

## BRIEF COMMUNICATION

# Chylous ascites following laparoscopic live donor nephrectomy: A new improved treatment paradigm

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**Abstract**

Chylous ascites is a difficult, albeit uncommon complication of laparoscopic live donor nephrectomy (LLDN). Lymphatic leak is believed to be a result of injury to the cisterna chyli, regional lymph nodes, or other peri-aortic lymphatics intraoperatively. Recommended management with dietary modifications can result in malnutrition and immunodeficiency. We present four patients who developed chylous ascites following LLDN. Approach to these patients evolved over time. Our initial two patients were successfully treated with a combination of surgical intervention followed by drain placement, after the failure of conservative management. The latter two cases were successfully treated with prompt intra-abdominal drain placement, without dietary modifications. Our cohort challenges the standard of care for treatment of chylous ascites after LLDN. We believe that prompt diagnosis and placement of an intra-abdominal drain can be used safely in select patients that develop this complication. We hypothesize that continuously draining the lymphatic leak, thus avoiding the re-accumulation of ascites, allows bowel and mesentery to make contact and adhere to the retroperitoneal tissue. We believe that prompt, initial, percutaneous drain placement is a viable alternative to both conservative and reoperative management in the treatment of chylous ascites after LLDN and should be considered as a reasonable first-line therapy.

## 1 | INTRODUCTION

Since the first successful live donor renal transplant in 1954, the dictum has been that living donor safety is paramount. Although donor nephrectomy peri-operative morbidity and mortality are low in the laparoscopic era, the known complication of chylous ascites can be particularly problematic. Although the exact location is unknown, the cisterna chyli main tributaries, regional lymph nodes or other lymphatics, can be injured during surgical dissection around the peri-aortic region, potentially leading to a lymphatic leak.<sup>1</sup>

Historically, chylous ascites was believed to be a rare complication following retroperitoneal surgery but has also been seen after laparoscopic donor nephrectomy when a transperitoneal approach has been utilized.<sup>2,3</sup> The incidence of chylous ascites after laparoscopic nephrectomy has been reported to range from 0.6% to 5.9%, posing significant morbidity and mortality to the patient.<sup>4-6</sup>

Although chylous ascites is a known complication associated with laparoscopic live donor nephrectomy (LLDN), there are currently no standardized management guidelines. Conventional treatment has consisted of dietary modification including a low-fat diet, dietary supplements with medium and short chain triglycerides, and even total parental nutrition (TPN).<sup>2</sup> Medical management is often prolonged and debilitating, resulting in malnutrition and immunodeficiency.<sup>5</sup> Alternative options such as paracentesis, temporary intra-abdominal drain placement, and surgical intervention have been reserved for patients that fail conservative management.<sup>1,2,7,8</sup> The determination of failure of medical management usually occurs on average around eight weeks and even those patients that have had resolution of the ascites are instructed to maintain strict dietary restrictions for up to six months.<sup>4</sup>

Given the high failure rate of conservative therapy with the potential adverse effects of this approach, along with the lifestyle

burden it imparts on the patient, we report our experience with four cases of chylous ascites as a complication of LLDN. Two of these four cases were successfully treated with a combination of surgical intervention followed by drain placement, after the failure of conservative management. The other two cases were effectively resolved with prompt percutaneous intra-abdominal drain placement. Herein, we describe the evolution of our approach to this difficult complication.

