

Review

Treatment options for chylous ascites after major abdominal surgery: a systematic review



Maximilian Weniger, M.D.¹, Jan G. D'Haese, M.D.¹, Martin K. Angele, M.D.*,
Axel Kleespies, M.D., Jens Werner, M.D., Werner Hartwig, M.D.

Department of General, Visceral, Transplantation, Vascular and Thoracic Surgery, Campus
Grosshadern, Ludwig-Maximilians-University, Marchioninstraße 15, Munich, D-81377, Germany

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Medium chain
triglyceride diet;
Octreotide

Abstract

BACKGROUND: Chylous leakage is a relevant clinical problem after major abdominal surgery leading to an increased length of stay.

DATA SOURCES: A systematic search of MEDLINE/PubMed and the Cochrane Library was performed according to the PRISMA statement. The search for the MeSH terms “chylous ascites” and/or “lymphatic fistula” retrieved a total of 2,348 articles, of which 36 full-text articles were reviewed by 2 independent investigators.

RESULTS: Chylous ascites is described with an incidence of up to 11%, especially after pancreatic surgery. The incidence is increasing with the number of lymph nodes harvested. In patients treated with total parenteral nutrition, conservative treatment is demonstrated to be effective in up to 100% of cases.

CONCLUSIONS: The extent of abdominal surgery mainly predicts the risk of chylous ascites. Conservative treatment has been shown to be effective in almost all cases and is the treatment of choice.

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Postoperative chylous ascites is a clinical issue of growing importance in abdominal surgery because of the increase in extended resections and lymph node dissections. It is commonly characterized by postoperative accumulation of chyle in the peritoneal cavity, and appearance of milky fluid and elevated triglyceride levels in the surgical drains.¹ Direct operative trauma to the main chyle ducts, its

branches, or lymph nodes is believed to be the major cause. Chylous ascites is known to cause prolongation of the length of hospital stay and represents a considerable economic problem, especially in oncologic surgery. Although chylous ascites is a widespread issue, evidence is limited to case series and no guidelines or general therapy recommendations exist. Therefore, we performed a systematic review of the literature to gather the existing data concerning incidence, diagnosis, treatment options, and outcome of chylous ascites after major abdominal surgery.

Patients and Methods

Search strategy

A systematic search of MEDLINE/PubMed and the Cochrane Library was performed according to the PRISMA

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* Corresponding author. Tel.: +49-894400712200; fax: +49-89440078893.

E-mail address: martin.angele@med.uni-muenchen.de

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¹ Maximilian Weniger and Jan G. D'Haese contributed equally to this work.

