Recurrent Pleural Effusion Complicating Liver Cirrhosis

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Background. **Pleural effusion (PE) is a rare complication of advanced liver cirrhosis, which may lead to an operation when uncontrolled. The purpose of this study was to evaluate the modality of the occurrence of pleural effusion and to describe its surgical management.**

Methods. **We studied 21 patients who were referred to the department of thoracic surgery because of massive and recurrent PE caused by liver cirrhosis. The PE was a transudate in 16 patients and an exudate in 5. Talc pleurodesis was attempted in all patients. The patients were divided into two groups. Video assisted thoracoscopy was performed in 13 patients in whom the clinical condition permitted general anesthesia; the pleural cavity was entirely explored before pleurodesis (group 1). Chest tube drainage alone was performed in 8 patients who were unable to undergo general anesthesia; talc pleurodesis was performed through the chest tube in these patients (group 2).**

Results. **In group 1 the PE was right-sided in 8 patients, left-sided in 3, and bilateral in 2. Diaphragmatic defects were observed in 2 patients, and a fluid leak oozing from the diaphragm was observed in 1 patient. Ten patients were considered cured and were without recurrence. Two patients underwent late recurrence before dying from their liver cirrhosis. Only 1 patient had an early recurrence that was cured by complementary talc slurry. In group 2 all patients presented with a right PE; of these, 3 patients died from septic shock caused by pleural infection. Three patients underwent early recurrence but were cured after repeat talc slurry. One patient had a midterm recurrence. One patient had an early recurrence treated by intrahepatic porto-systemic shunt with partial improvement.**

Conclusions. **Passage of ascites through diaphragmatic defects appears to be the main cause of PE complicating cirrhosis. Patients may benefit from talc pleurodesis. Video assisted thoracoscopy pleurodesis is the technique of choice with consistent results. Repeated talc injection through the drain may prove useful for patients in poor clinical status.**

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The occurrence of pleural effusion in cirrhotic patients is rare, with all causes being possible. Nevertheless, the incidence of pleural effusion ranges from 4% to 6% and may reach up to 10% [1] in cases of advanced cirrhotic disease. The majority of these late effusions represent a real complication of liver decompensation and are commonly referred to as hepatic or cirrhotic hydrothorax. The diagnosis and management of these cirrhotic pleural effusions are usually under the responsibility of medical departments. However, when the cause is uncertain or in cases of severely massive and recurrent effusions, patients are referred to thoracic surgeons. The purpose of this study was to review all patients with hepatic hydrothorax referred to our department and to discuss the cause and treatment of the disease.

Patients and Methods

Between September 1989 and August 2001, 32 cirrhotic patients suffering from pleural effusion were transferred to the department of thoracic surgery. No patient suffered from cardiac or renal disease. Eleven cases not corresponding to cirrhotic hydrothorax were excluded from our study; of these, 4 presented with exudative effusion caused by inflammatory disease, 3 suffered from pleural carcinosis, 1 suffered from a hepatoma invading the diaphragm, 1 presented with a tuberculosis effusion, 1 presented with a pericardial effusion and tamponade caused by generalized anasarca (both the pericardial and bilateral pleural effusions were drained), and 1 patient presented with a right pleural effusion after liver transplantation. The remaining 21 patients formed the core of our study. All patients presented with massive and recurrent pleural effusions (Table 1) complicating late stage liver cirrhosis. Patients included 12 females and 9 males, ranging from 42 to 75 years (mean, 59.7 $\pm$ 9.9 years). The origin of liver cirrhosis was alcoholic in 10 patients, post-hepatitis in 7 patients, primary biliary cirrhosis in 2 patients, hemochromatosis in 1 patient, and Osler syndrome in 1 patient.

Seven patients were classified as CHILDS B and 14

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Table 1. Mean Characteristics of Pleural Effusion and Results of Talc Pleurodesis

	Video Assisted Thoracic Operative Pleurodesis Group 1 (n = 13)	Chest Tube Drain Group 2 (n = 8)
Mean number of evacuations	11.5	12
Range	1–24	3–20
Location of pleural effusion		
Right	8	8
Bilateral	2	···
Left	3	···
Type of pleural effusion		
Exudate with ascites	5	2
Exudate without ascites	1	···
Transudate with ascites	2	6
Transudate without ascites	5	···
Duration of drainage after talc pleurodesis		
Mean (y)	5.8	9.8
Range	2–15[a]	1–42
Results of talc pleurodesis		
Successful pleurodesis	10	3[b]
Early recurrence cured by iterative talc slurry	1	3
Midterm and late recurrence	2	1
Failure	···	1[c]

[a] One patient underwent iterative drainages for 36 days; [b] The 3 patients died from septic shock; [c] Treated by transjugular intrahepatic portosystemic shunt.

patients as CHILDS C [2]. The effusion was associated with frank ascites in 13 patients. According to Light's criteria [3], the effusion was transudative in 16 cases and exudative in 5 patients (Table 1). All patients were drained before talc pleurodesis.

