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Chylous injury following anterior spinal surgery: case reports

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Abstract Chylous leakage is an unusual complication following anterior spinal surgery. This leakage can occur as a result of traumatic injury to the thoracic duct, the cisterna chyli, or the retroperitoneal lymphatic vessels. The authors present case reports of three patients who underwent anterior spinal surgical procedures in-

advertently complicated by an injury to the lymphatic system. All patients were managed nonoperatively with tube drainage and hyperalimentation and had uneventful recoveries.

Key words Chylothorax · Chyloretroperitoneum · Anterior spinal surgery

Introduction

Despite the close proximity of the thoracic duct and the cisterna chyli to the vertebral column, chylothorax or chyloretroperitoneum after an anterior spinal surgery is not a commonly recognized complication. Postoperative chylothorax is rare, with the majority of cases following cardiovascular or esophageal surgery [3]. However, intraoperative injury to the lymphatic system may be more common than reported, as it is difficult to detect the draining chyle mixed with hematoma in the immediate postoperative period [9].

Case reports

Case 1

A 14-year-old girl presented with a progressive idiopathic thoracolumbar scoliosis. Using a combined anterior transthoracic and retroperitoneal approach, correction was attempted using the anterior TSRH instrumentation system. The T11–L1 curve was corrected from 45° to 21°. She had an uneventful immediate postoperative period, and the chest tube was removed on the 8th day. On the same day the retroperitoneal drain began draining a milky white fluid at the rate of 50–100 cc every 8 h. The patient was put on a low-fat, high-protein diet, and the drainage gradually declined, completely stopping after 6 more days. No recurrence was observed at follow-up.

Case 2

A 64-year-old woman presented with low back pain of long duration with radiation to the right lower limb. Five previous lumbar spinal surgeries had given no relief from her symptoms. She underwent a laminectomy (L2–L3) with wide decompression (L2–S1), TSRH posterior instrumentation (L2–S1), and spondylolisthesis reduction (L2–L3 and L3–L4). Two weeks later an anterior lumbar interbody fusion from L2–S1 was performed. On a routine follow-up 2 weeks after the second operation, she presented with pain and fullness in left upper and lower abdominal quadrants. CT scan showed a large fluid accumulation in the retroperitoneal space with an associated left pleural effusion (Fig. 1). Diagnostic thoracentesis and left lower quadrant drainage recovered an opaque, odorless fluid that did not clot on standing. Cytologic analysis demonstrated a dominance of lymphocytes with a few histiocytes and neutrophils. No growth was obtained on culture. Two days later, the drainage tube left behind in the retroperitoneal space demonstrated decreased drainage, but a repeat CT scan performed 10 days after the initial drainage procedure showed reaccumulation of the retroperitoneal fluid (Fig. 2). Repeat drainage yielded approximately 2000 cc serosanguinous fluid. The indwelling drainage tube had a high output for the next 3 days, which gradually subsided 6 weeks after the second spinal surgery. The tube draining the retroperitoneal space was then removed. The patient had no related complaints at the subsequent follow-up visits.

Case 3

A 59-year-old woman presented with a kyphotic deformity at the thoracolumbar junction and radiating pain to the abdomen and ribs. An anterior transthoracic T12 vertebrectomy with anterior release, iliac crest strut graft (T11–L1), and contoured anterior spinal

Fig. 1 CT scan demonstrating a large retroperitoneal fluid collection 2 weeks after anterior lumbar interbody fusion from L2 to S1

Fig. 2 CT scan 10 days after the first drainage procedure, demonstrating repeat retroperitoneal fluid accumulation

plating was performed to correct the kyphotic deformity. She was discharged on the 10th postoperative day. The patient returned 2 weeks later with pain over the left side of her chest. Radiographs revealed a left-sided pleural effusion. Diagnostic and therapeutic thoracentesis was performed to obtain 150 cc opaque chylous fluid. She was maintained on hyperalimentation and chest tube drainage for 2 weeks. The chest tube was taken off suction, and a test dose of regular food was tried. The chylous drainage continued for a period of 12 more days and then resolved. After removal of the chest tube, a radiograph of the chest showed no evidence of pleural effusion.

