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Case Report

Isolated chylous injury due to blunt abdominal trauma: Report of a case and a review of the literature

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ABSTRACT

The chyle duct (CD) lies close to the spine behind the right renal vein and vena cava. Forces capable of tearing the CD may also injure other adjacent structures or organs. Cases of isolated chylous injury are rarely reported in the literature. Our aim was to report a case of isolated chylous injury due to blunt abdominal trauma that was successfully treated non-operatively. A 54-year-old man was involved in a deceleration-type traffic accident. His physical examinations, radiologic evaluations, paracentesis, and laboratory findings revealed isolated chylous injury resulting from intra- and retroperitoneal chylous fluid collection. The patient was treated via percutaneous drainage and medical therapy. This condition is generally self-limited and resolves without the necessity of any surgical interventions. However, if medical treatment is unsuccessful, the decision of diagnostic laparoscopy or exploratory laparotomy becomes inevitable.

Keywords: Abdominal trauma, chylous ascites, chyloretroperitoneum

INTRODUCTION

The cisterna chyli is an important structure because it receives the lymphatic drainage from the intestinal trunk, the right and left lumbar lymphatic trunks, and small lymph vessels that descend from the lower part of the thorax. Injury to the cisterna chyli is rare and eventful. It may manifest with chylous ascites and chyloretroperitoneum (1, 2).

Chylous ascites is the accumulation of a milk-like peritoneal fluid that is rich in triglycerides, due to the presence of thoracic or intestinal lymph in the abdominal cavity. It develops when there is a disruption of the lymphatic system due to traumatic injury or obstruction (from benign or malignant causes) (3).

Many pathological conditions can result in chylous ascites. These conditions include congenital defects of the lymphatic system; nonspecific bacterial, parasitic, and tuberculous peritoneal infections; liver cirrhosis; malignant neoplasm; surgical injury; and blunt abdominal trauma. However, the most common cause in adults is believed to be abdominal malignancy, while congenital lymphatic abnormalities is the most common cause in the pediatric population. The incidence of chylous ascites seems to be increasing because of more aggressive thoracic and retroperitoneal surgeries and with the prolonged survival of patients with cancer (4). Examples for surgical procedures that may be associated with chylous ascites are abdominal aortic aneurysm repair, retroperitoneal lymph node dissection, pancreaticoduodenectomy, liver transplantation, catheter placement for peritoneal dialysis, distal splenorenal shunt, inferior vena cava resection, and laparoscopic Nissen fundoplication (3).

Progressive and painless abdominal distention is the major clinical manifestation of chylous ascites, which occurs over the course of weeks to months, depending upon the underlying cause. Acute onset of symptoms may be observed in patients who have undergone either an abdominal or thoracic surgical intervention or had a major traumatic injury.

Blunt abdominal trauma resulting in intestinal and mesenteric injury is also another important cause of chylous ascites (1). However, cases of chylous injury without any affected adjacent structure or organs after blunt abdominal trauma are rarely reported in the literature.

We herein report a case of isolated chylous rupture due to blunt abdominal trauma with manifestations of both chylous ascites and chyloretroperitoneum.

CASE PRESENTATION

A 54-year-old man was involved in a deceleration-type traffic accident when he was in the passenger seat of an automobile with his seat belt strapped on. The patient was admitted to our emergency department (ED) 3 days after the accident with complaints of abdominal pain, nausea, and vomiting. He had no systemic diseases, but his past history revealed a right hemicolectomy and adjuvant chemotherapy 16 years ago due to right-sided colon cancer.

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On physical examination, the patient was hemodynamically stable, and he had a painful abdominal distension at the epigastric region. Except for this finding, his abdomen was soft with very mild tenderness to palpation over the rest of the entire abdomen. There was no rebound tenderness. Bowel sounds were active. Digital rectal examination showed no abnormal findings. Blood urea nitrogen (BUN), electrolytes, and amylase levels were normal as well as his complete blood count. Abdominal X-ray findings were normal. In addition, other routine radiographs revealed no bony injuries. A signed informed consent was obtained from the patient, and he was hospitalized for further evaluation and treatment.

We performed an ultrasound scan to identify the epigastric distension of the abdomen. A major retroperitoneal fluid accumulation of 6 × 6 × 4 cm on the right side, inferior, and medially to the pancreas was demonstrated ultrasonographically, and free intraperitoneal fluid was also detected in the pelvic region. A pancreatico-duodenal injury was suspected according to these initial findings.

