Splenic Abscess: An Uncommon Entity with Potentially Life-Threatening Evolution

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Received 8 September 2017; Accepted 27 December 2017; Published 31 January 2018

Background/Purpose. Splenic abscess is rare with potentially life-threatening evolution. The aim of this study is to review the clinical features, microbiological etiologies, treatment, and outcomes of patients with splenic abscess.

Methods. We reviewed the admitted patients with suspected splenic abscess and made the diagnosis of splenic abscess. The clinical characteristics, underlying diseases, treatment course, organism spectra, abscess number and size, therapeutic methods, and clinical outcome at a tertiary medical center in Taiwan over a period of 5 years were analyzed.

Results. Of 16 patients with splenic abscess, the male to female ratio was 1 : 1. Common presentations were fever (11 patients, 68.7%), diffuse abdominal pain (6 patients, 37.5%), left upper quadrant pain or tenderness (6 patients, 37.5%), and left-sided pleural effusions (8 patients, 50%). Antimicrobial therapy was administered in all patients. Fourteen (87.5%) patients recovered under medical treatment. One (6.2%) patient underwent splenectomy, four (25%) patients performed percutaneous drainage of their splenic abscess, and 11 (68.7%) patients received antimicrobial therapy alone.

Conclusion. We noted that mortality may be more related to patients with underlying immunodeficiency. Patients with splenic abscesses receiving antimicrobial therapy alone were in a relatively high proportion and got a good prognosis especially in patients with small and multiple abscesses.

1. Introduction

Splenic abscess is an uncommon infection. The incidence of splenic abscess in autopsy studies is estimated to be 0.05–0.7% [1, 2]. Hematogenous spread is the most common cause of splenic abscess. It typically results from endocarditis or seeding from some contiguous sites of infection [3, 4]. Other risk groups include immunosuppressed patients, hemoglobinopathies, and diabetes mellitus [3, 5]. Early diagnosis can readily be made by the combination of computed tomography (CT), abdominal ultrasonography (US), and clinical features [5]. The management of splenic abscesses includes medical therapy, CT-guided percutaneous aspiration, and splenectomy. Recent studies have stressed the changing clinical spectrum and indicated that intravenous antimicrobial therapy alone for patients with splenic abscess showed better outcome [2, 6, 7]. The aim of the study was to review the clinical features, microbiological etiologies, treatment, and outcomes of patients with splenic abscess over the previous 5 years.

2. Materials and Methods

2.1. Study Design and Data Collection. Admitted patients with the diagnosis of splenic abscess were collected over a period of 5 years (from January 2012 to December 2016). Inclusion criteria of this study were as follows: (1) histological results of the resected splenic tissue showed the
presence of an abscess, (2) causative pathogens were isolated from a splenic aspirate or blood culture with compatible imaging studies of CT or US, (3) splenic abscesses were found during exploratory laparotomy, or (4) clinical manifestations were consistent with imaging findings and there was an improvement in the patient’s clinical condition after antimicrobial therapy. Age, sex, clinical manifestations, underlying diseases, imaging studies, such as US or CT, treatment course, organism spectra, abscess number and size, therapeutic methods, and clinical outcome were collected and analyzed. The patients were followed up to discharge from our hospital as an end point to define the outcome. This study has been approved by the MacKay Memorial Hospital Institutional Review Board, and the IRB number is 17 MMHIS040.

2.2. Statistical Analysis. A univariate analysis of prognostic factors for splenic abscess including age, sex, abscess number, underlying disease, pathogens, and treatment methods was assessed using Fisher’s exact test. Continuous variables were compared using the independent t-tests such as the mean age and the length of stay. A p value of less than 0.05 was considered statistically significant, and the two-tailed test was adopted for all probabilities. All statistical analyses were performed with SPSS version 20.0 (SPSS, Chicago, IL, USA).

3. Results

One hundred and four patients with a diagnosis of splenic abscess were reviewed between January 2012 and December 2016, and 16 patients met the criteria for splenic abscess. The male to female ratio was 1:1, with a mean age of 49.9 years (range: 1 day to 52 years). Clinical characteristics of the patients including age, gender, predisposing factors, the number of splenic abscesses, microbiological etiologies, therapeutic methods, and clinical outcome were collected and analyzed. The patients were followed up to discharge from our hospital as an end point to define the outcome. This study has been approved by the MacKay Memorial Hospital Institutional Review Board, and the IRB number is 17 MMHIS040.

