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Hepatic Hydrothorax in Patients with Decompensated Cirrhosis in Zagazig University Hospitals: A Cross-sectional and Single Center Study

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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Original Research Article

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ABSTRACT

Background and Study Aim: Hepatic hydrothorax is the presence of more than 500 ml of pleural effusion in a patient with liver disorder. The work aimed to study the frequency of Hepatic hydrothorax in patients with decompensated cirrhosis admitted to the Tropical Medicine department, Faculty of Medicine, Zagazig University (inpatients, outpatient and intensive care unit) trying to determine the frequency of this disorder.
Patients and Methods: This study was performed on 208 decompensated cirrhotic patients (112 males and 96 females), their ages ranged from 27 to73 years old (53.8±7.09) between April 2013 to April 2014. Which were randomly divided into Group I included 182 decompensated cirrhotic patients without pleural effusion and Group II included 26 cirrhotic patients with pleural effusion. Clinical assessment, laboratory evaluation, plain chest x-ray and diagnostic paracentesis and pleurocentesis for cytological, biochemical analysis and bacteriological, biochemical and bacteriological analysis were carried out.
Results: In this study; the frequency of pleural effusion in decompensated cirrhotic patients was

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26/208 cases with a percentage of (12.5%) Also, this work showed (76.9%) of pleural effusion patients had effusion on right side, (15.4%) on left side, and (7.7%) have bilateral pleural effusion. This study showed; (23.1%) of cases with pleural effusion had mild effusion, (46.1%) had moderate effusion and (30.8%) had massive effusion.

Conclusion: Hepatic hydrothorax is an uncommon complication of advanced liver disease. In this study; the frequency of pleural effusion in decompensated cirrhotic patients was (12.5%), the majority of patients with hepatic hydrothorax were in child (C) 61.5%.

Keywords: Pleural effusion; paracentesis; pleurcentesis.

1. INTRODUCTION

Hepatic hydrothorax is the presence of more than 500 ml of pleural effusion in a patient with liver disorder, who does not show pulmonary or cardiac diseases or malignancies [1]. Hepatic hydrothorax is an uncommon complication of chronic liver disease occurring in approximately 0.4 to 12.2% of patients [2].

Pleural effusion develops when rate of fluid accumulation exceeds its removal. The overwhelming cause is the increase of the intra-abdominal pressure as a result of ascites, coughing, or straining which might lead to small herniations (pleuroperitoneal blebs) of the peritoneum through these gaps into the pleural cavity which may rupture and allow free communication between the peritoneal and pleural space [3].

The negative intrapleural pressure compared to that of the peritoneal cavity facilitates the one-way transfer of fluid and its subsequent trapping into the pleural space with predomination of right-side hepatic hydrothorax [4].

The transdiaphragmatic defects probably result from anatomic thinning and separation of the collagenous fibers of the tendinuous portion of the diaphragm [5]. Congenital factors, high intra-abdominal pressure and prolonged bed rest may contribute to the diaphragmatic thinning. Another possible explanation for the formation of transdiaphragmatic holes that allow the peritoneum to rupture into pleural space may be an increase of pressure caused by valsalva maneuvers (cough, defecation, parturition) and trauma. These defects are on the left side because the left diaphragm is thicker and more muscular [6].

Other mechanisms involved in the development of hepatic hydrothorax such as azygous vein hypertension causing formation of collateral anastomosis between portal and azygous systems [7], passage of fluid from peritoneal to the pleural space via transdiaphragmatic lymphatics, hypoalbuminemia resulting in decreased colloid osmotic pressure and lymphatic leakage from the thoracic duct [8].

The principles of medical management in hepatic hydrothorax are identical to those of ascites in cirrhotic patients [9]. The aim of the therapy should be to create and subsequently maintain a negative sodium balance. Therefore, a sodium-restricted diet is recommended [10]. A combination of a distal acting diuretic agent plus a loop diuretic is indicated [11].