Patients were divided into 2 groups. Group 1 consisted of 13 patients in satisfactory clinical condition whose talc pleurodesis was performed under general anesthesia by means of a video assisted thoracic operation. The pleural cavity was inspected and biopsied, and the diaphragm was examined for the presence of a defect. Pleurodesis was performed using sterile talc aerosol of asbestos free talc obtained from Luzenac (Steritalc, Novatech SA, Plan de Grasse, France). Two talc aerosols, each containing 3 g of talc, were administered to each patient. Group 2 consisted of 8 patients in poor general condition or with liver disease contraindicating general anesthesia and operation. In this latter group pleurodesis was performed by injecting talc particles directly through a pleural drain (talc slurry). A small (16 French or 18 French) intercostal drain (Monaldi, Porges, France) was inserted and attached to a water seal with suction. When chest radiograph showed no residual effusion, 4 to 8 g of asbestos-free talc from Luzenac (Steritalc) were suspended in 20 mL of saline solution (0.9%) with 20 mL of 1% lidocaine and injected through the drain into the pleural space. An additional 20 mL of saline solution was used to flush the drain. The drain was then clamped for 3 hours and suction was applied. The drain was removed when the effusion was less than 100 mL per day.

Results

Among the patients in group 1 (n = 13), a continuous fluid leak was observed oozing from the diaphragm in 1 patient and diaphragmatic defects were observed in 2 patients (1 associated with ascites). In 2 patients, the pleural effusion was bilateral but greater on the right side and only a right pleurodesis was performed. Patient follow-up (Table 1) ranged from 2 to 127 months (mean, 29 ± 31 months). Six 6 patients died from their liver disease without recurrence at 5, 11, 17, 20, 28, and 38 months, and 2 patients had late recurrence. One patient had early recurrence, received complementary talc slurry through a new drain, and was recurrence free at 28 months.

Among the patients in group 2 (n = 8), all presented with decompensated liver cirrhosis, and 5 patients had associated medical diseases (ie, pancytopenia with vertebral osteomyelitis, pyelonephritis, cerebral stroke, acquired immunodeficiency syndrome with multiple infections, and portal vein thrombosis. Three patients died from septic shock caused by pleural infection between 30 and 42 days. Three patients suffered from early recurrence (Table 1) and received iterative talc slurry successfully (2 are still alive, 1of whom underwent a liver transplantation, and 1 died from hepatic encephalopathy 6 months later. One patient suffered from midterm recurrence at 3 months (Table 1). One patient with recurrent effusion was treated by transjugular intrahepatic postsystemic shunt with partial improvement and is currently receiving chemotherapy for an hepatocarcinoma.

Comment

Etiology of Pleural Effusion

Since the first description of pleural effusion in cirrhotic patients by Laennec [1] many theories have attempted to explain the mechanism of formation of this effusion [1], the most common accepted passage being an ascitic transudate through diaphragmatic defects [1, 4].

EXUDATE VERSUS TRANSUDATE. Eight patients in our study presented with a pleural exudate. Ackerman and Reynolds [5] observed that subclinical secondary infections may explain differences in the protein levels between ascitic and pleural fluid. These authors believe that biochemical criteria are insufficient in comparing exudate and transudate effusion and must be correlated to clinical and radiologic criteria. In fact, it is not rare to find pleural effusions change their chemical constitution during the course of their evolution. This may explain the findings in our study.

PRESENCE OF ASCITIC FLUID. In our study, ascites were present in only 13 patients. However the absence of ascites is not contradictory. Singer and colleagues [6]

observed the absence of ascites in the postmortem study of 6 patients. McKay and colleagues [7] noticed minimal ascitic fluid in 3 patients. Kakizaki and colleagues [8] reported 27 patients with hepatic hydrothorax without ascites. Hartz and colleagues [9] and Rubinstein and colleagues [10] reported that ascites appeared after surgical treatment of pleural effusion, thus indicating that hydrothorax may be equivalent to ascites with ascites being directly drained into the pleural cavity through diaphramatic defects and reappearing after pleurodesis.