## 2 | CASE REPORTS

### 2.1 | Donor A

Donor A was a 48-year-old woman who underwent a left-sided LLDN in 8/2008 at another institution (Table 1). Approximately one week post-operatively, she developed abdominal distention which prompted evaluation. A CT of the abdomen and pelvis demonstrated ascites. The patient underwent a paracentesis. About 4L of chylous fluid was removed. She had multiple paracentesis over the next 7-10 days, with approximately 5L removed per procedure, followed by recurrent ascites accumulation. During this time she was also managed with parenteral alimentation and low-fat diet. Her follow-up was complicated by the development of cholecystitis. She presented to our institution in 12/2008 for a second opinion. We performed a laparoscopic cholecystectomy and exploration. Copious lymphatic drainage was found in the left renal fossa. Although no discrete area of the lymphatic leak could be identified, the area was oversewn and surgical adhesives along with hemostatic agents were topically applied to the area. A 19 French closed-suction drain was left in the left renal fossa and along the left paracolic gutter. Immediately postoperatively, there was 400 ml per hour of milky white fluid. Drainage fluid was analyzed and showed 1365 nucleated cells with 98% lymphocytes and 640 triglycerides (Table 2). Diagnosis of chylous ascites was confirmed. During her admission, her output decreased to 200 ml per hour. By the time of discharge on postoperative day three, there was 1.4L of chylous ascites draining per day. She was instructed to maintain a low-fat diet until seen for follow-up. She was seen in clinic eleven days post-operatively. By this time, the drainage had stopped. Her abdominal distention had resolved, and the drain was removed. She resumed a normal diet without further re-accumulation.

**TABLE 1** Donor characteristics

	Donor A	Donor B	Donor C	Donor D
Age	48	69	48	42
Sex	F	F	F	M
BMI	20.6	24.9	32.4	30.3
Donor side	Left	Left	Left	Left
Anatomy				
artery (n)	na	1	2	1
vein (n)	na	1	1	1

### 2.2 | Donor B

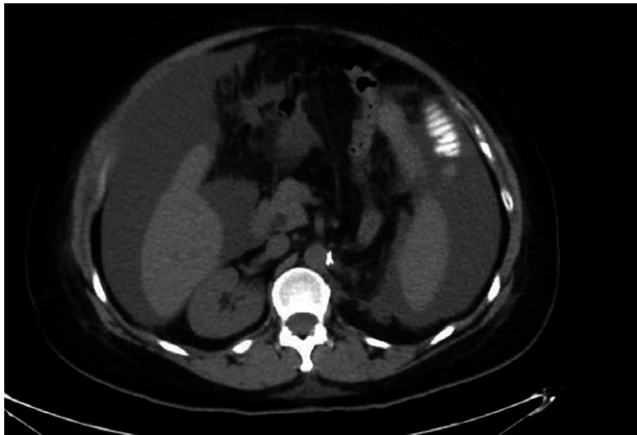
Donor B was a 69-year-old woman who underwent left-sided LLDN in 9/2009 (Table 1). She had an uncomplicated peri-operative course and was discharged home on post-operative day two. One month after surgery, she was readmitted with abdominal distention. Ultrasonography confirmed the presence of ascites. A paracentesis was performed that removed 3.5L of milky white fluid. Analysis showed 4700 nucleated cells with 86% lymphocytes and 1997 triglycerides, consistent with chylous ascites (Table 2). She was managed conservatively over the next two months, initially on low-fat diet and underwent multiple large volume paracentesis that drained between 1.7L to 3.5L each time. Given the recurrent accumulation of ascites, she was switched from a fat-free diet to TPN, which was complicated by candida albicans fungemia. The chylous ascites failed to resolve after two months of conservative management. In 12/2009, she underwent laparoscopic exploration. Milky white fluid was encountered during camera port placement with drainage of 6L. No discrete location of chyle leak could be identified. The area of diffuse chyle leakage was cauterized and oversewn. A 19 French closed-suction drain was placed in the left lower quadrant along the paracolic gutter extending to the left renal bed. Initially, there was over 3L a day of chylous output. Drainage continued to decrease until post-operative day five when she was discharged. As an outpatient, output varied between 1.2L-2L per day. She was managed with a low-fat diet post-operatively. She was seen weekly in the clinic and continued to have decreasing output and resolution of abdominal distention. At four months after the reoperation, her drain output ceased and was subsequently removed.