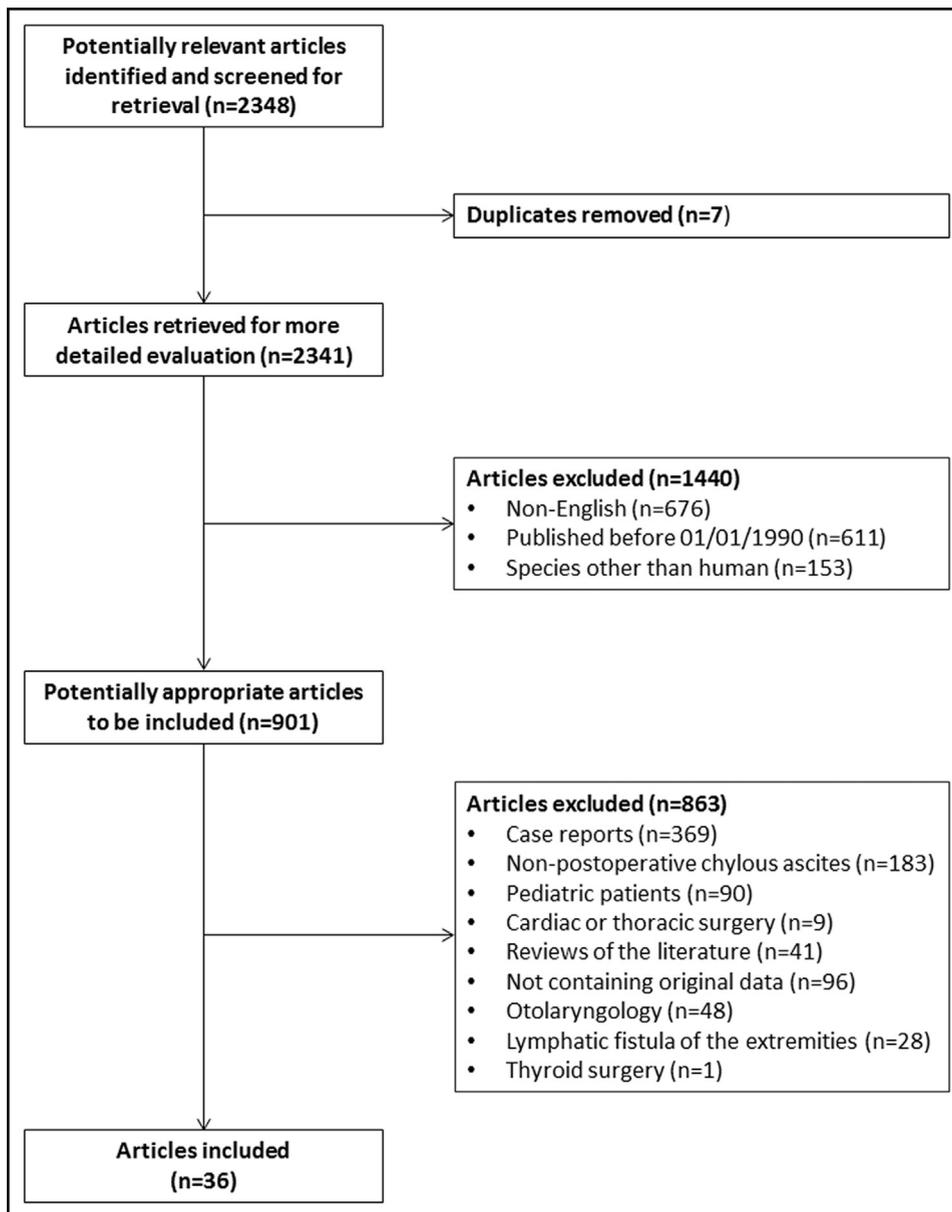


Figure 1 Flow diagram of the study selection process.

statement for reporting systematic reviews and meta-analyses.² The search terms used were “chylous ascites” and/or “lymphatic fistula.” The results were examined by 2 independent investigators (M.W. and J.G.D.) for further selection. Additionally, reference lists were hand searched for relevant literature.

Inclusion criteria

After screening and examination of the articles obtained, the articles were included for further analysis if they contained original data on incidence, diagnosis, treatment options, and outcome of postoperative chylous ascites. Literature containing original data on chylous ascites and not fitting into the above categories was also considered for analysis.

Exclusion criteria

Publications were excluded if they were published before January 1, 1990, published in any other language than English, or dealt with species other than human. Furthermore, articles were excluded from analysis if they focused on non-postoperative chylous ascites, pediatric patients, cardiac or thoracic surgery, otolaryngology, thyroid surgery, or lymphatic fistulas of the extremities. Sole case reports or articles representing reviews of the literature were also excluded. Furthermore, articles solely mentioning chylous ascites or lymphatic fistula and not containing data on chylous ascites and/or lymphatic fistula were excluded as well.