PRESENCE OF DIAPHRAGMATIC DEFECTS. These were observed in postmortem studies [6, 11] through thoracotomy [9] and with pleuroscopy [12, 13]. We observed diaphragmatic defects on only two occasions in our study. In fact, these communications may be difficult to locate and may be in the form of blebs [4]. Many blebs were found to be associated with diaphragmatic defects [14]. At times these communications remain unidentifiable and may be microscopic. Various authors have described microscopic defects by injecting dye into the peritoneum, which was then seen by pleuroscopy [10, 12]. In one of our observations we found a continuous fluid leak from the diaphragm, which may indicate a porous diaphragm. Transdiaphragmatic passage of fluid has been demonstrated by nuclear medicine [11, 15], which in the future may become an important diagnostic tool in the diagnosis of hepatic hydrothorax [10, 16–17].

THE PLEURAL EFFUSION IS USUALLY LOCATED ON THE RIGHT SIDE. However, we noticed bilateral (n = 2) and left-sided effusions (n = 3). In patients with bilateral effusions, right-sided effusions were greater and pleurodesis was performed only on the right. In 48 reported patients in the literature, Strauss and Boyer [18] found 12.5% of left-sided effusions and 2% of bilateral effusions. Mirouze and colleagues [19] suggest searching for other causes in cases of left-sided effusions. In our study, investigations and patient follow-up never demonstrated other causes. The higher rate of right-sided effusions may be explained by the physiologic flux of peritoneal fluid toward the right. According to Forster and colleagues [20], the fluid trickles from the pelvis to the right paracolic fold and then to the right infraphrenic space. This phenomenon is at the origin of the genitophrenic syndrome reported by Demons-Meigs [21]. Nevertheless it is difficult to explain a unilateral right-sided pleural effusion, even in patients with massive ascites. This may be due to a higher rate of right diaphragmatic defects probably of congenital origin as advocated by Strauss and Boyer [18], or due to a mechanical origin as advocated by Kirschner [21].

Management

Medical treatment is first indicated to reduce ascites and edema. Surgical treatment is indicated only in patients with medical treatment failure. In fact, repeated and massive effusions threaten patients' lives caused by the respiratory insufficiency they induce. Pleurodesis remains the surgical treatment of choice.

In the past, pleurodesis was performed by injecting tetracycline through the drain. The first case reported was a failure [6], and later results proved most often insufficient. LeVeen and colleagues [16] associated tetracycline pleurodesis with peritoneal-venous shunt in order to avoid recurrence of intraperitoneal ascites. Recently, tetracycline was replaced with talc powder; the first successful case was reported in 1994 [22]. In group 2 we used this technique by injecting talc through the intrathoracic drain. Injections may be repeated, which increases the success rate but simultaneously increases the risk of infection. This technique provides a simple solution for patients in poor general condition to be able to undergo general anesthesia and an operation.

Surgical techniques under general anesthesia permit the inspection and biopsy of the pleura and the search for diaphragmatic defects. Pleurectomy by thoracotomy [9] is only rarely performed and preference is now given to video thoracoscopic assisted operations. In our series, 13 patients who had video assisted thoracoscopic operations resulted in only one early failure and two late recurrences (a 77% success rate). The commonly reported success rate is 47.6% [23]. When diaphragmatic defects can be sutured, this rate may increase to 100% [12]. In our experience, good results are obtained even without diaphragm suturing. We strongly recommend video assisted thoracoscopy in all patients whose general condition permits an operation.

It has been proposed that pleural effusion in cirrhotic patients being caused by high hepatic sinusoidal pressure should have an intrahepatic portocaval anastomosis by metallic stent under fluoroscopy guidance (transjugular intrahepatic portosystemic shunt) performed [24–26]. Complete or partial success rates range from 58% [24–25] to 82% [26], but the risks are not negligible such as encephalopathy, thrombosis, and a high mortality rate during the first weeks [24–25]. Transjugular intrahepatic postsystemic shunt appears more suitable in young patients less than 60 years of age and waiting for liver transplantation. Transjugular intrahepatic postsystemic shunt was performed in 1 patient of our series after pleurodesis failure but without marked improvement.

In summary, patients suffering from hepatic hydrothorax may benefit from talc pleurodesis. Video assisted thoracic operative pleurodesis is the technique of choice having the most consistent results. Results may be improved when diaphragmatic defects are identified and sutured. In patients with advanced complicated cirrhosis and poor general condition, repeated talc injections through the thoracic drain may be of benefit.

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