DOI: 10.14260/jemds/2015/1518

ORIGINAL ARTICLE

SPONTANEOUS BACTERIAL EMPYEMA: AN UNCOMMON COMPLICATION OF LIVER CIRRHOSIS

Vijay Sharma[1], Vijan Rai[2], Richa Sharma[3]

HOW TO CITE THIS ARTICLE:
Vijay Sharma, Vijan Rai, Richa Sharma. "Spontaneous Bacterial Empyema: An Uncommon Complication of Liver Cirrhosis". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 60, July 27; Page: 10539-10544, DOI: 10.14260/jemds/2015/1518

ABSTRACT: Spontaneous bacterial empyema (SBEM) is an infection of a pre-existing hepatic hydrothorax in cirrhotic patients and scanty data in world literature. We analyzed that over last 5 years all cirrhotics with pleural effusion underwent thoracocentesis either on admission or when an infection suspected. SBEM defined as culture positive PF with PMN count greater than 250 cells/micro L or PMN count greater than 500 cells/micro L, and exclusion of parapneumonic effusions. Out of total 2620 admissions with liver cirrhosis, 310(11.8%) were having pleural effusion, SBEM was diagnosed in 38(12.25) patients with various aetiologies'. In 25 (66%) patients SBEM was associated with spontaneous bacterial peritonitis (SBP). SBP and SBEM when occurred together did not increase the mortality (OR=1.73, CI=0.43-6.7), however SBE alone had the same outcome as SBP 18(52.6%), 15(42.9%) p=0.815). Total 12 patients (31%) died during same admission. Poor child's score, low pleural fluid albumin and renal failure were associated with poor prognosis. For the assessment of mortality analysis, Mann Whitney U test and t test were used for continuous variables, while Fischer exact test/ chi square were used for categorical variables. On univariate analysis INR, Haemoglobin, Serum creatinine, MELD score and Pleural fluid protein were significantly associated predictors of high mortality if abnormal. However on multivariate regression. None of the factors were significant. Pleural fluid culture was positive in 21 (55%). Microorganisms identified in PF were Gram-negative bacilli in 13, and Gram positive cocci in 8 samples. Antibiotic sensitivity of organisms also reported.

KEYWORDS: Cirrhosis, Hepatic hydrothorax, Spontaneous bacterial empyema.

INTRODUCTION: Spontaneous bacterial empyema (SBEM) is spontaneous infection of a pre-existing hepatic hydrothorax in cirrhotic patients; it is an uncommon complication of portal hypertension. It is diagnosed by pleural fluid aspiration, Pleural fluid (PF) albumin level, polymorphonuclear (PMN) leukocyte count, and conventional culture.[1,2] There is scanty data in world literature so we planned to collect our data and share the experience.

OBJECTIVES: To study prevalence of SBEM in patients with liver cirrhosis, factors affecting prognosis, and to study bacterial spectrum and antibiotic sensitivity in culture isolates.

MATERIAL AND METHODS: Study was retrospectively done at Department of Gastroenterology, Soni Manipal Hospital, Jaipur, India, Gandhi Medical College, Bhopal and Regional Institute of Health, Medicine and Research, Jaipur, India. Five year data from 2010 to 2015 was collected, hospital record system was used to collect information about total number of admissions to Gastroenterology department, and cases seen in OPD from that data number of Liver cirrhosis patients was separated, on further analysis Confirmed Hepatic hydrothorax patients files were separated and studied.

DOI: 10.14260/jemds/2015/1518

All cirrhotics with pleural effusion (hydrothorax) underwent thoracocentesis either on admission or after admission if they developed fever, pleuritic pain, encephalopathy or unexplained deterioration in renal function, and/or respiratory distress.[3] Pleural fluid (PF) albumin level, polymorphonuclear (PMN) leukocyte count, and conventional culture done. Pleural fluid culture performed by inoculating 10ml pleural fluid into a conventional blood culture bottle at bedside. SBEM was defined as pleural fluid with a polymorphonuclear (PMN) cell count >500cells/mm 3 or positive culture with PMN cell count >250cells/mm 3 with the exclusion of a parapneumonic effusion with chest x ray.

Statistics

Mann Whitney U test and t test were used for continuous variables. Fischer exact test/ chi square were used for categorical variables.