Table 1 Study characteristics with the overall number of patients included and the level of evidence according to the center for evidence-based medicine (Oxford)³

	Type of study	Level of evidence	Patients
Gynecological surgery			
Han et al ⁴	Case series	4	4,119
Zhao et al ⁵	Case series	4	997
Tulunay et al ⁶	Case series	4	1,514
Tinelli et al ⁷	Case-control study	3b	55
Urological surgery			
Evans et al ⁸	Case series	4	329
Baniel et al ⁹	Case series	4	603
Baniel et al ¹⁰	Case series	4	18
Abdominal surgery			
Huang et al ¹¹	Case series	4	5
Abdominal aortic surgery			
Pabst et al ¹²	Case series	4	27
Colorectal surgery			
Nishigori et al ¹³	Case series	4	907
Matsuda et al ¹⁴	Case-control study	3b	135
Baek et al ¹⁵	Case-control study	3b	727
Hepatic surgery			
Yilmaz et al ¹⁶	Case series	4	516
Pancreatic surgery			
van der Gaag et al ¹	Case-control study	3b	609
Kuboki et al ³	Case-control study	3b	2,002
Noji et al ¹⁷	Case series	4	138
Aoki et al ¹⁸	Case-control study	3b	65
Assumpcao et al ¹⁹	Case-control study	3b	3,532
Malik et al ²⁰	Case series	4	105
Madanur et al ²¹	Case series	4	138
Kaas et al ²²	Case series	4	163
Lim et al ²³	Case-control study	3b	54
Holbrook et al ²⁴	Case series	4	30
Nephrectomy			
Capocasale et al ²⁵	Case series	4	208
Kim et al ²⁶	Case series	4	622
Gastrectomy with D3 lymph node dissection			
Yol et al ²⁷	Case series	4	34
Gastrectomy with D1 or D2 lymph node dissection			
Bo et al ²⁸	Case series	4	302
Kunisaki et al ²⁹	Case series	4	152
Gastrectomy and pancreaticosplenectomy			
Lo et al ³⁰	Case-control study	3b	127
Hyperthermic intraperitoneal chemotherapy			
Cotte et al ³¹	Case series	4	12
Diagnostic and interventional radiology			
Alejandro-Lafont et al ³²	Case series	4	50
Kawasaki et al ³³	Case series	4	14
Deso et al ³⁴	Case series	4	16
Matsumoto et al ³⁵	Case series	4	9
Kos et al ³⁶	Case series	4	22
Cope et al ³⁷	Case series	4	5

Results

The search for the MeSH terms “chylous ascites” and/or “lymphatic fistula” retrieved a total of 2,348 articles; all titles were screened for relevance. After removal of duplicates a

total of 2,341 articles remained. Subsequently, 1,440 articles were excluded because they were either not published in English or published before January 1, 1990. Nine hundred one publications were eligible for analysis after application of these exclusion criteria. Of these 901 publications, 369

case reports, 41 reviews of the literature, 183 focusing on non-postoperative chylous ascites, 90 articles focusing on pediatric patients, 9 publications on cardiac or thoracic surgery, 48 publications on otolaryngology, 1 publication on thyroid surgery, 28 articles focusing on lymphatic fistulas of the extremities, and 96 articles not containing original data on chylous ascites and/or lymphatic fistula were excluded. A total of 36 articles remained for analysis. Fig. 1 shows the study selection process in detail. Of those 36 publications, 27 were case series and 9 were case–control studies. The articles which were analyzed in this review of the literature are displayed in Table 1.

Incidence

Incidence of chylous ascites ranged from .17% to 2% in gynecological pelvic surgery,^{4–6} 1.0% to 6.6% in colorectal surgery,^{13–15} 4.7% in hepatic surgery including liver transplantation,¹⁶ 3.8% to 5.1% in nephrectomy,^{25,26} and 1.0% to 11% in pancreatic surgery.^{1,3,17–22,24} The incidence of chylous ascites in patients with abdominal drainage after pancreatic surgery did not differ significantly from those patients without drainage.²³ After gastrectomy with D3 lymph node dissection, lymph fistula rate was 11.7%,²⁷ while it was as low as .3% to .7%^{28,29} after laparoscopic gastrectomy with D1 or D2 lymph node dissection. Combination of gastrectomy with pancreaticosplenectomy was associated with an incidence of chylous ascites of 2.4%.³⁰ After postchemotherapy retroperitoneal lymph node dissection in patients with testicular cancer, chylous ascites was reported in 7.0% of the patients.⁸ In a case series of Cotte et al³¹ on 12 patients with hyperthermic intraperitoneal chemotherapy, chylous ascites occurred in 1 patient. The absolute numbers of patients and percentages may also be seen in Table 2.