The patient underwent a contrast-enhanced computed tomography (CT) scan of his abdomen. The CT scan showed an irregular, extensive, hypodense retroperitoneal fluid collection with dimensions of 9 × 7 × 6 cm on the right side, inferior, and medially to the pancreas at the level of the second lumbar vertebra (Figure 1). In addition, there were small hypodense fluid collections in the Morrison's pouch, the perisplenic and perihepatic regions, and the rectovesical recess with a density similar to water (Figures 2, 3). However, no findings of any solid or luminal organ injuries were detected.

According to the radiological findings, a diagnostic paracentesis was performed which revealed a white-milky, odorless fluid with a density of 1.030. The findings revealed the following values: sodium, 139 mEq/L; potassium, 3.6 mEq/L; total protein, 3.4 g/dL; glucose, 96 mg/dL; amylase, 21 IU/L; lipase, 8 IU/L; triglycerides, 772 mg/dL; and cholesterol, 86 mg/dL. The concurrent standard blood tests were at normal levels. The Gram staining and bacterial cultures were found to be negative. As a result, the collected fluid was experimentally confirmed to have a chylous character.

The initial volume of the drainage was 600 mL at the time of paracentesis. A catheter was left in the abdominal cavity and the drainage continued with a flow of approximately 200 mL/day. The patient was treated non-operatively with intravenous fluids and analgesia. Total parenteral nutrition (TPN) and intravenous administration of somatostatin at a dose of 6 mg/day via an infusion pump was started the day after the intervention. On the third day, the volume of the drainage was 100 mL/day. Low-fat diet with a restriction of long-chain triglycerides was started on the fourth day.

With intensive treatment, the drainage steadily decreased and stopped by the 10th day. The abdomen was found to be normal on physical examination, and no signs of chylous ascites were found on ultrasonography images. The drainage tube was removed, and the patient was discharged on the 13th day uneventfully.

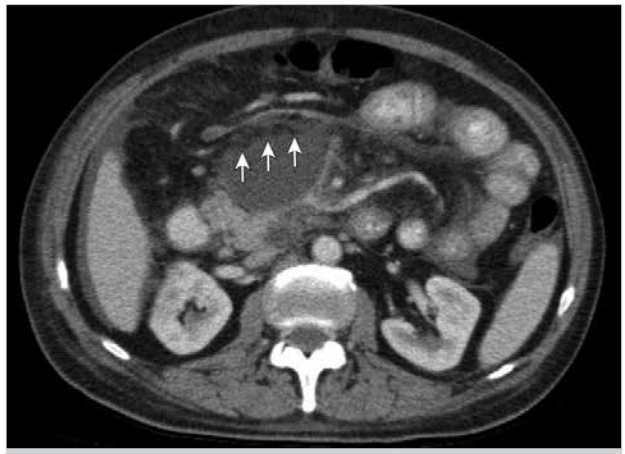

Figure 1. Computed tomography image of the irregular, extensive, hypodense retroperitoneal fluid collection, with dimensions of 9 × 7 × 6 cm also revealing a thin fat-fluid level marked by the arrows

Figure 2. Computed tomography image of the small, hypodense fluid collections in the Morrison's pouch and the perisplenic and perihepatic regions

Figure 3. Computed tomography image of the fluid collection in the rectovesical recess

He was followed-up at office visits on the 15th and 30th days of the initial intervention, and a control examination was also scheduled for the third month of the event. He did not have any complaints in these short-term follow-ups, and no abnormal findings were detected on his physical examinations.

DISCUSSION

The lymphatic system is an accessory route by which fluids, proteins, and lipids can flow from the interstitial spaces to the vascular system. Almost all tissues of the body have lymphatic channels composed of one-way valves that drain the excess fluid from the interstitial spaces of tissues. Lymph from the lower part of the body drains into the thoracic duct. This duct arises from the cisterna chyli, which lies between the aorta and the inferior vena cava anterior to the bodies of the first and second lumbar vertebrae. The thoracic duct passes through the aortic hiatus of the diaphragm to enter the posterior mediastinum. It continues between the aorta and azygous vein until it reaches the fifth thoracic vertebrae. At this point, it crosses to the left to enter the superior mediastinum behind the aortic arch and empties into the venous system at the junction of the internal jugular vein and subclavian vein (3).