RESULTS: Out of total 2620 admissions with liver cirrhosis over 5year period, total 310(11.8%) were having pleural effusion (hepatic hydrothorax), among these patients SBEM was diagnosed in only 38(12.25%) patients. Eleven patients with SBEM were female and 27 were male. Mean age of the male patients was 49 years (Range 25-74 years), and Mean age of female patients was 50 years (Range 22-73years). The aetiologies' for liver cirrhosis were Hepatitis B virus in 6 patients, Hepatitis C Virus in 7 patients, Alcohol in 12 patients, primary billiary cirrhosis in one, mixed aetiologies' (HCV with Alcohol) in 2 patients and cause of the liver cirrhosis could not be identified (Cryptogenic) in 10 patients. In 25 (66 %) patients out of 38 patients SBEM was associated with spontaneous bacterial peritonitis (SBP). SBP and SBEM when occurred together did not increase the mortality (OR=1.73, CI=0.43-6.7), however SBE alone had the same outcome as SBP (18(52.6%), 15(42.9%) p=0.815). There was high mortality-12 patients (31%) during admission.

Eleven patients were Child's C status and one was Child's B among no survivors, while among survivors twenty were Child's C, three were Child's A, and three were Child's B status. Average pleural fluid protein was 1.28gm/l (Range 0.9-2.5 g/l) in patients with poor prognosis while it was 1.7gm/l (Range 1.2-2.3g/l) in patients discharged from hospital. The mean Creatinine in patients with poor prognosis was 2.48mg/dl (Range 1.5-4.1mg/dl), while mean Creatinine was 1.3mg/dl (Range 0.8-1.8mg/dl) in patients with better prognosis. Mann Whitney U test and t test were used for continuous variables. Fischer exact test/ chi square were used for categorical variables. On univariate analysis INR, Hb, S.creat, MELD score and Pl. fluid protein are significantly associated with mortality. However on multivariate regression. None of the factors were significant for mortality prediction.

Pleural fluid culture was positive in 21(55%) of the samples. The microorganisms isolated were Gram-negative bacilli in 13 samples (62%) (Escherichia coli in 4, Pseudomonas in 4, Acinetobacter in 2, Enterobacter in 2, Citrobacter in 1 sample) and Gram positive cocci from 8 samples (38%) (Staphylococcus in 6, Enterococcus from 1 & Streptococcus Viridans from 1 sample). Gram-negative isolates were sensitive to Carbapenam (80%), Amikacin (73%), Piperacillin-tazobactem (38%), Ciprofloxacin (38%), Ceftriaxone (15%). Gram-positive isolates were sensitive to Amoxycillin (75%), Quinolone (87%), Amikacin (87%), Gentamycin (87%), Vancomycin (87%), Cefazolin (75%), and Cotrimoxazole (25%).

DISCUSSION: Hepatic hydrothorax is defined as a significant pleural effusion, usually greater than 500 ml, in a cirrhotic patient without any underlying pulmonary or cardiac diseases. It appears to be a relatively uncommon complication of portal hypertension with an estimated prevalence of 5–12%

in patients with the cirrhosis of the liver. Hepatic hydrothorax is usually right-sided (65–87% of reported cases) but may be left-sided or bilateral. Prevalence of hydrothorax in Indian patients (11.8%) is similar to reports elsewhere. Spontaneous bacterial empyema, defined as the spontaneous infection of the pleural fluid, represents a distinct complication of hepatic hydrothorax. Mostly there is no evidence of pus or abscess in the thoracic cavity.[2] Spontaneous bacterial empyema has been reported to be present in as many as 13% to 30% of the hospitalized cases of hepatic hydrothorax:[4] in our patients prevalence of SBEM (12%) in hepatic hydrothorax patients is comparable to other centres. A transient bacteraemia that infects the pleural space could be the underlying pathogenic mechanism apart from the impaired opsonic activity of the pleural fluid.[5] Sese et al, reported patients with SBEM also have lower levels of C3.[6]

A high Child-Pugh score decreased pleural fluid total protein and low levels of C3 component in pleural fluid, SBP has been proved risk factors for the development of SBEM by other authors.[6,3] SBEM may occur as a result of a direct bacterial spread from the peritoneal cavity; in our study 66% of the SBEM patients were also having spontaneous bacterial empyema (SBP), which is similar to other reports. The causative microorganisms isolated were Gram-negative bacilli most commonly in descending order Escherichia coli, Pseudomonas, Acinetobacter, Enterobacter, Citrobacter. Gram positive organisms like Staphylococcus, Enterococcus also reported in significant number of samples. While in study by Sese et al, most common isolates were Escheria coli, Streptococcus species, Enterococcus and Klebsiella.[6]

Conventional cultures are not sufficiently sensitive to diagnose the condition.[2] By conventional culture methods in only 55% of the samples organisms could be isolated in our patients. One study by Castellote et al. reported that analysis of pleural fluid with a reagent strip for leukocyte esterase might represent a rapid, easy-to-use and inexpensive tool for the diagnosis of SBEM in cirrhotic patients.[7] We are planning to conduct similar study in future.

