



## *Original article*

# A rare complication of D3 dissection for gastric carcinoma: chyloperitoneum

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### Abstract

**Background.** Chyloperitoneum is the accumulation of lymphatic fluid in the peritoneal cavity. Although uncommon, it has been reported after retroperitoneal lymph node dissection. But the incidence of this complication after radical gastrectomy is unknown. In the present study, we analyzed our patients who underwent D3 dissection for gastric carcinoma and developed chyloperitoneum.

**Methods.** Between June 1999 and June 2002, a total of 134 patients with gastric cancer underwent radical lymph node dissection, performed according to the Japanese Research Society for Gastric Cancer guidelines, as the standard procedure for gastric cancer treatment. Of these patients, 34 underwent D3 lymphadenectomy, and chyloperitoneum was detected in 4 of them.

**Results.** There were three male patients and one female patient. All patients were in stage III according to the International Union Against Cancer (UICC)-TNM classification. In three patients, chyle leakage was noticed during the surgery, and surgical ligation of the duct was performed. Abdominal distension developed in one patient 7 days after the surgery, and chylous ascites was diagnosed. This patient was successfully treated with fasting and total parenteral nutrition, within 2 weeks.

**Conclusion.** The incidence of chyloperitoneum is not low, and may increase with more aggressive surgery. Surgeons should be aware of this complication after retroperitoneal lymph node dissection, and injured lymphatics must be controlled and ligated intraoperatively.

**Key words** Gastric cancer · Extended lymph node dissection · Chyloperitoneum · Chylous ascites · Complication

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### Introduction

Chyloperitoneum is the accumulation of lymphatic fluid in the peritoneal cavity, and, if unrecognized during surgery, it may result in postoperative chylous ascites which is a rare complication of retroperitoneal surgery. It is caused by interruption of the thoracic duct, cisterna chyli, or their major tributaries [1]. Various surgical procedures, including abdominal aortic surgery, aortofemoral bypass, resection and replacement of the inferior vena cava, portacaval and mesocaval shunt procedures, lymphadenectomy for testicular and renal cancers, pelvic surgery for advanced gynecologic malignancies, and anterior spinal surgery have been reported as causes of postoperative chylous ascites [2]. However, chylous ascites is an unusual complication following treatment of gastric carcinoma. Only two cases of chylous ascites after a D2 dissection have been reported [3,4].

Surgical resection is the only curative treatment modality presently available for gastric carcinoma. Radical lymph node dissection is an important part of curative resection. In order to give patients with gastric cancer the broadest range of therapeutic options, surgeons began to perform more extensive lymph node dissection. D2 dissection, as defined by the Japanese Research Society for Gastric Cancer (JRS GC), is accepted as the standard practice for patients undergoing an operation with curative intent [5]. Those who need more aggressive surgery according to the extent of lymph node invasion may benefit from D3 dissection. To our knowledge, the incidence of chyloperitoneum after extended lymph node dissection has not been defined, however.

In the present study, we have reported our experience with chyloperitoneum occurring during or after D3 gastric resection, in order to detail the incidence of this complication.

## Patients and methods

In June 1999, we started using the Maruyama computer program [6] preoperatively to differentiate patients who need more extensive lymph node dissection from those for whom standard D2 dissection is enough. The incidence of lymph node metastases in each of the 16 lymph node stations, according to the JRSGC classification, was determined. When the predicted percentage of lymph node metastasis for any station of compartment 3 was more than 10%, then that lymph node station was dissected in addition to D2 dissection.

All patients who underwent extended lymph node dissection between June 1999 and June 2002 were evaluated. During this period, 359 patients were admitted for gastric resection; 101 underwent palliative bypass procedure or only laparotomy, 124 needed palliative resection, and 134 underwent radical gastric resection with curative intent. Of these 134 patients, 34 underwent D3 dissection. These 34 patients formed the basis of the present report.

