

Management and prevention of chylous leakage after laparoscopic lymphadenectomy

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Abstract. – OBJECTIVE: To investigate the development and management of chylous leakage after laparoscopic retroperitoneal lymphadenectomy.

PATIENTS AND METHODS: From July 2006 to September 2013, 13 cases of chylous leakage after the laparoscopic lymphadenectomy (6 cases of renal cell carcinoma, 4 cases of gastric cancer, 2 cases of ovarian cancer, 1 case of endometrial cancer) were studied to analyze the occurrence, development and management of chylous leakage.

RESULTS: In 3 cases (2 cases of renal cell carcinoma, 1 case of gastric cancer) massive amount of milky fluid drainage was seen after the first two days post operation. Dietary intervention, TPN (total parenteral nutrition), somatostatin therapy, maintenance of continuous drainage helped to successfully manage the condition in about 1 month duration. In the remaining 10 cases, chylous leakage appeared after restoring normal diet. Managed with changes in diet and maintenance of unobstructed drainage, they were cured in about 2 weeks after treatment. There was significant reduction in drain output, ultrasonography did not reveal presence of free fluid collection in abdomen, and the patients were in good condition without signs and symptoms of infections.

CONCLUSIONS: Chylous leakage is a rare complication of retroperitoneal lymph node dissection. Surgeons should be familiar with laparoscopic techniques, relevant anatomy and be aware of the fact that the effect of CO₂ pressure and use of ultrasonic knife to occlude the lymphatic vessel can transiently block the leakage making the surgeon overlook them. Routine placement of indwelling drainage tube, immediate diagnosis, dietary modification, TPN, somatostatin and drainage are the modalities of conservative management.

Key Words:

Chylous leakage, Laparoscopy, Lymphadenectomy.

Introduction

Chylous leakage is an infrequent post operative complication of major abdominal and

retroperitoneal surgeries. In recent years, with increasingly sophisticated and extensive application of laparoscopic techniques, laparoscopic postoperative chylous leakage cases are gradually increasing. Chylous leakage is becoming an increasing concern during postoperative care. The occurrence of this condition is 1.2%-3.0%¹; Zheng et al² reported a prevalence of 4/1578; Kaas et al³ reported that about 7.4%. Although rare this condition causes significant morbidity. The clinical manifestation may be in the form of fatigue, bloating, backache and weight loss. The drained fluid appears milky due to high chylomicron content and is rich in protein, triglyceride and lymphocytes. Therefore, loss of large amount of such fluid can result in nutritional and immunological deficiencies in the form of fluid and electrolyte disturbance, hypoalbuminemia and lymphopenia. The conservative management with low fat MCT rich diet, TPN, somatostatin and continuous drainage are the mainstay of treatment followed by surgery in refractory cases. Both clinical assessment and laboratory analysis of drainage fluid aid in the diagnosis of from July 2006 to September 2013, the clinical course of 13 cases of malignant tumors who underwent laparoscopic lymphadenectomy and presented with postoperative chylous leakage is summarized below.

Patients and Methods

Patients

The group of 13 patients: 6 cases of renal cell carcinoma who underwent radical nephrectomy; 4 cases of gastric cancer who underwent radical gastrectomy: 1 of them with portal hypertension; 3 cases of gynecologic oncology: 2 cases of ovarian cancer, 1 case of endometrial cancer, who underwent pelvic and para-aortic lymph node dissection were studied. Patients aged 40 to 63

years, mean age of the patient studied being 56 years. This study was conducted in accordance with the Declaration of Helsinki. This study was conducted with approval from the Ethics Committee of the First Affiliated Hospital of Zhengzhou University. Written informed consent was obtained from all participants.

Clinical Manifestations

From 3rd post operative day onward 3 cases (2 cases of renal cell carcinoma, 1 case of gastric cancer) complained of bloating, fatigue, back pain and other symptoms and presented with about 350-600 ml/day of sanguineous fluid drainage before starting oral diet. After starting oral diet, the drainage fluid became pale yellow and the amount suddenly increased rapidly to about 870-1300 ml/day. In the remaining 4 cases of renal cell carcinoma and 3 cases of gastric cancer, the amount of milky to pale yellow chylous fluid increased rapidly after beginning oral diet but with no symptoms. In the gynecologic oncology group chylous drainage increased after eating, but the highest drain output (> 500 ml/day) observed were still less than that in gastric cancer and the renal cell carcinoma cases. 13 patients with peritoneal drainage fluid analysis was positive for chyle (triglyceride level > 110 mg/dl); Blood tests of 6 cases showed hypoalbuminemia and significant decrease in lymphocytes. Bacterial culture of the fluid were positive in 4 cases of which 2 cases presented with fever (Table I).