Chylous ascites is an uncommon finding with a reported incidence of approximately 1 in 20000 admissions at a large university-based hospital over a 20-year period (3). Traumatic chyloperitoneum is a rare injury. Forces capable of tearing the cisterna chyli or the thoracic duct will generally also injure other structures such as the liver, duodenum, kidney, and pancreas (5). As far as we could extract from the literature, up to 10 cases have been reported describing isolated traumatic chylous injury causing either intra- or retroperitoneal fluid collection. The patient that we herein report was a case with an isolated chylous rupture due to blunt abdominal trauma presenting with both chylous ascites and chyloretroperitoneum without any other concomitant organ injuries.

A detailed history should be obtained and a careful physical examination should be performed, similar to that in any patient presenting with acute onset ascites. The patient should be questioned regarding weight loss or gain, symptoms of malignancy, family history, underlying liver or kidney disease, travel, recent abdominal surgery, and abdominal trauma (3). In our patient, blunt abdominal trauma, which took place 3 days before his admission to our emergency service, was the cause of chylous ascites and chyloretroperitoneum.

Chylous leak after non-penetrating trauma, which constitutes the pathogenesis of traumatic chylous ascites, is generally attributed to hyperflexion-extension of the vertebral column with shearing of tethered lymphatics. Alternatively, sudden compression of the lipemic and engorged mesenteric lymphatics, adjacent nodes, and lower thoracic duct aggravated by deformations associated with stretching and tearing motions may also directly disrupt chyle containing lymphatics (6). The car accident of the deceleration type or the presence of the seat belt may have affected the vertebral column of our patient, and hyperextension followed by hyperflexion may be the reason of the chylous injury.

It is important to remember that chyle leaks slowly into the peritoneal cavity through lymphatic fistulas or by back-pressure on the intestinal lymphatics, and significant quantities of chylous ascites may take some time to accumulate (5). In our case, the patient emphasized that he was well until the second day after the accident. He remarked that all his symptoms started on the second day of the event after dinner when he had eaten fried lamb chops, which was a fatty meal.

Radiation therapy to the abdomen causes fibrosis and obstruction of the lymphatic vessels in the small bowel and mesentery (7). According to the surgical history of our patient, although there was an adjuvant chemotherapy anamnesis following right hemicolectomy due to right-sided colon cancer, he did not reveal a past history of any kind of radiation therapy.

There are several diagnostic modalities available. Particularly, CT scanning makes the diagnosis easier because it enables identifying pathologic intra-abdominal lymph nodes, masses, and solid and luminal organs, and it also helps in determining the extent and localization of the fluid. In chylous ascites and chyloretroperitoneum the CT reveals a collection of fluid with a similar density to water and ascites (5). If the patient lies in a supine position for an extended period, he may show a fat-fluid level, which is pathognomonic for this condition (8). When we performed the CT scan for our patient, we visualized the presence of an extensive hypodense retroperitoneal fluid collection, which contained a thin layer of patchy images of the intensity of floating fat, thus forming a fat-fluid level (Figure 1). In addition, there were small hypodense fluid collections in the Morrison's pouch, the perisplenic and perihepatic regions, and the rectovesical recess (Figure 2, 3). However, no other findings of any concomitant solid or luminal organ injuries were detected. We confirmed the diagnoses of both chylous ascites and chyloretroperitoneum based on the CT scan which guided our treatment approach.

Abdominal paracentesis is generally the most important diagnostic tool in evaluating and managing patients with ascites, and this issue is valid for chylous ascites as well. Typically, chyle has a cloudy and turbid appearance, in contrast to the straw-colored and transparent appearance of ascites caused by cirrhosis or portal hypertension. Ascitic fluid should be sent for the analysis of the cell count and culture; Gram staining; total protein concentration; albumin, glucose, LDH, amylase, and triglyceride levels; and cytology. The total protein content in chylous ascites varies depending on the underlying cause and ranges between 2.5 and 7.0 g/dL (3). The triglyceride levels in the ascitic fluid are critical in defining chylous ascites. Triglyceride values are typically found to be above 200 mg/dL, although some authors use a cut-off value of 110 mg/dL (9). We performed an abdominal paracentesis on our patient and obtained a white milky, odorless fluid with a density of 1.030. The findings revealed the following values: sodium, 139 mEq/L; potassium, 3.6 mEq/L; total protein, 3.4 g/dL; glucose, 96 mg/dL; amylase, 21 IU/L; lipase, 8 IU/L; and cholesterol, 86 mg/dL. The concurrent standard blood tests were at normal levels. The Gram staining and bacterial cultures were negative. The triglyceride level was 772 mg/dL in our case, which constituted the most valuable diagnostic parameter. At the same time, the color of the fluid, and the total protein, cholesterol, glucose, and amylase values were all proper for defining chylous ascites.

