: benign pancreatico-biliary disease (n=4, 16%) manifesting as gallstones, acute cholecystitis, pancreatitis and Caroli’s disease; recent liver resection or Whipple’s procedure (n=6, 24%); diverticulosis with or without overt diverticulitis (n=3, 12%); active IBD (n=2, 8%). Uncommon causes were represented by intra-abdominal tuberculosis, amoebic liver abscess and infected benign liver cyst. The causality was not evident in seven cases (28%).

Discussion

Our PLA incidence is similar to comparable regions.\(^1\)\(^4\) It follows the overall rising trends reported elsewhere. It is debatable how much of this trend is contributed to by ageing population, improved diagnosis and overall more aggressive treatment of certain conditions such as malignancies.\(^2\)\(^4\)\(^7\)

Only a few quoted studies comment on ethnicity, others being conducted in Asian regions.\(^2\)\(^4\)\(^12\) Our predominantly Caucasian cohort lacked Māori or Pacific Islanders. This could be to some degree explained by the latest census in 2013, reporting on Canterbury population as significantly

<table>
<thead>
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<th>Table 2: Abscess diameter and intervention undertaken.</th>
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<tr>
<td><strong>Intervention</strong></td>
</tr>
<tr>
<td>Nil</td>
</tr>
<tr>
<td>US guided needle aspiration</td>
</tr>
<tr>
<td>US guided drain insertion</td>
</tr>
<tr>
<td>CT guided drain insertion</td>
</tr>
<tr>
<td>ERCP</td>
</tr>
<tr>
<td>1 cholangitis/cholecystitis</td>
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<tr>
<td>PTC due to Caroli’s disease</td>
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<tr>
<td>Primary surgical drainage</td>
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underrepresented in ethnic minorities. Māori, Asian and Pacific Islanders combined represented only 17.5% of our region versus 34.5% nationwide.15

Known risk factors were similarly represented. Diabetes in particular had a comparable prevalence of 20% in our study.2,6,9,12,16 In addition, we have identified 20% of immunocompromised cases, but none were liver transplant patients.

Our postulated causality follows similar trends elsewhere with benign aetiology being most frequent.1,4,9 All intra-abdominal malignancy cases were managed surgically prior to the PLA manifestation. As such, the actual PLA causality in this subgroup may well be a surgical complication as opposed to malignancy.

In contrast to other studies, there was only a single case of Klebsiella in our group.1,2,7,12 However, Asian ethnicity was underrepresented in our cohort.

Our interventional management approach was in concordance with the current best evidence.10,11

The percentage of our surgically drained PLAs (8%) is similar to studies published in the last decade.3,16,17 Despite already established percutaneous method of drainage, earlier studies quote significantly higher numbers of surgically drained cases, approximately one third.4,7,12 The growing availability of interventional radiology as well as changing management protocols no doubt played a role.

Our tertiary centre management approach together with a short observation period may have contributed to our unprecedented zero inpatient mortality.

We read with interest a recent study by Osman et al (2018),17 a contemporary retrospective single centre PLA review from a different New Zealand cohort. Their results differ significantly in a number of ways: vastly different ethnicity in Auckland region (only 47% vs 80% Caucasian); younger less comorbid patients (70% vs 56%); Klebsiella predominant pathogen (26% vs 4%); and cryptogenic causality (52% vs 28%). Significant regional variations in demographics including ethnicity could account for some of these differences.

Finally, we would like to acknowledge limitations of our single tertiary centre cohort study with related diagnostic, management and outcome implications. The short period provides merely a snapshot. In addition, there is a differing regional ethnicity distribution in New Zealand, thus possibly underrepresenting important country specific ethnic minorities in our centre. This phenomenon is supported by the above-mentioned paper by Osman et al.

We conclude that pyogenic liver abscess continues to carry significant morbidity. Demographics, especially ethnicity, play an important role. The fact that our hospital is a tertiary centre may account for higher incidence and better clinical outcomes.

**Competing interests:**
Nil.

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