## Results

Four (11.8%) of the 34 patients developed chyloperitoneum. There were three men and one woman, with a mean age of 60.5 years (range, 54 to 66 years). All patients were in stage III according to the International Union Against Cancer (UICC)-TNM classification. In three patients, chyle leakage was noticed during the surgery; the thoracic duct was found and surgical ligation was performed. One patient presented with abdominal distension occurring 7 days postoperatively. This patient underwent diagnostic paracentesis, which demonstrated the typical findings of chylous ascites: milky, sterile, odorless fluid with an alkaline pH, total protein level greater than 3.2 g/dl, and total fat content 3.3 g/dl. Total parenteral nutrition (TPN) was begun, and the patient was permitted nothing by mouth. After 10 days of TPN therapy, a reduction in the abdominal girth was noted. A diet high in protein and low in total fat was begun, and TPN was gradually tapered. The chylous ascites resolved completely without any need for intervention.

## Discussion

Resection provides the most consistent chance of curing locoregional gastric cancer. For patients' benefit, all tumor tissue should be resected, and such a resection can be achieved only by an extended lymph node dissection. The number of patients with gastric cancer who undergo radical surgery is increasing, with an expect-

ancy for the prolonged survival of these patients with more aggressive surgery. As some centers are convinced that extended lymph node dissection will be beneficial for patients, D3 dissection is being performed at these centers [7].

It has been shown that morbidity increases after an extended lymph node dissection [7,8]. Also, unusual complications such as chyloperitoneum, may be encountered. Chyloperitoneum is the accumulation of lymphatic fluid within the peritoneal cavity. Although it is an uncommon condition, it has been reported after retroperitoneal lymph node dissection performed for testicular and renal cancers. But the incidence of this complication after D3 dissection is unknown.

This rare disorder presents an interesting and challenging clinical problem. Anatomically, the postoperative development of chylous ascites indicates the existence of damaged lymphatic drainage into the thoracic duct, the cisterna chyli, or its tributaries. The cisterna chyli drains, primarily, the intestinal lymphatics; specifically, the efferents from the superior mesenteric and celiac group of lymph nodes. Classically, the cisterna chyli lies on the anterior aspect of the first or second lumbar vertebra on the right side of the aorta, and is intimately involved with the operative area in D3 dissection. During the D3 dissection procedure, the retroperitoneal lymphatics and fat are excised. Severance and interruption of the lymphatic return are likely to occur during this dissection.

Another reason for the disturbance of and damage to the lymphatic system may be its quite variable anatomy [9]. The classic anatomy is present in only 50% of subjects, while, in other subjects, a distinct cisterna chyli is not found, but is replaced by a lymphatic plexus [10]. McVay [10] has described 16 distinctive anatomic variants of the abdominal lymphatic plexus and cisterna chyli. Surgeons who practice gastric surgery should be aware of the inconsistent anatomy of the abdominal lymphatic system and cisterna chyli, and the variable lymphatic plexus as well.

Postoperative chyloperitoneum may represent a difficult problem in patient treatment. Patients with low performance status due to the primary operation may be further debilitated by the serious consequences of the chyloperitoneum. It may cause constant loss of protein and lymph, nutritional depletion, metabolic complications, prolonged hospital stay, and even the death of the patient. Our patient responded to conservative treatment. This case demonstrated that chylous ascites that develops after D3 dissection may be a reversible condition, and initial therapy with restriction of oral intake, and low-fat diet supplementation, may be sufficient.

It is apparent that the true incidence of chyloperitoneum is indeed not very low, although it is, likely, unre-

ported. In our series, the incidence was 11.8% after 34 operations. Chyloperitoneum after surgery may be easier to prevent than to cure. In 1937, Blalock and colleagues [11] found that ligation of all major identifiable lymphatic trunks in both cats and dogs rarely resulted in chylous ascites. With careful attention to the lymphatic network, this complication can be avoided. The incidence of chyloperitoneum may increase with more aggressive surgery. Surgeons should be aware of this complication after retroperitoneal and paraaortic lymph node dissection, and injured lymphatics must be controlled and ligated intraoperatively.