Discussion

Anatomy and pathophysiology

The cisterna chyli is formed by the union of two lumbar lymphatic trunks and an intestinal trunk anterior to the first or second lumbar vertebra. Channels continue upward through the aortic hiatus of the diaphragm and enter

the posterior mediastinum as the thoracic duct. At the level of the fifth thoracic vertebra, the thoracic duct turns to the left, ascends toward the base of the neck, terminating in, or within 1 cm of, the junction of the left subclavian and left internal jugular veins. The anatomy and the course of both cisterna chyli and the thoracic duct are highly variable [1]. Both of these highly mobile structures are located in the prevertebral tissues and are seldom visualized by the orthopedic surgeon [10]. Propst-Proctor et al. [10] surveyed ten spinal surgeons with experience totaling more than 1000 anterior spinal procedures. They reported observing the thoracic duct or cisterna chyli on only 15 occasions. The major function of this ductal system is to transport 60–70% of ingested fat. It is the main pathway for the return of extravascular protein to the circulation. Lymphocytes constitute the main cellular element of the thoracic duct lymph. The rate of chyle transport is dramatically affected by the amount of fat in the diet, particularly long-chain triglycerides.

Clinical manifestations

Injury to this system can lead to mechanical and/or metabolic effects. The degree of disturbance is directly related to the rapidity and chronicity of the leakage. In addition to producing mechanical compression of adjacent structures, chylous leakage can lead to fat, protein, and fat-soluble vitamin depletion [1]. Lymphocytes are depleted as well, since chyle contains between 400 and 600 cells/ml.

Prevention

Awareness of the normal anatomy and its variations, especially of the cisterna and the thoracic duct system, is essential to the surgeon planning an anterior spinal procedure. Propst-Proctor et al. [10], while quoting Hall [7], suggest that it is preferable to stay in the subperiosteal plane by reflecting the anterior longitudinal ligament to avoid the major lymphatics.

As a preventative measure, the patient can be given Sudan black B orally in cream the evening before the operation. During surgery, the drainage of lymph will be apparent because of its bright blue color [6]. Colleta and Mayer [4] suggest the routine preoperative use of cream mixed with Drug and Cosmetic Green No. 6 as a dietary supplement to help in the identification of lymphatics injured at the time of surgery.

Treatment

During anterior exposure of the thoracolumbar spine, the cisterna can be traumatized, leading to a chylous leak into the pleural space from the recently sutured diaphragm. In

the postoperative period, the delay in onset of the chylous leakage is due to the delay in its formation, resulting from the usual postoperative restriction in diet [1].

The first successful transthoracic ligation of the thoracic duct was by Lampson [8] in 1946. Prior to this, various treatment modalities, including frequent needle aspirations followed by reinjection of the aspirated chyle, were used [1].

According to Selle et al. [12], a daily chyle flow exceeding 1500 cc in adults or 100 cc per year of age in children for a duration of more than 5 days is an indication for surgical ductal ligation. Eisenstein and O'Brien [6], Bozzetti et al. [2], and Nakai and Zielke [9] report on successful conservative treatment of patients with postoperative chylothorax.

A continuous tube drainage is preferred to repeated thoracentesis, since a fully inflated lung is believed to exert a tamponade effect, thereby reducing the accumulation of chyle [6].

The first published case of chyloretroperitoneum following anterior spinal arthrodesis with Dwyer instrumentation was reported by Shen et al. [13].

DeHart et al. [5] concluded that an obvious chylous leakage in the retroperitoneum can spontaneously close without complications. However, the authors feel that some degree of chylous leakage occurs in every retroperitoneal operation. This leakage normally closes spontaneously due to the low-pressure lymphatic system, multiple connections between the lymph vessels, and anastomosis with the venous system.

In all three of our patients, we believe that the injury was to the cisterna chyli. In the first patient, the chyle drained through the retroperitoneal drain, rather than being allowed to drain through to the pleural cavity and through the sutured diaphragm. In the second patient, an associated abnormal fistulous connection explained the

associated pleural effusion. Another possibility is that the chyloretroperitoneum slowly dissected into the posterior mediastinum with subsequent rupture into the left chest [3]. Ross [11] has described a few cases of chylothorax occurring with this mechanism. Usually an injury to the thoracic duct at or below the fifth thoracic vertebra results in a right-sided chylothorax, and injury above the fifth thoracic vertebra would result in a left-sided chylothorax [1]. However, an anatomic variation of the normal course, which is not uncommon, could explain the left-sided chylothorax in the third patient.

Conclusion

This series of three patients allows the authors to conclude that:

1. Adequate conservative treatment in the initial stages of postoperative chylous leakage usually leads to a complete resolution in most patients.
2. Treatment of patients with chylous leakage should be directed toward a decrease in the formation of chyle through a low-fat diet consisting mainly of medium-chain triglycerides, continuous drainage of the fluid, and adequate supportive therapy.
3. To the orthopedic surgeon performing anterior spinal surgery, knowledge of the lymphatic ductular anatomy and its variations is essential.
4. Intraoperative injury to the lymphatic system is perhaps more common than reported. Any draining chyle mixed with blood in the immediate postoperative period is difficult to detect.

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