Lymphangiography is an imaging modality for investigating chyluria, chyloperitoneum, and chylothorax. It is useful for detecting abnormal retroperitoneal lymph nodes, leakage from dilated lymphatics, lymphoperitoneal and lymphaticopelvic fistulization, skipping of lymphatic chain, patency of thoracic duct, and abnormal leg lymphatics. However, it requires tedious cannulation of lymphatics. It can also result in local tis-

sue necrosis, fat embolism to the lungs, hypersensitivity reaction, and exacerbation of lymphedema by the contrast material (10). Lymphoscintigraphy can be performed to acquire information about the localization of the injury using ^{99m}Tc sulfurmicrocolloid, antimony sulfide colloid, stannous phytate, rhenium sulfur colloid, human serum albumin, or dextran. It delineates the pattern of lymphatic drainage, is fast and non-traumatic, and does not have major side-effects (6, 10). However, these tests are invasive and are often deferred until other modalities fail. Because we already succeeded in the diagnosis and treatment of our patient, there was no necessity to perform either lymphangiography or lymphoscintigraphy.

Somatostatin or octreotide have been used successfully to treat chylous effusions in patients with the yellow nail syndrome and lymphatic leakage due to abdominal and thoracic surgery (3). The exact mechanisms of somatostatin on drying lymphatic fistulas are not completely understood. It has been previously shown to decrease the intestinal absorption of fats, lower triglyceride concentration in the thoracic duct, and attenuate lymph flow in the major lymphatic channels. In addition, it also decreases gastric, pancreatic, and intestinal secretions; inhibits motor activity of the intestine; slows the process of intestinal absorption; and decreases splanchnic blood flow, which may further contribute to decreased lymph production. Total parenteral nutrition allows the bowel to rest and decreases the production and flow of the lymph. Somatostatin along with TPN can close the lymphatic leakage or relieve the symptoms effectively and rapidly compared with that of conventional regimens (4). We simultaneously started TPN and administered somatostatin at a dose of 6 mg/day via an infusion pump and observed that the drainage decreased by the second day of the treatment.

In cases of chylous injury, a high-protein and low-fat diet with medium-chain triglycerides (MCT) is the best dietary choice (4). Dietary restriction of long-chain triglycerides (LCT) avoids their conversion into monoglycerides and free fatty acids (FFA), which are transported as chylomicrons to the intestinal lymph ducts. In contrast, MCTs are absorbed directly into intestinal cells and transported as FFA and glycerol directly to the liver via the portal vein. Thus, a low-fat diet with MCT supplementation reduces the production and flow of the chyle (3). We preferred a low-fat diet with MCT for our patient as well, and the amount of chyle decreased dramatically.

In patients with chyloperitoneum, if ascites does not respond to conservative management in 2 weeks, surgical exploration should be performed (2). When surgical treatment is indicated, exploratory laparotomy necessitates a formal exploration to rule out any concomitant injuries of the intraabdominal organ or structures. The surgeon must carefully inspect the mesenterium, beneath the diaphragm, around the aorta and pancreas. Maurer et al. (1) reported that if the retroperitoneum is intact and retroperitoneal space is found to be bulging from the mesenteric root to the bifurcation of the aorta with a cream-like fluid collection without the presence of any chylous ascites intraoperatively, it is not recommended to open the retroperitoneum to avoid the formation of chylous ascites and to maintain the retroperitoneal compression. However, if chylous ascites and retroperitoneal rupture is present at laparotomy, the retroperitoneal space should be explored and the ruptured lymphatics must be ligated to stop chyle leakage. Patten et al. reported two cases of isolated traumatic chylous injury, both of whom were surgically treated via retroperitoneal dissection and the ligation of the ruptured cisterna chyli (5). Because the chyle drainage stopped by the 10th day, our patient was considered to be successfully treated non-operatively. Following his control imaging studies and examinations, the drainage tube was removed and he was discharged on the 13th day and was followed-up at office visits.

CONCLUSION

A detailed history and a thorough physical examination accompanied with appropriate imaging modalities and paracentesis are the most important points in the diagnosis and treatment of chylous injury due to blunt abdominal trauma. The condition is generally self-limited and resolves without the necessity of any surgical interventions. However, if the dietary management and medical treatment is unsuccessful, the decision of diagnostic laparoscopy or exploratory laparotomy becomes inevitable.

Informed Consent: Written informed consent was obtained from patient who participated in this case.

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