Therapeutic thoracentesis is performed in order to relieve symptoms of dyspnea in patients with large effusions. Moreover, it is indicated in cases with recurrent or refractory hydrothorax [12].

Several surgical interventions have been used in the management of hepatic hydrothorax such as tube thoracostomy with chemical pleurodesis by injection of sclerosing agent, repair of defects in the diaphragm, and peritoneovenous shunts. The performance of transjugular intrahepatic portosystemic shunts (TIPS) is the procedure of choice in patients with hepatic hydrothorax who do not respond to diuretic treatment and/or repetitive therapeutic thoracentesis [6].

The work aimed to study the frequency of pleural effusion in decompensated cirrhotic patients in cases admitted to the Tropical Medicine department (inpatients, outpatient and intensive care unit) trying to determine the frequency of this disorder.

2. PATIENTS AND METHODS

This cross sectional study was performed on 208 cirrhotic ascitic patients (112 males and 96 females), their ages ranged from 27 to73 years old (53.8±7.09) who were seen at Tropical

Medicine Department, Faculty of Medicine, Zagazig University Hospitals between April 2013 to April 2014.

2.1 Patients were Divided Into Two Groups

- Group **I** included 182 cirrhotic ascitic patients without pleural effusion.
- Group **II** included 26 cirrhotic ascitic patients with pleural effusion.

2.1.1 Inclusion criteria

Two hundred and eight (208) decompensated cirrhotic patients were enrolled. The diagnosis of liver cirrhosis was based on the presence of at least 2 of the following: characteristic imaging features, esophageal or gastric varices, ascites, increased international normalized ratio (INR) that could not be attributed to any other cause [13]. The severity of the liver disease was assessed according to the Child-Pugh Turcotte classification [14].

2.1.2 Exclusion criteria

1. Patient had ascites not attributed to hepatic cirrhosis.
2. Hepatic patient without ascites.
3. Hepatic patient had pulmonary or cardiac diseases or malignancies.

2.2 Methods

All patients were subjected to the following:

2.2.1 Full clinical history

Patient medical and nutritional history was taken with special stress on gastrointestinal manifestation (especially abdominal enlargement and abdominal pain), chest symptoms (especially dyspnea, cough and chest pain). History of fever, bleeding tendency, and neuropsychiatric symptoms were also taken.

2.2.2 Thorough clinical examination

Including manifestations of liver cell failure (jaundice, palmar erythema, flapping tremors, spider naevi, lower limb edema and ascites). All patients were classified according to Child Pugh Turcotte (CPT) classification [14]. In addition to chest examination (inspection, palpation, percussion and auscultation).

2.2.3 Laboratory investigation

- Complete blood picture (white blood cell, hemoglobin level and platelet count)
- Liver function tests (total protein, albumin, total bilirubin, direct bilirubin, alkaline phosphatase) and liver enzymes (AST, ALT).
- Kidney function tests (blood urea nitrogen and creatinine).
- International normalizing ratio (INR)

2.2.4 Pelviabdominal ultrasound

It shows the condition of liver (size and echogenicity), spleen size (enlarged or not enlarged) and ascites grade (mild, moderate and marked).

2.2.5 Plain chest X-ray (PA and lateral view) to detect the fluid. CT was done when needed

2.2.5.1 Mild effusion

Accumulates in a subpulmonic location, causing slight elevation of the hemidiaphragm.

2.2.5.2 Moderate effusion

Appears as a dependent opacity with lateral upward sloping of a meniscus-shaped contour. The diaphragmatic contour is partially or completely obliterated, depending on the amount of the fluid.

2.2.5.3 Massive effusion

Appears as an opaque hemithorax with a mediastinal shift to the contralateral side. The mediastinal shift can be less prominent or even absent in the presence of underlying lung pathology (eg, atelectasis).

2.2.6 Diagnostic paracentesis and pleurcentesis for cytological, biochemical analysis and bacteriological

- Cytological (total and differential leucocytic count), using hemocytometer and microscopic method [15]. The fluid obtained in a tube containing an anticoagulant to avoid clotting.
- Biochemical: (total protein, LDH, glucose) using autoanalyzer.