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Causative pathogens were identified in 11 patients (68.7%) with splenic abscess and sterile in the other 5 patients. Blood culture was positive in 7 of 16 patients (43.7%), and abscess culture was positive in 3 of 16 patients (18.7%). Two patients were diagnosed with Mycobacterium infection clinically, including patient #14, whose clinical condition improved after treatment with antimycobacterial agents. A systemic candidiasis with spleen invasion was diagnosed in patient #15, in whose blood culture Candida parapsilosis was isolated. In our study, 5 patients revealed Gram-positive coccal infections (3 streptococci, 1 enterococci, and 1 Staphylococcus aureus), 2 patients showed Gram-negative bacillary infections (1 Salmonella group B and 1 Klebsiella pneumoniae), and 1 patient had a Gram-positive coccal infection and a Gram-negative bacillary infection (enterococci + Escherichia coli-ESBL).

The clinical symptoms and signs included fever (11 patients, 68.7%), diffuse abdominal pain (6 patients, 37.5%), and left upper quadrant pain or tenderness (6 patients, 37.5%). Physical examination revealed splenomegaly in four patients (25%). Chest radiographs showed left-sided pleural effusions in eight patients (50%). Leukocytosis was noted in 15 patients (93.7%). One patient with AIDS had febrile leucopenia. All patients underwent US and CT. A single abscess was noted in seven patients (43.7%) and multiple abscesses in nine patients (56.3%).

The prognostic factors for splenic abscess are analyzed in Table 2. Antimicrobial therapy was administered in all patients. Fourteen patients (87.5%) recovered under medical treatment. One patient (6.2%) underwent laparoscopic splenectomy, and four patients (25%) underwent percutaneous drainage of their splenic abscess. The mortality rate was 12.5% (2 patients). All four patients who underwent percutaneous drainage and one patient who underwent splenectomy survived, but two (18.2%) of the eleven patients who only had antimicrobial therapy died. The two patients who died separately had the underlying disease AIDS (CD4 count: 20 cells/µL, viral load: 21,460 copies/mL and bladder urethral carcinoma with recurrence and needed to be treated in the intensive care unit.

4. Discussion

Splenic abscess is an uncommon entity. The incidence of splenic abscess is estimated to be 0.05–0.7% [1, 2]. The rare occurrence of splenic abscess is evidenced by the study of Altemeier et al. They reported that no splenic abscess was found in reviewing 540 intra-abdominal abscesses [8]. In our study, only 16 patients with splenic abscess were found in the recent 5 years.

Hematogenous spread is the most common cause. The typical examples include patients with septic endocarditis and septicemia. Other risk groups include immunosuppressed individuals (e.g., HIV, malignancy, and diabetes mellitus), trauma, and contiguous spread [5, 9]. In our study, 7 of 16 patients (43.7%) had septicemia including 2 patients with endocarditis. 43.7% of 16 patients had immunodeficiency disorders, such as AIDS, end-stage kidney disease, malignancies, liver cirrhosis, and preterm premature rupture of membranes.

A comparison of epidemiology and symptomatology in patients with splenic abscess in the five periods is reviewed in Table 3. Our patient experienced relatively lower percentage of fever and higher percentage of left lung pleural effusion than those reported by other studies [7, 9–11].

The most common organisms obtained from culture of the abscesses are aerobic microbes, in particular, staphylococci, streptococci, Salmonella, and Escherichia coli [9, 10]. However, it seems to have geographical variations and population difference. Klebsiella pneumoniae was the leading pathogen causing splenic abscess in Taiwan [2]. Mycobacterium tuberculosis had been reported to be the most common pathogen of liver abscess in Spain [12]. In Thailand, Burkholderia pseudomallei had been prescribed to be the most predominant pathogen in a retrospective study of 60 cases with splenic abscess [13]. Considering fungal splenic
abscesses, they were found predominantly in immuno-compromised patients [14]. In our study, no specific pathogen was predominant in patients with splenic abscess. It could be limited by fewer case numbers.

As to the treatment of splenic abscesses, intravenous antimicrobial therapy, CT-guided percutaneous aspiration, and splenectomy were the options. An earlier study had shown that the use of intravenous antimicrobial therapy alone resulted in 100% mortality [9]. In recent years, some researches had indicated the success rate of 70.8%–100% in patients with splenic abscess treated with antimicrobial therapy alone (Table 4) [2, 7, 11, 15]. In our study,