Diagnosis of chylous ascites

Diagnosis of chylous ascites was mainly based on clinical parameters by a large number of authors. Concurrent with the beginning of enteral feeding,^{16,17,33} the appearance of milky,^{1,3,6,13,15–19,25,26,33} nonpurulent^{15,18} fluid in the drainage tubes was characteristic of postoperative chylous ascites. Most patients showed abdominal distention.^{6,8,10,12} The definition of the minimum daily volume of chylous ascites varied from 100³ to 600 mL,²⁰ but most authors define 200 mL/24 hours as the lower limit.^{15,19,22} Laboratory findings typical for chylous ascites were amylase-poor,^{3,19,20} bilirubin-poor,²⁰ and chylomicron-rich²⁰ drainage fluid with a triglyceride concentration greater than 110 mg/dL^{3,6,15,18,19} or greater than 1.2 mmol/L.^{1,33} Other authors used a minimum of 150 mg/dL²⁶ or 200 mg/dL²¹ in triglycerides. Further typical laboratory findings included a drainage fluid/serum ratio greater than 1.0 for triglycerides¹⁶ and a drainage fluid/serum ratio less than 1.0 for cholesterol.¹⁶ A normal white blood cell count^{13,15} and negative culture¹⁶ showed absence of infection. Conventional

Table 2 Incidence of chylous ascites differentiated by type of surgery

	Patients	Patients with chylous ascites	Percentage
Gynecological surgery			
Han et al ⁴	4,119	7	.17
Zhao et al ⁵	997	9	.90
Tulunay et al ⁶	1,514	24	2.00
Urological surgery			
Evans et al ⁸	329	23	7.0
Colorectal surgery			
Nishigori et al ¹³	907	9	1.00
Matsuda et al ¹⁴	135	9	6.50
Baek et al ¹⁵	727	48	6.60
Hepatic surgery			
Yilmaz et al ¹⁶	516	24	4.70
Pancreatic surgery			
van der Gaag et al ¹	609	66	11.0
Kuboki et al ³	2,002	21	1.00
Noji et al ¹⁷	138	11	8.00
Aoki et al ¹⁸	65	5	7.70
Assumpcao et al ¹⁹	3,532	47	1.30
Malik et al ²⁰	105	7	6.70
Madanur et al ²¹	138	3	2.20
Kaas et al ²²	163	12	7.40
Nephrectomy			
Capocasale et al ²⁵	208	8	3.80
Kim et al ²⁶	622	32	5.10
Gastrectomy with D3 lymph node dissection			
Yol et al ²⁷	34	3	8.8
Gastrectomy with D1 or D2 lymph node dissection			
Bo et al ²⁸	302	1	.33
Kunisaki et al ²⁹	152	1	.66
Gastrectomy and pancreaticosplenectomy			
Lo et al ³⁰	127	3	2.40
Hyperthermic intraperitoneal chemotherapy			
Cotte et al ³¹	12	1	8.00

diagnostic lymphangiography detected the location of lymphatic leakage in about 75% of the cases^{32,36}