- Bacteriological culture using aerobic and anaerobic standard blood culture bottles, brain-heart infusion broth, which were inoculated with 10 ml of ascitic fluid and incubated for 48 hours at 37℃ [16]. Identification of the isolated organism by gram stain, biochemical reaction (API system) and agglutination with specific antisera.

I send all samples to hospital laboratory.

2.3 Statistical Analysis

Data were checked, entered and analyzed using SPSS 14 for Windows. Data were expressed as mean ± SD for quantitative variable, number and percentage for qualitative one. Chi-squared (X^2) or t test and paired t test were used when appropriate. P<0.05 was considered significant.

3. RESULTS

Demographic data of both groups: Group I shows more males 53.8% than females 46.2% and their ages ranged from 27 to 73 years old. While group II shows more males 53.8% than females 46.2% and their ages ranged from 35 to 70 years old (Table 1). The decompensated cirrhotic patients 12.5% of decompensated cirrhotic patients have pleural effusion (Table 2). The majority of cases with pleural effusion have right side effusion (76.9%), while 15.4% have left side effusion and 7.7% on both sides. Of all; 23.1% have mild effusion amount, 46.1% and 30.8% have moderate and massive effusion amount respectively (Table 3). Cases with pleural effusion are more in patients who are Child C-(61.5%) and B-(38.5%); while, in group I patients in most cases are children C-(52.8%), (Table 4). There is no significant difference between the chemical and bacteriological analysis of ascitic and pleural fluids in group II patients (Tables 5, 6). However, there was a significant difference between the degree of pleural effusion and the degree of ascitic fluid (Table 7). In addition, (69.2%) of cases in group II show improving due to control of ascites (Table 8).

4. DISCUSSION

In this study; the frequency of hepatic hydrothorax in cirrhotic ascitic patients was 26/208 cases with a percentage of (12.5%). Hepatic hydrothorax is considered an uncommon complication of chronic liver disease. This result coincide with several studies reported that the occurring of pleural effusion ranged from 4 to 12.2% of patients with advanced cirrhosis [17,18].

Table 1. Demographic data of decompensated cirrhotic patients among the two groups

			Decompensated cirrhotic patients	
			Group I (n=182)	***Group II (n=26)***
Sex	*Male*	N, %	98 53.8%	14 61.5%
	Female	N, %	84 46.2%	12 42.3%
Age	mean±SD		53.7±7.18	54.5±6.84
	Range		27-73 ys	35-70 ys

Table 2. Frequency of cases of pleural effusion in decompensated cirrhotic patients

		n	**%**
Cases	Group II	26	12.5
	Group I	182	87.5
	Total	208	100

Table 3. Frequency of pleural effusion according to side and amount of effusion

		n	**%**
Side of pleural effusion	Right side	20	76.9
	Left side	4	15.4
	Bilateral	2	7.7
Amount of pleural effusion	mild	6	23.1
	Moderate	12	46.1
	Massive	8	30.8
Total		26	100.0

Table 4. Child classification of decompensated cirrhotic patient among the two groups

			Group I (n=182)	**Group II (n=26)**	**P**
Child classification	**B**	Count	86	10	0.153
		%	47.2%	38.5%	
	C	Count	96	16	
		%	52.8%	61.5%	
Total		Count	182	26	
		%	100.0%	100.0%	

Table 5. Chemical analysis of peritoneal fluid among the two groups

		Group I	Group II	P
		Mean ± SD	***Mean ± SD***	
Peritoneal fluid	TLC (cells/mm^3)	228.4±141.2	211.4±132.3	0.958
	Glucose (mg/dl)	130.3±56.9	115.0±62.4	0.073
	Protein (mg/dl)	1321.6±638.2	1251.9±700.8	0.085
	LDH (U/l)	143.1±123.4	137.7±83.3	0.146