Treatment

5 cases of renal cell carcinoma, 2 cases of gastric cancer and 3 cases of gynecologic oncology group responded well to dietary adjustments with low fat, high calorie, high protein diet and vitamin supplementation and maintenance of open drainage. 1 case of renal cell carcinoma and 2 cases of gastric cancer with large amount of chyle leakage (> 500 ml/day) were managed initially with low fat, high protein and high calorie diet for two weeks and later due to inadequate response were instituted on TPN and somatostatin therapy to which they responded adequately. 4 bacterial culture positive cases were treated additionally with antibiotics.

Results

5 cases of renal cell carcinoma, 2 cases of gastric cancer and 3 cases of gynecologic oncology group showed significant reduction in drainage output (< 15 ml/day) after institution of treatment (dietary modification and continuous drainage) for about two weeks. With the ultrasound showing no free fluid in the abdomen, drainage tubes were removed. Remaining 2 cases of gastric cancer and 1 case of renal cell carcinoma were treated initially with diet therapy and continuous drainage for two weeks did not show significant decrease in the drain output, then, with TPN, somatostatin therapy instituted later along with continuous unobstructed drainage. For 3 consec-

Table I. Occurrence and management of chylous leakage.

Features	Renal cell carcinoma	Gastric cancer	Gynecologic oncology
Time of resumption of oral diet after surgery	3-5 days	4-7 days	2-3 days
Color of the drainage fluid before starting oral diet	Sanguineous – 4 patients	Sanguineous – 3 cases	Sanguineous – 3 cases
Color of the drainage fluid after resuming oral diet	Milky – 4 cases	Milky – 2 cases	Milky – 2 cases
Highest drain output	500-1300 ml/day	500-1100 ml/day	500-650 ml/day
Average daily drain output	740 ml/day	670 ml/day	290 ml/day
Bacterial culture	Positive in 1 case	Positive in 2 cases	Positive in 1 case
Treatment	Dietary modification, continuous drainage, antibiotics, TPN and somatostatin*	Dietary modification, continuous drainage, antibiotics, TPN and somatostatin*	Dietary modification, continuous drainage, antibiotics
Recovery time	13-27 days	15-31 days	14-16 days

*In refractory cases.

utive days showed significant decrease in the drain output and the abdominal ultrasound as well showed no free fluid in the abdomen letting the drain to be removed. After conservative treatment, none showed any serious complications, electrolyte disorders or peritonitis. During the follow up conducted three months post discharge, clinical examination, blood parameters and ultrasound abdomen of all 13 cases of chylous leakage patients were within normal limits.

Discussion

Both clinical assessment and laboratory analysis of drainage fluid aid in the diagnosis of chylous leakage. Clinically, chyle leak is suggested by the change in the nature of drainage fluid from initial serosanguineous to milky or pale yellow turbid liquid and gradual increase in amount which is more pronounced after stating oral diet becoming clearer after the oral therapy is stopped. Not all chylous leakage exhibit typical milky white color, it depends upon the fat content of the diet, and presence of infection. Normal chyle is milky white but if the color becomes cloudy or pale yellow it is often suggestive either of larger fat content or infection. The drainage fluid triglyceride content > 110 mg/dl suggests the fluid to be chylous in nature. An elevated ascites fluid: plasma triglyceride ratio (between 2:1 and 8:1) is indicative of chylous ascites⁴. Leukocyte count generally is high, from 232-2560 cells/mm³, usually with a marked lymphocytic predominance. Total protein content varies from 1.4-6.4 g/dl, with a mean of 3.7 g/dl⁵.