Risk factors

Analysis of the literature for risk factors of postoperative chylous ascites identified the following factors: Higher age,¹⁵ female sex,¹ the surgeon,¹⁵ preoperative ascites and low preoperative albumin,¹⁶ chronic pancreatitis,¹ preoperative chemotherapy,⁸ retroperitoneal tumor invasion,³ tumors fed by the superior mesenteric artery,¹³ number of lymph nodes removed,^{6,19} manipulation of the paraaortic area,³ concomitant vascular resection,¹⁹ increased intraoperative blood loss,⁸ right-sided hemicolectomy,¹⁵ and early enteral feeding.^{3,17} Early enteral feeding was defined as full enteral feeding via a nasointestinal feeding tube or feeding jejunostomy within 48 hours postoperatively,³ or liquid feeding with 15 g of fat after the third postoperative

Table 3 Summary of risk factors for postoperative chylous ascites with the respective ORs or HRs

	OR/HR	P value
Higher age		
Baek et al ¹⁵	No data	.017
Female sex		
van der Gaag et al ¹	1.78 (OR)	.034
Surgeon		
Baek et al ¹⁵	No data	<.01
Preoperative ascites		
Yilmaz et al ¹⁶	2.8 (HR)	.04
Low preoperative albumin		
Yilmaz et al ¹⁶	No data	.04
Chronic pancreatitis		
van der Gaag et al ¹	2.52 (OR)	.016
Preoperative chemotherapy		
Evans et al ⁸	1.24 (OR)	.027
Retroperitoneal tumor invasion		
Kuboki et al ³	5.19 (OR)	.031
Tumors fed by the superior mesenteric artery		
Nishigori et al ¹³	No data	<.01
Number of lymph nodes removed		
Tulunay et al ⁶	No data	.001
Assumpcao et al ¹⁹	1.07 (OR)	.007
Manipulation of the paraaortic area		
Kuboki et al ³	11.74 (OR)	<.001
Concomitant vascular resection		
Assumpcao et al ¹⁹	8.25 (OR)	.004
Increased intraoperative blood loss		
Evans et al ⁸	1.33 (OR)	<.001
Right-sided hemicolectomy		
Baek et al ¹⁵	No data	.013
Early enteral feeding		
Kuboki et al ³	14.13 (OR)	<.001
Noji et al ¹⁷	No data	.004

HR = hazard ratio; OR = odds ratio.

day.¹⁷ A summary of these risk factors with respective odds and hazard ratios is shown in [Table 3](#).

Treatment

Conservative, interventional, and surgical therapeutic approaches were described in the literature. Conservative treatment included total parenteral nutrition (TPN) or medium chain triglyceride (MCT) diet with or without the addition of octreotide. Successful resolution of chylous ascites was described in 77% to 100% of the cases with TPN alone,^{3,8,17,20} in 75% of the cases with MCT diet,²² and in 100% of the cases with addition of octreotide to MCT diet or TPN.^{3,25} In publications in which the authors did not differentiate between TPN and MCT diet, conservative treatment was successful in 71% to 100%.^{1,5,6,13–15,19,21} TPN alone was successful in suspending chylous ascites within 5 to 19 days in pancreatic surgery.^{3,17,20} When TPN alone was used to treat postoperative chylous ascites after postchemotherapy retroperitoneal lymph node dissections in

testicular cancer, TPN resolved chylous ascites within a median of 29 days in 76.1% of patients (16/21 patients with chylous ascites).⁸ MCT diet alone showed to be effective within 6 days in 75% of patients in a study by Kaas et al (9/12 patients with chylous ascites).²² With addition of octreotide to TPN or MCT diet, drains could be removed within 12.3 days in laparoscopic donor nephrectomy (8/8 patients with chylous ascites).²⁵ Comparing TPN alone with TPN and octreotide, Kuboki et al³ found that TPN and octreotide allowed removal of drains significantly earlier in patients with chylous ascites after hepatopancreatobiliary surgery (12 vs 19 days, 11 vs 9 patients). The absolute and relative numbers concerning conservative therapy of chylous ascites are displayed in [Table 4](#).