### 2.3 | Donor C

Donor C was a 48-year-old woman that underwent left-sided LLDN in 11/2016 (Table 1). She had an uncomplicated postoperative course and was discharged home on post-operative day two. She was readmitted one month later with periumbilical pain and abdominal distention of two weeks duration. CT abdomen and pelvis revealed ascites (Figures 1 and 2). Paracentesis removed 2.5L of milky white fluid. Analysis showed 1437 nucleated cells with 69% lymphocytes and 885 triglycerides, confirming the diagnosis of chylous ascites (Table 2). After confirmation, a 16 French intermittent drainage device (Aspira) was placed under fluoroscopic guidance with the catheter tip in the mid-abdomen on the right side. This immediately yielded the removal of an additional 7L. She was instructed to continue low-fat diet, and she was prescribed medium chain triglyceride supplements with meals. She was readmitted to the hospital five days after drain placement due to decreased drain output and cellulitis around the drain insertion site. She was started on antibiotics and the drain was removed. She was discharged home from the hospital after four days, without a drain and was seen several times in clinic without re-accumulation of fluid, tolerating a regular diet.

**TABLE 2** Donor fluid paracentesis analysis

	Diagnostic criteria	Donor A	Donor B	Donor C	Donor D
Total nucleated cells (mg/dL)	>500	1365	4700	1437	8800
% Lymphocytes	>50	98	86	69	97
Triglycerides (mg/dL)	>110	640	1997	885	716

**FIGURE 1** Computed tomography scan abdomen/pelvis of donor C one-month post-laparoscopic live donor nephrectomy demonstrating free-flowing fluid, consistent with ascites

## 2.4 | Donor D

Donor D was a 42-year-old man who underwent left-sided LLDN in 8/2018 (Table 1). He had an uncomplicated course and was discharged home on post-operative day one. He was readmitted one month later complaining of two weeks of increasing abdominal distention and pain. A CT of the abdomen and pelvis demonstrated new ascites. Fluoroscopic-guided percutaneous drain placement using a 10.2 french Dawson-Mueller catheter<sup>®</sup> into the left lower quadrant immediately yielded 6L of milky white fluid. Laboratory analysis revealed 8800 nucleated cells with 97% lymphocytes and 716 triglycerides (Table 2). Diagnosis of chylous ascites was confirmed. Drain output decreased over his admission to 2.8L a day on the day of discharge. He was hospitalized for three days. He was discharged without any dietary modifications or restrictions. One week post drain placement his output decreased to 1.1L– 1.7L per day with resolution of abdominal distention. After two weeks, his drain output had decreased to less than 30 mL in 24 hours. His drain was removed twenty-two days post drain placement without re-accumulation of ascites or recurrence of symptoms.

## 3 | DISCUSSION

LLDN is the standard of care in most transplant institutions. Overall, surgical complications have decreased since the transition from an open to a laparoscopic procedure. It has been shown that patients who undergo a laparoscopic approach have earlier functional

**FIGURE 2** CT abdomen/pelvis of Donor C one-month post-laparoscopic live donor nephrectomy illustrating large ascites

recovery, less postoperative pain and return to work sooner.<sup>9</sup> One surgical complication that continues to be seen post-LLDN is chylous ascites.

Elemental diet and TPN have been considered first-line conservative management options in the treatment of chylous ascites.<sup>3,10</sup> Bowel rest and low-fat diet are thought to decrease lymphatic flow, sealing the leak over time. Potential pitfalls in this treatment regimen include malnutrition, immunodeficiency, as well as potential psychological implications. Conservative management results in prolonged treatment courses during which patients continue to lose protein and lymphocytes and continue to experience discomfort.<sup>11</sup> As many as 24%–40% of patients fail conservative therapy and require more aggressive management such as paracentesis, intra-abdominal drain placement, and even surgical exploration.<sup>1,5,12</sup> Although surgical exploration and therapeutic lymphangiography is reserved for those patients that have failed initial management, these patients are still routinely managed with drain placement, dietary modifications and bowel rest postoperatively.<sup>12,13</sup>

Within our cohort of patients, the first two donors were conservatively managed, both ultimately failing. Despite conservative

