Epidemiology, Risk Factors, and Treatment Considerations for Pyogenic Liver Abscess (PLA) in the Calgary Health Zone (CHZ) Revisited: A Population-Based Study.

Jennifer A. Losie[1], John C. Lam[2], Daniel B. Gregson[2], Michael D. Parkins[2]
[1]Faculty of Medicine, University of Calgary, Calgary, AB; [2]Department of Infectious Disease, University of Calgary, Calgary, AB

UNIVERSITY OF CALGARY

Background & Aims

- These abscesses can develop from[1]:
  i) biliary tree disease
  ii) gastrointestinal tract infections via the hepatic portal vein
  iii) systemic bacteremia via the hepatic artery
  iv) contiguous spread
  v) direct inoculation from trauma or an invasive procedure
  vi) cryptogenically
- Approximately 75% of PLA are in the right lobe, 20% in the left lobe, and 5% in the caudate lobe[2].
- Microbiology of PLA varies based on geographic location. *Klebsiella* species are the predominant organism found in PLA throughout Asia[3], whereas *Streptococcus anginosus* group are most prevalent in North America[4].
- We sought to redefine the epidemiology and outcomes of PLA utilizing a population-based study in the Calgary Health Zone (CHZ).

Methods

- All residents over 20 years of age who were hospitalized with PLA in the Calgary Health Zone (population ~1.3 million) in 2015 to 2017 were included.
- Study subjects were identified using the International Classification of Diseases 9 and 10 (ICD-9 & ICD-10) codes for PLA.
- Recurrent episodes in the same subject were not included in the data set.
- Retrospective chart reviews (using Sunrise Clinical Manager) were conducted to determine demographics and clinical outcomes.
- Multivariate logistic regression were used to assess for factors associated with 30-day mortality using STATA 16.1 (College Stn., TX).
- Findings were compared to a previous assessment of PLA in the CHZ from 1999-2003[5].

Tables

Table-1. The most common organisms identified via blood culture or liver aspirate culture.

Organism	Total Prevalence 1999-2003[5]	Total Prevalence 2015-2017
***S. anginosus* group**	44% (31/71)	40% (54/136)
***Klebsiella* species**	27% (19/71)	25% (34/136)
Escherichia coli	16% (11/71)	18% (24/136)
Obligate anaerobes	20% (14/71)	16% (22/136)
***Enterococcus* species**	7% (5/71)	9% (12/136)

Table-2. Multivariate analyses were performed to determine factors associated with 30-day mortality.

Factors associated with 30-day mortality	Multivariate (OR [95% CI], p-value)
Polymicrobial bacteremia	18.5 [1.8-191], 0.014
No drainage performed	13.3 [1.1-167], 0.045
History of congestive heart failure	35.7 [1.4-912], 0.031
History of liver disease	10.3 [0.9-115] , 0.059
Total bilirubin	1.0 per umol/L [1.00-1.04], 0.023

Results

- 136 patients with PLA were identified (37% female, median age 62 [IQR 53-71] years) corresponding to an incidence rate of 3.6 cases per 100,000 population.
- Compared to 1999-2003, incidence of PLA was increased (2.3 per 100,000; p<0.01) but mortality was similar (1999-2003: 0.22 per 100,000 vs. 2015-2017: 0.26 per 100,000; p=0.6).
- Most (91%) cases had at least one organism identified via blood or liver aspirate culture (Table-1). Pathogen prevalence was similar to the prior cohort.
- Compared to 1999-2003, antibiotic resistant organisms were more frequent (1% vs 8%, p=0.04).
- The median duration of intravenous antibiotic therapy was longer compared to previous (2015-2017: 23 days (IQR 9-38) vs. 1999-2003: 17 days (IQR 10-29); p=0.001). Similarly, the total duration of antibiotic therapy was longer (2015-2017: 42 days (IQR 25-65) vs. 1999-2003: 31 days (IQR 18-45); p<0.001).
- Thirty-day mortality from admission was 7% and was not significantly changed over time. There were multiple risk factors associated with mortality identified (Table-2).

Discussion & Conclusions

- PLA incidence is increasing in the CHZ and is an emerging disease of concern.
- Liver aspirations for diagnosis are being done less frequently but have higher yield of a microbiologic diagnosis when performed.
- The prevalence of culprit pathogens has not changed significantly compared to 15 years ago but antimicrobial resistance has increased. Antibiotic treatment durations are longer in our cohort with no decrease in mortality.
- Understanding these trends and how they have changed over a 15 year time period is valuable in directing care in the future.
- Objectives of future areas of study include:
  i) Characterize the range of treatments and investigations patients receive in the management of PLA and how this associates with subsequent outcomes.
  ii) Determine the frequency with which imaging is performed.
  iii) Determine the impact of imaging on the duration of antibiotic therapy in PLA.
  iv) Determine the impact of follow-up imaging of PLA on patient outcomes.
  v) Determine patient characteristics that affect duration of therapy.

Alberta Health Services

Selected References:
1. Bächler P, Baladron MJ, Menias C, et al. Multimodality Imaging of Liver Infections: Differential Diagnosis and Potential Pitfalls. Radiographics **2016**; 36(4): 1001-23.
2. Guerrant RL, Walker DH, Weller PF. Tropical infectious diseases: principles, pathogens, and practice. 3rd ed. Edinburgh; New York: Saunders/Elsevier, **2011**.
3. Lo JZW, Leow JJJ, Ng PLF, et al. Predictors of therapy failure in a series of 741 adult pyogenic liver abscesses. J Hepatobiliary Pancreat Sci. **2015**; 22(2): 156-165.
4. Meddings L, Myers RP, Hubbard J, et al. A population-based study of pyogenic liver abscesses in the United States: incidence, mortality, and temporal trends. Am J Gastroenterol **2010**; 105(1): 117-2.
5. Kaplan GG, Gregson DB, Laupland KB. Population-based study of the epidemiology of and the risk factors for pyogenic liver abscess. Clin Gastroenterol Hepatol **2004**; 2(11): 1032-8.