In a study by Aoki et al,¹⁸ the incidence of postoperative chylous ascites in pancreatic surgery was decreased from 7.7% to 2.9% by a so-called “milk test,” which involved intraoperative insertion of 100 mL of milk via a nasogastric feeding tube (5/65 patients vs 3/104 patients). The intraoperative use of collagen patches coated with human coagulation factors also decreased the incidence of postoperative lymphocele after laparoscopic lymphadenectomy (15/29 patients vs 5/26 patients).⁷ Assumpcao et al¹⁹ further stratified patients after pancreatic surgery with chylous ascites into those with contained peripancreatic chylous fluid collection and those with diffuse chylous ascites. In this study with overall 47 patients with chylous fistula, patients with contained chyle leaks represented the majority (n = 34, 72.9%). These required TPN less frequently (44.1% vs 92.3%), and had a shorter time to resolution (13 vs 36 days) than those with diffuse chylous ascites (n = 13).¹⁹

The therapeutic use of bipedal lymphangiography with lipiodol has been described with occlusion rates from 35% to 70%^{32,34,36} in patients with chylous ascites refractory to conservative treatment. A study by Alexandre-Lafont et al³² (n = 43) demonstrated occlusion rates of 70% when the daily volume of chyle leakage was less than 500 mL. Matsumoto et al³⁵ described successful closure of lymphatic fistula after lymphangiography in 8 of the 9 cases. Successful transabdominal catheterization of the cisterna chyli has also been reported in a small series of 5 patients.³⁷

Of the 36 publications analyzed, 9 described surgical revision for chylous ascites refractory to conservative therapy.^{6,8,11,12,19,20,22,26,31} A peritoneovenous shunt was placed in 5 publications,^{8,12,19,20,22} whereas 4 did not specify the performed operative procedure in detail.^{6,11,26,31} The use of a peritoneovenous shunt was associated with an 80% surgical revision rate in a study by Evans et al,⁸ and Pabst et al¹² reported a 20% mortality.

Outcome

Chylous ascites is associated with a prolonged length of hospital stay. Matsuda et al¹⁴ reported a mean length of stay of 10 days for patients without postoperative chylous ascites vs 14 days in patients with postoperative chylous ascites

Table 4 Conservative treatment in chylous ascites

	Patients	Patients cured	Percentage	Duration (days)
MCT diet alone				
Kaas et al ²²	12	9	75.0	6
TPN alone				
Noji et al ¹⁷	11	11	100	5
Malik et al ²⁰	7	6	85.7	7.5 (median)
Evans et al ⁸	21	16	76.1	29 (median)
Kuboki et al ³	9	9	100	19 (median)
TPN or MCT diet (no differentiation)				
van der Gaag et al ¹	66	66	100	3.5 (median)
Zhao et al ⁵	9	9	100	7 (median)
Tulunay et al ⁶	24	17	71.0	28 (median)
Matsuda et al ¹⁴	9	9	100	No data
Baek et al ¹⁵	48	48	100	7.4 (mean)
Assumpcao et al ¹⁹	47	40	85.1	13 (median)
Madanur et al ²¹	3	3	100	28 (median)
Nishigori et al ¹³	8	8	100	4 (median)
TPN + primary addition of octreotide				
Kuboki et al ³	11	11	100	12 (median)
TPN or MCT diet + primary addition of octreotide				
Capocasale et al ²⁵	8	8	100	12.3 (mean)

MCT = medium chain triglyceride; TPN = total parenteral nutrition.

in laparoscopic colorectal surgery. An increased length of stay was also reported for patients after pancreaticoduodenectomy and lymph fistula (15 vs 12 days).¹

A significantly increased tumor recurrence rate (22.2% vs 3.9%) and a reduced 3-year disease-free survival rate (76.2% vs 93.4%) has been reported in colorectal cancer surgery by Matsuda et al.¹⁴ However, the absolute number of patients with chylous ascites was low in this study (n = 9), and the 3-year overall survival was not impaired.¹⁴ In pancreatic surgery, those patients with contained chyle leaks had a 3-year-survival comparable with those patients without any chylous fistula (46.9% vs 53.4%).¹⁹ However, patients with diffuse chylous ascites tended to have a worse 3-year-survival rate (18.8%), which can be attributed to postoperative complications and early demise, or delayed adjuvant chemotherapy.¹⁹