**TABLE 3** Summary of Initial Donor Management and Complications

	Donor A	Donor B	Donor C	Donor D
Approximate time (days) after donor nephrectomy to diagnosis of chylous ascites	7	30	30	30
Initial management	Paracentesis TPN Low-fat diet	Paracentesis TPN Low-fat diet	Paracentesis Intermittent drainage device Low-fat diet Medium chain triglyceride Supplementation	Percutaneous drain placement
Complications	Cholecystitis	Candida albicans fungemia	Cellulitis	None

management and multiple procedures to drain the ascites, donor A required surgical intervention with drain placement. After continuous drainage, the output decreased to nil over eleven days without re-accumulation. Donor B experienced life-threatening complications from conservative management. During her TPN administration, she developed fungemia. She ultimately required exploratory laparoscopy with drain placement. Drain removal was delayed to four months because of continued output, but ultimately had resolution of symptoms and lymphatic leak. In contrast, donor C and donor D had drains placed as soon as the diagnosis of chylous ascites was made. The drain from donor C was removed after only five days secondary to cellulitis around the drain insertion site, but she showed no evidence of re-accumulation. Donor D did not experience any complications from the drain placement (Table 3). Drainage continued to decrease over a three-week period, and the drain was removed without any return of ascites.

Our cohort challenges the standard of care for treatment of chylous ascites after LLDN. Previously used treatment options have considerable adverse effects. We feel prompt diagnosis and placement of an intra-abdominal drain can be used safely in select patients that develop this complication and should be first-line therapy. We hypothesize that continuously draining the lymphatic leak, thus avoiding the re-accumulation of ascites, allows the bowel and mesentery to make contact and adhere to the retroperitoneal tissue. Therefore, limiting the potential space for lymph accumulation and resulting in a seal of the damaged lymphatics. Although prompt re-exploration has been postulated as a potential first-line treatment option, we have learned from the donors A and B that it is extremely difficult to identify a discrete source amenable for operative intervention.<sup>14</sup> The resolution of chylous ascites in donors A and B was believed to be from drain placement, as opposed to surgical intervention given that a discrete lymphatic leak could not be identified at the time of surgery, and because high lymphatic output persisted in the early peri-operative period. Although therapeutic lymphangiography has been proposed as a potential intervention, these patients routinely have a drainage catheter in situ, which may explain the improvement in the chylous leak.<sup>13</sup> Percutaneous drain placement may be a safer, less invasive option, and may provide faster resolution of the problem. Our findings challenge the algorithm postulated by Jairath et al who stated drains with greater than 1000 ml per day should have immediate surgical exploration.<sup>12</sup> Donors C and

D underwent drain placements with outputs greater than 1000 ml per day of drainage fluid and did not require surgical intervention to achieve resolution of the chyle leak. Differences in donor BMIs were noted where donors C and D had higher BMI than donors A and B. It is uncertain if this difference is clinically significant.

Since 2005, five surgeons have performed 1563 LLDN at our institution, resulting in three cases of chylous ascites for an incidence of 0.19%. To date, none of our surgeons have experienced this complication twice. Given the relatively low incidence rate at our institution, routine drain placement after LLDN does not seem appropriate and may lead to more harm than benefit. Although all of our patients who had chylous ascites underwent a left-sided LLDN, it may not be a complication limited to the left side. In our series of >1500 cases, the left kidney was used 91% of the time. Given the low usage of right LLDN this may be the reason, we have yet to see this associated complication. Surgical considerations during a left vs right LLDN may also explain why this complication may be limited to the left side. During the dissection of the left kidney, there is close proximity to the aorta in order to gain adequate renal artery length.<sup>15</sup> In contrast, the right renal artery is usually considerably longer and the proximity of the dissection to the aorta is significantly less. With this said, there may be a higher likelihood of disrupting the para-aortic lymphatics during a left LLDN compared to a right LLDN. In conclusion, we believe that prompt drain placement is a viable alternative to both conservative and reoperative management in the treatment of chylous ascites after LLDN and should be considered as a reasonable first-line therapy.

#### CONFLICT OF INTEREST

None.

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