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## Editorial comment

### **Incidence of and treatment options for chyloperitoneum from the Japanese gastric surgeon's point of view**

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The article published in the current issue of *Gastric Cancer* “A rare complication of D3 dissection for gastric carcinoma: chyloperitoneum” by Yol et al. [1] attracted our attention as Japanese gastric surgeons, but at the same time caused some feeling of difference. It is well known that surgical resection is considered to be the only curative treatment modality available for gastric carcinoma. For this reason, extending the surgical procedure to D3 lymphadenectomy by the Turkish doctors is a truly praiseworthy attempt, which not many Western gastric surgeons would dare to try. In Japan, a randomized controlled clinical trial, JCOG 9501, to compare outcomes of D2 and D3 lymphadenectomies has been carried out, with the report on this trial including some initial findings regarding operative mortality and morbidity [2]. We are now looking forward to the final results, which are expected to be reported in a year or two, and we anticipate that this clinical trial will find that extended D3 lymphadenectomy proves to be beneficial in terms of survival.

Chyloperitoneum, as Yol et al. mention in their article, is a rare complication of gastric surgery. Major lymphatic networks, including the main thoracic duct, reside in the retroperitoneal domain and surround large vessels such as the aorta and inferior vena cava. Standard D0 or D1 resection as commonly performed in Western countries or D2 dissection, usually performed in Japan and Korea, scarcely affects this network. Chyloperitoneum thus rarely occurs as a result of the D1 or D2 lymphadenectomy procedure [3]. Even if some of the more fragile and delicate tributaries of the lymphatic system are injured, the damage is usually repaired spontaneously, and neither surgeons nor patients will be aware of this negligible problem. In fact, the preliminary report of the JCOG 9501 study reported none of the 263 patients surveyed had chyloperitoneum due to D2 lymphadenectomy [2]. Although I expanded my literature search of the Japanese Medline system with the key words “chyloperitoneum or lymphorrhea” plus “gastrectomy,” I could find hardly any publications regarding this complication. Of two distinguished gastric surgeons who have performed over 1000 gastrectomies, one has encountered three cases out of more than 1000 (0.3%) in general clinical practice, and the other found two out of 500 (0.4%), which developed either chyloperitoneum or notable lymphorrhea from the drainage site after D2 lymphadenectomy for gastric cancer. (Personal communication by Dr. Yamamura

from the Aichi Cancer Center and Dr. Yonemura from the Shizuoka Cancer Center, respectively.)

With regard to  $\geq$ D3 lymphadenectomy, the setting might be somewhat different. Direct intervention involving para-aortic lymph nodes is certain to affect the delicate network of lymphatic vessels, and the amount of lymphatic fluid leakage after the procedure must be substantially greater. In fact, Maeta reported four cases with lymphorrhea out of 70 patients (5.6%) enrolled in a clinical trial using  $\geq$ D3 lymphadenectomies [4]. A collaborative clinical trial between Japan and Taiwan found that chyloperitoneum occurred in 1.6% of cases undergoing the D3 operation (Dr. Yonemura, personal communication). Moreover, according to the JCOG 9501 results, lymphorrhea was observed in 10 out of 260 D3 surgery cases (3.8%) [2]. The report by Yol et al. mentions that four cases of chyloperitoneum occurred in 34 patients (11.8%) who had undergone the D3 operation. However, in three of their cases, the thoracic duct was ligated following intra-operative detection of chyle leakage by the surgeons. Even in the Turkish study, therefore, genuine chyloperitoneum accounted for only one case (3.9%).

Is chyloperitoneum intractable? Surgeons' comments and literature search findings report that in most of the cases the disease was cured spontaneously after 1 to 2 weeks of conservative therapy including proper drainage and/or intravenous hyperalimentation. In very rare cases, surgical intervention or intraperitoneal injection of agents to promote adhesion was needed [5,6]. Therefore, as Yol et al. mention, chyloperitoneum is really a rare postoperative disorder and hardly ever becomes a serious, life-threatening complication. Accurate diagnosis and proper treatment would therefore be

sufficient to cure this disorder in Japan and probably in Turkey.

All in all, the most important question is whether D3 lymphadenectomy actually improves survival and provides real benefits, including quality of life and cost effectiveness, for curatively resected gastric cancer patients. This question can be answered only by a randomized clinical trial, and for this reason we are looking forward to the final results of the JCOG 9501 study.

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