Table 6. Degree of ascites in cases with pleural effusion

		Ascites degree			P
		Mild (n=5)	**Moderate (n=16)**	**Severe (n=5)**	
Pleural effusion	Mild (n=6)	1	3	2	0.022*
	Moderate (n=12)	1	8	3	
	Severe (n=8)	3	5	0	
Total number = (26)					

**p‹0.05 significant*

Table 7. Comparison between ascitic and pleural fluids in group II

	Ascitic fluid	Pleural fluid	P
	Mean ± SD	***Mean± SD***	
TLC(cells/mm^3)	211.4±132.3	209±121	0.987
Glucose(mg/dl)	115.0±62.4	129±40	0.081
Protein(mg/dl)	1251.9±700.8	1389±712	0.079
LDH(U/l)	137.7±83.3	137±67	0.993

Table 8. Frequency of pleural effusion improvement due to control of ascites

		Pleural effusion cases	
		n	***%***
Treatment	*Responder*	18	69.2%
	Non responder	8	30.8%
Total		**26**	**100%**

Also, this work showed (76.9%) of Hepatic hydrothorax patients had effusion on right side, (15.4%) on left side, and (7.7%) have bilateral Hepatic hydrothorax. So, this study shows that the majority of patients with hepatic hydrothorax have effusion on right side (76.9%). These results coincide with that reported by Strauss and Boyer [1] who reported incidences of hepatic hydrothoraxes (85.4%) right-sided, (12.5%) left-sided, and (2%) bilateral.

Also, this is in agreement with that reported by Lazaridis et al. [19] the right pleural effusion occur more common than the left pleural effusion in hepatic hydrothorax.

This study showed; (23.1%) of cases with Hepatic hydrothorax had mild effusion, (46.1%) had moderate effusion and (30.8%) had massive effusion. These results were in agreement with that reported by Dhanasekaran et al. [20] and Krok and Cárdenas [21].

In this work (23.1%) only of cases had mild effusion who had less symptoms and don't need admission and most of the cases were diagnosed accidentally when they were examined for other symptoms not related to chest symptoms. Most of cases had moderate effusion about (46.1%) who had more symptoms, which requires admission to hospital, (30.8%) had massive effusion that had severe chest symptoms. They needed aggressive treatment by salt restriction, full dose of diuretics, albumin transfusion or even thoracentesis so converted to moderate effusion. The patients cannot sustain massive pleural effusion for long time [22].

This study showed that the cases with Hepatic hydrothorax were more in Child (C) 61.5% than child (B) 38.5%. This agrees with study of Roussos et al. [13] who reported that a majority of patients with hepatic hydrothorax have advanced liver disease and may be potential candidates for orthotopic liver transplantation.

In this work hepatic hydrothorax is represented by signs and symptoms of end stage liver diseases (cirrhosis) in additional to chest manifestation. This study showed a highly significant increase in incidence of dyspnea in Hepatic hydrothorax cases, about (78.8%) of cases in group II suffer from dyspnea in spite of about (27.5%) only of cases in group I suffer from dyspnea which mainly occur in tense ascites. This agrees with several studies which

reported that dyspnea is the most common symptom of Hepatic hydrothorax. As the effusion grows larger with more fluid, the harder it is for the lung to expand and the more difficult for the patient to breathe [20,23].

Additional to presence of dyspnea, there is other chest symptoms related to hydrothorax such as dry cough which was reported in (84.6%) of cases and chest pain (15.4%) both occur due to irritation of pleural lining by fluid. The chest pain is usually described as pleuritic. These results are in concordance with these reported by Rossle and Grebes' [22] who reported dyspnea in (75%) of cases, dry cough in (82.5%) and chest pain in (14.3%).

This study showed that, there was highly significant difference in size of abdominal enlargement between the two groups; (28.8%) only of cases in group II have mild ascites. Cases with mild ascites were asymptomatic, and don't need to be admitted or even have no chest symptoms to be admitted to chest department.