Patients who develop SBEM have approximately 20% mortality during therapy and that a beneficial effect on mortality has been demonstrated with albumin infusion in the setting of SBP. In our report mortality in these patients was 31% which is higher than published literature. Our study could demonstrate that patients with higher mean Creatinine {2.48mg/dl (range 1.5-4.2mg/dl)} and lower mean pleural fluid protein {mean 1.29gm/l (range 0.9-2.5g/l)} had poor prognosis, while patients with good prognosis had low mean serum Creatinine {1.39mg/dl (range 0.8–2.3mg/dl)} and higher pleural fluid protein {mean 1.68gm/l (range 1.1-2.4g/l)}. Albumin infusion can increase survival in this group of patients, by acting on oncotic pressure and renal perfusion. In cases where there is slow clinical recovery, a repeat thoracocentesis is recommended to document that the patient is responding to treatment. We could not document any repeat thoracocentesis in our patients. As per guidelines a chest tube should not be used in the treatment of SBEM because it can be risky for cirrhosis patients, no chest tube was placed in any of our patients.[3]

Poor Child's status is the most important factor with higher death rates in patients with SBEM; our observation in similar to other reports in this regard. Transplantation candidates should be recognized in time and waitlisted so that there life can be saved.[8]

CONCLUSION: SBEM is uncommon in Liver cirrhosis patients; it is mostly associated with SBP, advanced liver disease and high mortality. Poor child score, renal failure and low pleural fluid albumin are associated with poor survival. Culture positivity of PF in SBE is low when routine culture methods are used.

DOI: 10.14260/jemds/2015/1518

ACKNOWLEDGEMENT: To the coauthors who helped in writing and data collection of the manuscript.

REFERENCES:

1. Garcia N, Jr, Mihas AA. Hepatic hydrothorax: Pathophysiology, diagnosis and management. J Clin Gastroenterol. 2004; 38: 52–8.
2. Xiol X, Castellvi JM, Guardiola J, Sesé E, Castellote J, Perelló A, et al. Spontaneous bacterial empyema in cirrhotic patients: A prospective study. Hepatology. 1996; 23: 719–23.
3. Roussos A, Philippou N, Mantzaris GJ, Gourgouliannis KI. Hepatic hydrothorax: Pathophysiology, diagnosis and management. J Gastroenterol Hepatol. 2007; 22: 1388–93.
4. Gur C, Ilan Y, Shibolet O. Hepatic hydrothorax-pathophysiology, diagnosis and treatment: Review of the literature. Liver Int. 2004; 24: 281–4.
5. Guarner C, Soriano G. Bacterial translocation and its consequences in patients with cirrhosis. Eur J Gastroenterol Hepatol. 2005; 17: 27–31.
6. Sese E, Xiol X, Castellote J, Rodriguez-Farinas E, Tremosa G. Low complement levels and opsonic activity in hepatic hydrothorax: Its relationship with spontaneous bacterial empyema. J Clin Gastroenterol. 2003; 36: 75–7.
7. Castellote J, Lopez C, Gornals J, Domingo A, Xiol X. Use of reagent strips for the rapid diagnosis of spontaneous bacterial empyema. J Clin Gastroenterol. 2005; 39: 278–81.
8. Xiol X, Tremosa G, Castellote J, Gornals J, Lama C, Lopez C, et al. Liver transplantation in patients with hepatic hydrothorax. Transpl Int. 2005; 18: 672–5.

Sl. No.	Age	Sex	Aetiology	CHILD Status	Creatinine	Pleural fluid protein	Mortality	SBP
1	74	Male	HCV	C	0.9	2.3	No	No
2	48	Male	HBV	A	1.1	2.3	No	No
3	58	Male	HCV	C	2.3	2.5	Yes	Yes
4	40	Male	HBV	C	1.5	1.2	No	Yes
5	65	female	PBC	C	1.6	1.9	No	No
6	41	Male	HCV	C	1.9	1.1	Yes	Yes
7	44	Male	ALCOHOL	C	1.2	2.1	No	No
8	45	Male	HBV	C	1.5	1.8	No	Yes
9	36	Male	ALCOHOL	C	1.4	1.9	No	No
10	48	Male	CRYPTOGENIC	C	1.8	2.0	No	Yes
11	49	Male	ALCOHOL	C	1.2	1.5	No	No
12	45	Male	C & ALCOHOL	C	2.5	1.2	Yes	No
13	49	Male	ALCOHOL	C	1.8	1.1	No	No
14	54	Male	C & ALCOHOL	A	0.8	1.6	No	No
15	45	female	HBV	C	1.3	1.5	No	No
16	52	female	CRYPTOGENIC	C	1.2	1.6	No	No
17	53	Male	ALCOHOL	C	1.5	1.4	No	Yes
18	22	female	CRYPTOGENIC	C	1.4	1.6	No	Yes