| Case number | Sex | Age (years) | Predisposing factors | Number of abscesses | Microbiological etiology | Treatment | Outcome |
|-------------|-----|-------------|----------------------|---------------------|-------------------------|-----------|---------|
| 1           | F   | 71          | Biliary liver cirrhosis, gallstone s/p cholecystectomy, acute pancreatitis | Single | Alpha-Streptococcus species (blood) | AT | Recovered |
| 2           | M   | 75          | HTN, infectious endocarditis HTN, ESRD, bladder urothelial carcinoma, high grade s/p TURBT, with recurrence s/p robotic radical cystoprostatectomy, acute pancreatitis | Two mixed echoic nodules (2.0 × 2.8 cm and 3.9 × 2.1 cm) | Beta-Streptococcus non-ABD (blood) | AT | Recovered |
| 3           | M   | 67          | Chronic pancreatitis with pancreatic duct dilatation and pancreatic stones | Single (4.3 × 1 cm in size) | ESBL-producing Escherichia coli (blood), Enterococcus faecium (blood) | AT | Died |
| 4           | M   | 32          | Liver cirrhosis, malignant neoplasm of intrahepatic bile ducts, postcholecystectomy DM, hyperthyroidism, valvular heart disease, congestive heart failure, infective endocarditis AIDS (CD4 count: 59 cells/µL, viral load: 308 copies/mL), anal abscess and anal fistula | Single (2.9 cm) | Not identified | AT | Recovered |
| 5           | F   | 82          | Peptic ulcer, duodenitis, chronic hepatitis B | Single (10 × 3 cm) | Beta-Streptococcus non-ABD (blood) | PD + AT | Recovered |
| 6           | F   | 51          | AIDS (CD4 count: 20 cells/µL, viral load: 21,46,000 copies/mL) | Single (5.0 × 4.0 cm) | Coagulase (−) Staphylococcus (MS-CNS) (blood × 3 sets) | PD + AT | Recovered |
| 7           | M   | 48          | Chronic liver disease, DM, HTN | Multiple | Klebsiella pneumoniae (liver abscess) | AT | Recovered |
| 8           | F   | 43          | Peptic ulcer, duodenitis, chronic hepatitis B | Multiple | Mycobacterium avium complex (culture at bone marrow biopsy) | AT | Died |
| 9           | M   | 49          | AIDS (CD4 count: 20 cells/µL, viral load: 21,46,000 copies/mL) | Multiple | Enterococcus species (abscess) | LS + AT | Recovered |
| 10          | F   | 77          | Chronic liver disease, DM, HTN | Multiple (a 10 cm abscess with smaller abscesses) | Not identified | AT | Recovered |
| 11          | M   | 48          | DM, HTN, pancreatitis | Three (2.4, 1.22, 1 cm) | Not identified | AT | Recovered |
| 12          | M   | 31          | DM, alcoholism, chronic hepatitis B, chronic pancreatitis | Multiple | Not identified | AT | Recovered |
| 13          | F   | 81          | DM, HTN, ESRD, valvar heart disease | Multiple | Mycobacterium tuberculosis complex (lung tissue, sputum) | AT | Recovered |
| 14          | F   | 42          | Cholangitis | Three | Not identified | AT | Recovered |
| 15          | M   | 1 d         | Prematurity (GA 33 + 6 weeks, BBW 2208 gm), PPROM 10 days s/p complete IAP, necrotizing enterocolitis | Multiple | Candida parapsilosis (blood) | Antifungal agents | Recovered |
| 16          | F   | 2           | Acute gastroenteritis | Single (11.57 × 8.74 × 12.27 cm) | Salmonella group B (abscess, blood) | PD + AT | Recovered |

LS: laparoscopic splenectomy; AT: antimicrobial therapy; PD: percutaneous drainage; DM: diabetes mellitus; ESRD: end-stage renal disease; AIDS: acquired immune deficiency syndrome; PPROM: preterm premature rupture of membranes.
68.7% (11/16) of our patients received antimicrobial therapy alone, and 81.8% (9/11) of these patients got recovered. We also found that small and multiple abscesses may respond to intravenous antimicrobial therapy alone even though there was no significant difference ($p = 0.491$). The combination of ceftriaxone and metronidazole is the most common empiric antimicrobial treatment in our study.

Percutaneous drainage is an alternative for critically ill patients and for young patients who vigorously attempt to preserve the spleen [16]. Furthermore, percutaneous drainage is only performed when the abscess is unilocular or bilocular with a discrete wall and no internal septa and liquid content [12]. In our study, 4 of 16 patients (25%) underwent percutaneous drainage and all recovered.

The mortality rate varied from 12.4 to 27.6% [7, 9, 11, 15]. Patients with multiple splenic abscesses or immunodeficiency are suggested to have a poor prognosis and high mortality [2, 10]. The overall mortality rate in our study was 12.5% which was consistent with that of previous studies [7, 9]. It is worth mentioning that the two dead patients had serious immunodeficiency and needed to be treated in the intensive care unit (ICU). Because of the limited cases, it is difficult to