Comments

Postoperative chylous ascites is a common phenomenon in abdominal surgery that causes significant prolongation of hospital length of stay and thus increases healthcare costs. However, the evidence on this issue is limited. Chylous ascites is commonly believed to be the result of direct trauma to the cisterna chyli or one of its branches with subsequent lymphatic leakage into the peritoneal cavity. Chylous ascites may cause significant morbidity including malnutrition, dehydration, immunosuppression, or septic complications because of superinfection.^{12,38,39}

Based on the literature that has been reviewed, the incidence of postoperative chylous ascites varies between

different types of surgery. While the reported incidence is remarkably low in gynecologic surgery,^{4–6} up to 6.6% of patients in colorectal surgery¹⁵ and up to 11%¹ of patients in pancreatic surgery are affected by postoperative chylous ascites. However, definition criteria of chylous ascites differ between publications and clinical detection and documentation may be vague. Most data on the incidence of postoperative chylous ascites are published for pancreatic surgery, in which the incidence of chylous ascites seems to be highest. This is because of the necessity of an extensive dissection of lymphatic tissue along the superior mesenteric artery and the celiac trunk and the proximity of the surgical field to the cisterna chyli in oncologic pancreatic surgery.

Up until now, there has been no common definition or diagnostic criteria for chylous ascites. All publications which were analyzed have based the diagnosis on clinical parameters. Therefore optimal placement of drainage tubes is a prerequisite for postoperative detection of chylous ascites. After thorough evaluation of the literature, a clinically significant postoperative chylous ascites is best defined as the appearance of milky,^{1,3,6,13,15–19,25,26,33} non-purulent^{15,18} fluid in the abdominal cavity or in drainage tubes, with a triglyceride level greater than 110 mg/dL^{3,6,15,18,19} and a daily minimum volume of 200 mL.^{15,19,22} A microbiological culture and a white blood cell count are indispensable to rule out infection. Further laboratory tests of the drainage fluid may be obtained optionally if there is any doubt about differential diagnosis. Chylous ascites can be exactly graded into Grade A, B, and C by using criteria defined by van der Gaag et al.¹ Grade A chylous ascites is described as chylous leakage persistent for less than 7 days.¹ Grade B chylous ascites requires

therapeutic measures and resolves within 7 to 14 days.¹ Any duration of chylous ascites longer than 14 days despite therapy and the requirement of surgical intervention or re-admission to hospital is defined as Grade C.¹

Factors that imply more extensive surgery or extended manipulation of the lymphatic vessels are predictive for chylous ascites. According to the literature, the risk for postoperative chylous ascites increases in extended resections, because it correlates with the number of lymph nodes harvested,^{6,19,26,27} concomitant vascular resection^{9,19} or manipulation of the paraaortic area,^{3,4} retroperitoneal tumor invasion,³ and increased blood loss.⁸ In line with this, a history of chronic pancreatitis¹ was also associated with an increased risk. One could hypothesize that long-standing inflammation complicates surgery and requires a more extensive surgical approach. It is of note that female sex¹ was also cited as a risk factor. Yet, pathophysiological explanations for this fact are unknown.

The effects of early enteral feeding via a feeding jejunostomy in upper gastrointestinal surgery are controversially discussed.^{40–43} Watters et al⁴⁴ argued that early enteral feeding may impair postoperative vital capacity, forced expiratory volume (FEV1), and mobility. With regard to chylous ascites, early enteral feeding via a feeding jejunostomy has been shown to increase risk.³ Noji et al¹⁷ showed that early oral feeding with liquid diet and 15 g fat from postoperative day 3 also increased the rate of chylous ascites. Therefore, routine use of a feeding jejunostomy cannot be recommended and a fat-containing diet before the 4th postoperative day should be avoided. An intraoperative milk test with insertion of 100 mL milk via a nasogastric tube reduces the incidence of postoperative chylous ascites.¹⁸ Although this is not a standard procedure, such a test may be used in cases of increased risk for chylous ascites.