DOI: 10.14260/jemds/2015/1518

19	56	Male	ALCOHOL	C	1.3	1.8	No	Yes
20	56	Male	ALCOHOL	C	1.5	0.9	Yes	Yes
21	62	Male	ALCOHOL	C	1.0	1.9	No	Yes
22	43	female	HCV	C	1.4	1.2	No	Yes
23	43	female	HCV	C	1.3	1.7	No	Yes
24	47	Male	ALCOHOL	C	1.3	1.4	No	Yes
25	27	Male	CRYPTOGENIC	C	2.1	1.1	Yes	Yes
26	55	female	CRYPTOGENIC	C	3.1	1.0	Yes	Yes
27	59	female	CRYPTOGENIC	C	1.9	1.0	Yes	Yes
28	38	Male	HBV	C	1.4	1.4	No	Yes
29	25	Male	HBV	C	4.2	1.5	Yes	Yes
30	73	female	CRYPTOGENIC	B	1.1	1.9	No	No
31	47	Male	ALCOHOL	B	1.5	2.0	No	Yes
32	56	Male	ALCOHOL	C	2.0	1.3	Yes	No
33	54	Male	CRYPTOGENIC	B	2.4	1.2	Yes	Yes
34	43	Male	ALCOHOL	A	0.8	1.8	No	Yes
35	61	Male	CRYPTOGENIC	C	3.8	1.6	Yes	Yes
36	66	Male	CRYPTOGENIC	C	2.1	1.1	Yes	Yes
37	49	female	HCV	B	2.3	1.8	No	Yes
38	49	female	HCV	C	1.6	1.2	No	Yes

Table 1. Demographic factors, aetiology of cirrhosis, and poor prognostic indicators in patients with SBEM

Parameters	SBE (n=34)	SBP (n=28)	P value
MELD	23.23(29)	20.41(32)	0.842
S.Creat	1.5(3.4)	1.6(4)	0.535
INR	1.739(2.3)	1.77(2.5)	0.813
Bilirubin	4.4(35)	2.9(9.2)	0.270
Mortality	18(52.6%)	15(42.9%)	0.815

Table 2: Comparison of prognostic parameters in patients with SBEM and SBP

	Nonsurvivors (n=16)	Survivors (n=19)	P value
Sex (male/females)	15/2	12/7	0.135
Aetiology (Alcohol/HBV /HCV/Crypto/others)	6/2/2/6/0	7/4/3//4/1	0.846
Presence of SBP	11(69%)	11(5%)	0.50
CTP class	0/1/15	2/2/15	0.608
Age	48(41)	48(52)	0.832
S.Bil	6.3(35)	1.55(27.7)	0.025
AST	59(334)	63(306)	0.929

DOI: 10.14260/jemds/2015/1518

Alkaline phosphatase	132(453)	153.5(284)	0.343
T.prot	6.5(3.6)	6.3(3.5)	0.845
alb	2.6(2.3)	2.3(1.9)	0.135
INR	1.92(1.9)	1.519(2.3)	0.01
Platelet	60.5(445)	87.5(368)	0.107
Hb	7.8(3.3)	9.2(7.2)	0.02
TLC	8.4(27.4)	8.2(22.8)	0.901
S.creat	2.05(3.0)	1.3(1.5)	<0.001
Pl fluid prot	1.25(1.4)	1.8(1.2)	<0.001
MELD	28.12(19)	15.1(21.43)	<0.001

Table 3: Comparison of various parameters and analysis of their significance in non-survivors versus survivors

AUTHORS:

1. Vijay Sharma
2. Vijan Rai
3. Richa Sharma

PARTICULARS OF CONTRIBUTORS:

1. Senior Consultant Gastroenterologist, Department of Gastroenterology, Soni Manipal Hospital, Jaipur.
2. Assistant Professor, Department of Department of Gastroenterology, Gandhi Medical College, Bhopal.
3. Medical Officer, Regional institute of Health, Medicine and Research, Jaipur, India.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:
Dr. Vijan Rai
Second Floor,
78, Malviya Nagar,
Bhopal- 462003.
E-mail: vijanrai@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None

Date of Submission: 03/07/2015.
Date of Peer Review: 04/07/2015.
Date of Acceptance: 16/07/2015.
Date of Publishing: 25/07/2015.