| Table 2: Prognostic factors for splenic abscess. |
|------------------------------------------------|
| Variables                                      | Category (n) | Recovered (n = 14, %) | Mortality (n = 2, %) | t     | p     |
| Gender                                         | Female (8)   | 8 (50)                 | 0 (50)               | —     | 0.467*|
|                                               | Male (8)     | 6 (75)                 | 2 (25)               | —     | —     |
| Age (years)                                    | Mean ± SD    | 48.8 ± 26.8            | 58.0 ± 12.7          | 0.467 | 0.648**|
| Number of abscesses                            | Solitary (7) | 6 (86)                 | 1 (14)               | —     | 1.0*  |
|                                               | Multiple (9) | 8 (89)                 | 1 (11)               | —     | —     |
| Immunodeficiency                               | Without (4)  | 4 (100)                | 0 (0)                | —     | 1.0*  |
|                                               | With (12)    | 10 (83)                | 2 (17)               | —     | —     |
| Underlying diseases                            | Without (2)  | 2 (100)                | 0 (0)                | —     | 1.0*  |
|                                               | With (14)    | 12 (86)                | 2 (14)               | —     | —     |
| Microorganism                                  | GNB (2)      | 2 (100)                | 0 (0)                | —     | 0.092*|
|                                               | GPC (5)      | 5 (100)                | 0 (0)                | —     | —     |
|                                               | GNB + GPC (1)| 0 (0)                 | 1 (100)              | —     | —     |
|                                               | Fungus (1)   | 1 (100)                | 0 (0)                | —     | —     |
|                                               | Mycobacterium (2)| 1 (50)   | 1 (50)             | —     | —     |
|                                               | Sterile (5)  | 5 (100)                | 0 (0)                | —     | —     |
| Treatment modality                             | AT + LS (1)  | 1 (100)                | 0 (0)                | —     | 1.0*  |
|                                               | AT + PD (4)  | 4 (100)                | 0 (0)                | —     | —     |
|                                               | AT alone (11)| 9 (82)                | 2 (18)               | —     | —     |
| Number of abscesses in patients with AT alone  | Solitary (3) | 2 (67)                 | 1 (33)               | —     | 0.491*|
|                                               | Multiple (8) | 7 (88)                 | 1 (12)               | —     | —     |
| Length of stay (days)                          | Mean ± SD    | 33.4 ± 24.8            | 19.0 ± 7.1           | −0.797| 0.439**|

GNB: Gram-negative bacillus; GPC: Gram-positive cocci; AT: antimicrobial therapy; PD: percutaneous drainage; LS: laparoscopic splenectomy; *Fisher’s exact test; **t-test of independent samples.

| Table 3: Comparison of epidemiology and symptomatology among five studies. |
|---------------------------------------------------------------|
| Variable                                      | Nelken et al. [10] | Ooi and Leong [9] | Chiang et al. [11] | Liu et al. [7] | Present study |
|---------------------------------------------------------------|
| Duration of study                                            | 1977–1986          | 1987–1995         | 1990–2001          | 2000–2011     | 2012–2016     |
| Number of cases                                              | 189                | 287              | 29                | 28           | 16           |
| Male : female                                                | 125 : 64           | 163 : 80         | 18 : 11           | 13 : 15      | 8 : 8        |
| Age, mean (years)                                            | Not available      | 41.4             | 44                | 46.5         | 49.9         |
| Age range                                                    | 6 mo–82 y          | 6 mo–92 y        | 4 y–85 y          | 4 mo–85 y   | 1d–52 y      |

| Clinical presentations                                       |                   |                   |                   |             |             |
|---------------------------------------------------------------|
| Fever (n, %)                                                  | 131/156 (84)       | 246/271 (89.8)    | 26/29 (99.7)      | 20/28 (71.4)| 11/16 (68.7)|
| Left upper quadrant pain (n, %)                               | 61/156 (39)        | 126/253 (94.9)    | 9/29 (30.4)       | 4/28 (14.3) | 6/16 (37.5) |
| Splenomegaly (n, %)                                           | 62/156 (40)        | 79/257 (30.7)     | 5/29 (17.2)       | 9/28 (32.1) | 4/16 (25.0) |
| Left-sided pleural effusion (n, %)                            | Not available      | 57/256 (22.3)     | 3/29 (10.3)       | 9/28 (32.1) | 8/16 (50.0) |

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compare the outcome between the tubercular and pyogenic origin. We speculated that patients with underlying immunodeficiency may also have contributed to these deaths.

5. Conclusions

Since there are no guidelines regarding its diagnosis and management, the best therapeutic approach for splenic abscess is still a matter of debate. Based on our experience, patients with splenic abscesses receiving antimicrobial therapy alone were in a relatively high proportion and got a good prognosis especially in patients with small and multiple abscesses. We also noted that mortality may be more related to patients with underlying immunodeficiency. Due to fewer cases collected in our study, further research will be needed to support our study in the future.

Disclosure

An earlier version of this work was presented as a poster at the 30th International Congress of Chemotherapy and Infection, 2017.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this article.

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