Conservative treatment is sufficient in resolving chylous ascites in up to 100% of the cases,^{8,17,20,22,27} especially when patients are treated with TPN.^{8,17,20,27} MCT diet provides the advantage of continued oral diet, and reported success rates in suspending chylous ascites are lower than with TPN. However, this review of the literature did not reveal any study comparing TPN with MCT diet in a randomized controlled manner. Because the reported results provide a tendency toward a higher effectiveness of treatment with TPN, we recommend using TPN for treatment of clinically significant chylous leakage (eg, a volume >200 mL/day). MCT diet may be used for cases with a volume smaller than 200 mL/day or when TPN is contraindicated.

Octreotide, a somatostatin analog, which is often used in addition to TPN or MCT diet, decreases postoperative pancreatic fistula after pancreatic surgery, and its potential adverse effects are minor.^{45–47} A current Cochrane review showed a reduction in postoperative complications by 31%, and octreotide therapy was aborted in only 1.3% of patients, but no serious adverse effects were reported.⁴⁵ When TPN was compared with TPN plus octreotide, Kuboki et al³ showed a shorter time to resolution of chylous ascites when TPN was combined with octreotide. However,

these data were based on a small retrospective clinical analysis including only 21 patients. Nevertheless, the costs of any additional day in the hospital by far outweigh the costs of octreotide. Given the low risk-benefit profile of octreotide and the potentially favorable economic effects of a shortened length of hospital stay, the administration of octreotide in addition to TPN should be considered in any patient with clinically significant chylous ascites.

Surgical and interventional approaches should be reserved for cases that are refractory to conservative treatment. Especially when the daily volume of chylous leakage is less than 500 mL, bipedal lymphangiography with lipiodol seems to be a promising tool with occlusion rates of the chylous leakage reaching up to 70%.³² The evidence for treatment of chylous ascites not amenable to conservative treatment or lymphangiography is extremely scarce. In these cases, open surgical ligation of the leaking vessels or the implantation of a peritoneovenous shunt are an option, although they carry a higher rate of morbidity.^{12,19}

Patients with postoperative chylous ascites show a good outcome with conservative treatment. Analyzing patients with chylous ascites after pancreatic surgery, Assumpcao et al¹⁹ found that the majority of patients with chylous ascites show a mean time to resolution of the leakage of 13 days and the 3-year survival is comparable with those patients without chylous leakage. This is in line with findings that show an unimpaired 3-year survival of patients with chylous ascites in colorectal surgery.¹⁴ Nonetheless, chylous ascites prolongs the length of hospital stay¹⁴ and significantly increases treatment costs, and therefore an early and consequent therapeutic approach should be sought.

Conclusions

In conclusion, postoperative chylous ascites is not a frequent but an important clinical issue, especially in pancreatic surgery. It is mainly predicted by the extent of lymphadenectomy and lymphatic tissue dissection. In the early postoperative course, fat-containing enteral feeding should be avoided before the 4th postoperative day. In cases with increased risk of chylous ascites, an intraoperative milk test may be considered. Once diagnosed, TPN provides a high efficacy in resolving chylous ascites. Addition of octreotide may be an option to shorten leakage time. If conservative treatment fails, bipedal lymphangiography can be utilized. Any other cases refractory to therapy may be considered for open surgery. Overall, the evidence for chylous ascites is sparse and randomized controlled trials are lacking. Further clinical research is urgently needed to enhance prevention, diagnosis, and treatment of this relevant surgical problem.

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