The study showed that (61.5%) had moderate ascites and (9.6%) only had massive ascites. these were in concomitant with that reported by Abd-El-Sattar [24]. There is significant difference of LL edema between two groups. Group I has (88.7%) LL edema and group II had (75.0%) LL edema. The patients with Hepatic hydrothorax were more interested to take diuretics and do salt restriction to avoid chest manifestation especially dyspnea which increase by increasing amount of effusion and this control LL edema.

This study showed that there was no significance relation between development of abdominal hernia and development of pleural effusion; (49.0%) of cases in group I have abdominal hernia and (50.0%) of cases in group II have abdominal hernia. This indicates that the development of Hepatic hydrothorax does not depend on pressure or amount of ascites. These results are similar to that reported by Assouad et al. [17].

A diagnostic thoracentesis was performed in all patients with suspected hepatic hydrothorax to confirm diagnosis and exclude the infection. In this study the chemical analysis of pleural fluid shows TLC (209±121) cells/mm^3, glucose (129±40) mg/dl, total protein (1389±712) mg/dL, and LDH (137±67) U/l. So, all cases showed transudate Hepatic hydrothorax, this is agreed with studies of [20] which reported that pleural effusions of cirrhotic patients are always transudative. Polymorph nuclear cells count is less than 250 cells/mm^3, total protein less than 2.5 g/dL, pleural fluid total protein/serum total protein ratio less than 0.5, and pleural fluid lactate dehydrogenase/serum lactate dehydrogenase less than 0.6.

In this work, physical, chemical and bacteriological analysis of ascitic and pleural fluid is similar, all cases were transudates, and these results are in concordance with that reported by Lazaridis et al. [19] this may be due to movement of peritoneal fluid into the pleural space via diaphragmatic defects.

There was a significant difference between the degree of Hepatic hydrothorax and the degree of ascetic fluid. This study showed that the amount of Hepatic hydrothorax does not depend on amount of ascites. Some cases with mild ascites have massive pleural effusion and vice versa. This is consistent with studies of Singer et al. and Umino et al. [25,26] which reported that hepatic hydrothorax may occur with absence of ascites. It might be caused by a rapid transdiaphragmatic movement of fluid from the peritoneal cavity to the pleural cavity prior to the formation of ascites.

This study showed that (69.2%) of cases with pleural effusion were improved due to control of ascites by salt restriction, diuretics, and albumin transfusion and paracentesis. Because hepatic hydrothorax and ascites share the same pathophysiological mechanisms, hepatic hydrothorax is ascitic fluid that has entered the pleural cavity. So, the principles of medical management of hepatic hydrothorax are identical to those of ascites in cirrhotic patients [9].

This study showed that (30.8%) of cases with Hepatic hydrothorax did not show any improvement in spite of control of ascites. When patients with persistent hydrothorax despite fluid and sodium restriction and use of maximal tolerable doses of diuretics are considered to have refractory hydrothorax so, I recommend more invasive therapeutic modalities should be considered.

5. CONCLUSION

- Hepatic hydrothorax is an uncommon complication of advanced liver disease. In this study; the frequency of pleural effusion in cirrhotic ascitic patients was (12.5%), the majority of patients with hepatic hydrothorax were in child (C) 63.5%.

- The patients with hepatic hydrothorax have mainly effusion on right side (76.9%), and only (13.5%) on left side and (9.6%) have bilateral pleural effusion.
- In most cases, dominating clinical manifestations are these cirrhosis and ascites. However, a variety of respiratory symptoms including, dyspnea, non-productive cough and pleural chest pain were seen.
- A diagnostic thoracentesis must be performed to all patients with suspected hepatic hydrothorax to confirm diagnosis (hepatic hydrothorax is always trasudate) and exclude the infection.

ETHICAL APPROVAL

The protocol of the study was approved by the ethical committee of Faculty of Medicine, Zagazig University. Informed consents were obtained from all patients.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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