The right and left lumbar lymphatic trunks and the intestinal lymphatic trunk converge to form the cisterna chyli which is located retroperitoneally at the level of L1-L2 vertebrae and gives rise to the thoracic duct which drains into left subclavian vein. Inadvertent injury to the major lymphatic trunks, cisterna chyli or thoracic duct during retroperitoneal surgery leads to chylous leakage in the abdomen. The extent of the para-aortic lymphadenectomy was positively associated with the appearance of chyloperitoneum as seen in the study where the risk and extent of chylous leakage observed was more in gastric cancer and renal cell carcinoma patients with greater need for more extensive lymph node dissection compared to gynecologic oncology group⁶. The CO₂ pressure created during laparoscopic surgery and the use of ultrasonic knife for

coagulation may result in transient occlusion of the injured lymphatic channels. Later after the release of intra abdominal pressure or increase in intraluminal pressure secondary to increased lymph production after oral diet, the transiently occluded channels may leak. Whether the use of ultrasonic knife for occlusion is related to increased occurrence of chylous leakage needs further studies. Other causes may be interruption of lymphatic drainage due to obstruction by malignant lymph nodes, aneurysmal dilatation of the thoracic duct etc.

A variety of treatment methods have been used to control lymphatic leakage after surgery. Management strategies for chylous ascites are based on a step-up approach from conservative treatment to surgical intervention. Conservative treatment methods usually take several weeks to alleviate the symptoms and may take up to 2 months in some protracted cases. They include: low fat, high protein, high calorie diet with MCT supplementation; maintenance of continuous drainage; TPN and somatostatin therapy.

The lymph flow rate in the thoracic duct increases from the 1 ml/kg/h in fasting state to 220 ml/kg/h after eating fatty meal⁷. Thus, low fat diet is instituted in order to decrease the lymph flow and promote healing of the leakage site. The medium chain triglyceride (MCT) diet is supplemented because the medium chain triglycerides are absorbed directly into the blood stream and, therefore, do not participate in the formation of abdominal lymphatic fluid⁸. In patients with drainage output < 500 ml/d chyle leakage is mostly due to damage to small branches of lymphatic channel and can be managed with high-calorie, high-protein, low-sodium, low-fat diet whereas in patients with drainage output > 500 ml/d, TPN with long-chain fatty emulsions and somatostatin therapy should be instituted⁹. TPN support can improve the nutritional status of patients, promote protein synthesis, increase plasma colloid osmotic pressure, inhibit the gastrointestinal fluid secretion, reduce the formation of lymph and further promote shortened healing time of the leakage site^{10,11}. Somatostatin, or its analog (octreotide), is highly effective in controlling lymphatic flow. The action of somatostatin or octreotide is mediated through specific receptors that are distributed in various regions, including the pancreas, vascular tissues and gastrointestinal tract through which they inhibit intestinal secretion and absorption, resulting in decreased lymphat-

ic and splanchnic blood flow contributing in the reduction of lymphatic production. This coupled with direct contraction of the lymphatic vessels help to reduce lymphatic leakage from the cisterna chyli. These multiple mechanisms help to explain the rapid and strong response in patients refractory to conservative management⁶. For leakage greater than 1500 ml/d, continuous high drainage output (> 1000 ml/d) even after more than one week of fasting and TPN, or lymphography shown larger lymphatic leakage should be considered for surgery. The use of peritoneo-venous shunt remains a satisfactory therapeutic or palliative option for the management of severe refractory chylous ascites, mainly in patients with poor performance status who cannot undergo surgical exploration¹². Standard protocols for treatment of post operative chylous ascites are yet to be established.

Laparoscopic surgery has made rapid advancements and the area of its application is widening. With the use of this approach more extensive lymph node dissection is made possible, however, more extensive the area of dissection more will the risk of injuring lymphatic vessels. Surgeons must be well versed with the relevant anatomy, lymphatic distribution, anatomic variations and possible congenital anomalies of the lymphatic system. Gentle handling and careful occlusion of the lymphatic vessel must be done while dissecting the para aortic nodes¹³. The dissection of lymph nodes towards renal vessels must be carried out under good retroperitoneoscopic view and clips should be used instead of bipolar coagulation in areas like this particularly prone to leakage from transected lymphatics^{14,15}. CO₂ pressure may transiently occlude the injured lymphatic vessels; therefore, it is important to examine the operative field for any leakage after decreasing the pressure. Use of fibrin sealant at the end of the surgery may help to seal smaller leaks¹⁶. Preventive diet in the form of low fat diet given after surgery also helps to prevent possible leakage. Preoperative use of dye marker may help in timely identification and ligation of the leak site.

Conclusions

Chylous leakage is rare, yet increasing complication of laparoscopic retroperitoneal surgery. Conservative management with low fat diet with MCT, maintenance of continuous drainage, TPN

and somatostatin is the main stay of treatment followed by surgery in the refractory cases. Knowledge of relevant anatomy, dissection under good vision, gentle handling and complete occlusion of the lymphatic tissue are the measures of prevention.

Conflict of Interest

The Authors declare that there are no conflicts of interest.

References

- 1) HALKIC N, ABDELMOUMENE A, SUARDET L, MOSIMANN F. Postoperative chylous ascites after radical gastrectomy. A case report. *Minerva Chir* 2003; 58: 389-391.
- 2) ZHENG H, CHEN JQ. Prevention and treatment of lymphorrhagia due to lymph node dissection in gastric cancer. *Chinese J Gastrointest Surg* 2000; 3: 17-19.
- 3) KAAS R, RUSTMAN LD, ZOETMULDER FA. Chylous ascites after oncological abdominal surgery: incidence and treatment. *Eur J Surg Oncol* 2001; 27: 187-189.
- 4) AALAMI OO, ALLEN DB, ORGAN CH JR. Chylous ascites: a collective review. *Surgery* 2000; 128: 761-778.
- 5) TALLURI S K, NUTHAKKI H, TADAKAMALLA A, TALLURI J, BESUR S. Chylous ascites. *N Am J Med Sci* 2011; 3: 438-440.
- 6) KIM E A, PARK H, JEONG S G, LEE C, LEE JM, PARK CT. Octreotide therapy for the management of refractory chylous ascites after a staging operation for endometrial adenocarcinoma. *J Obstet Gynaecol Res* 2014; 40: 622-626.
- 7) LEIBOVITCH I, MOR Y, GOLOMB J, RAMON J. The diagnosis and management of postoperative chylous ascites. *J Urol* 2002; 167: 449-457.
- 8) YUAN FS, SHI XT, ZHANG XK. 3 cases report of chylous leakage after Pancreaticoduodenectomy. *Shandong Med J* 2008; 48: 82.
- 9) LEIBOVITCH I, MOR Y, GOLOMB J, RAMON J. Chylous ascites after radical nephrectomy and inferior vena cava thrombectomy. Successful conservative management with somatostatin analogue. *Eur Urol* 2002; 41: 220-222.
- 10) COLLARD JM, LATERRE PF, BOEMER F, REYNAERT M, PONLOT R. Conservative treatment of postsurgical lymphatic leaks with somatostatin-14. *Chest* 2000; 117: 902-905.
- 11) VALENTINE CN, BARRESI R, PRINZ RA. Somatostatin analog treatment of a cervical thoracic duct fistula. *Head Neck* 2002; 24: 810-813.
- 12) BAIOCCHI G, FALOPPA C C, ARAUJO R L, FUKAZAWA EM, KUMAGAI LY, MENEZES AN, BADIGLIAN-FILHO L. Chylous

ascites in gynecologic malignancies: cases report and literature review. *Arch Gynecol Obstet* 2010; 281: 677-681.

- 13) YING RC, JIN HC, ZHANG XP. Clinical application of laparoscopic radical resection of rectal carcinoma (22 cases report). *China J Endosc* 2005, 11: 706-708.
- 14) AERTS J, MATAS A, SUTHERLAND D, KANDASWAMY R. Chylous ascites requiring surgical intervention after donor nephrectomy: case series and single center experience. *Am J Transplant* 2010; 10: 124-128.
- 15) FARIÑA LA, MARTÍNEZ MC. Chylous ascites following radical nephrectomy. Conservative management without paracentesis. *Actas Urol Esp* 2009; 33: 703-705.
- 16) MOLINA WR, DESAI MM, GILL IS. Laparoscopic management of chylous ascites after donor nephrectomy. *J Urol* 2003; 170: 1938.