Cureus
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Open Access Case Report

Beyond Drainage: Octreotide for Persistent Chyle Leak Following Robotic Partial Nephrectomy

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Review began 10/05/2026
Review ended 10/28/2026
Published 11/06/2026

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DOI: 10.7759/cureus.119233

Abstract

Chyle leak is a rare complication of renal surgery caused by disruption of retroperitoneal lymphatics and is infrequently reported following robotic partial nephrectomy. Unlike direct lymphatic ligation in open surgery or ultrasonic sealing commonly employed in laparoscopy, robotic dissection frequently relies on surgical decision-making, which may not provide definitive lymphatic sealing. We report the case of a 66-year-old man who underwent left robotic partial nephrectomy for a renal tumour. His immediate postoperative course was uneventful, with only serosanguinous drain output, permitting discharge after drain removal on postoperative day (POD) 4. However, on routine follow-up imaging on POD 10, an approximately 200-mL perirenal collection was detected. On POD 11, ultrasound-guided pigtail drainage was performed, and biochemical analysis of the drained fluid confirmed a chyle leak. In view of persistent chylous drain output, a structured conservative strategy comprising continued percutaneous drainage, dietary fat restriction, and intramuscular octreotide was instituted. Following initiation of octreotide, there was a progressive reduction in chyle output with concomitant resolution of the perirenal collection. The leak ultimately resolved without the need for lymphangiographic intervention or surgical re-exploration. This report shows that persistent chyle leakage can be challenging to manage, highlighting the potential role of somatostatin analogues such as octreotide in facilitating conservative resolution.

Categories: Urology, General Surgery, Healthcare Technology
Keywords: chyle leak, lymphatic injury, octreotide, robotic partial nephrectomy, robotic surgery

Introduction

While haemorrhage and urinary leakage are well-recognized complications, postoperative chyle leak is rare and may be overlooked [1]. The reported incidence of chyle leak after renal surgery ranges from 0.6% to 5.9%, largely from donor, radical, and laparoscopic series [2-4]. Chyle leak results from inadvertent disruption of retroperitoneal lymphatic channels closely related to the renal hilum and great vessels, with left-sided renal surgery being particularly relevant because of the regional lymphatic anatomy. Although uncommon, persistent lymphatic drainage or a recurrent collection can be troublesome, delaying recovery and potentially resulting in nutritional, metabolic, and immunological consequences [5].

Robotic partial nephrectomy has become an established nephron-sparing approach for localized renal tumours, offering enhanced visualization, instrument dexterity, and precise dissection [6]. After robotic partial nephrectomy, chyle leak has been described only in isolated case reports and small series [2,7].

The technique of lymphatic control differs across surgical approaches. During open surgery, identifiable lymphatic channels can be directly ligated with sutures, whereas laparoscopic surgery commonly employs ultrasonic energy devices that simultaneously divide and seal small vascular and lymphatic channels [8]. Lymphatics may be controlled by suture ligation, clips, bipolar energy, or vessel-sealing devices in open, laparoscopic, and robotic surgery alike; however, small, thin-walled lymphatic channels encountered during hilar dissection may be divided without being recognised, whichever technique is used [4,9].

The established management of chyle leak is conservative. It rests on adequate drainage and reducing lymph production through dietary fat restriction, using a low-fat or medium-chain triglyceride diet, with bowel rest and parenteral nutrition kept for refractory leaks [4,5]. Octreotide, a somatostatin analogue, reduces intestinal fat absorption, splanchnic blood flow, and lymphatic flow. It has been used as an adjunct to hasten closure of disrupted lymphatics [4,10]. However, its additional benefit over drainage and diet alone has not been tested in controlled studies, and failures have been reported

Most reported chyle leaks after robotic partial nephrectomy present early with high-volume chylous drainage. We describe the case of a delayed, clinically silent chylous collection that appeared after low early drain output and drain removal. It resolved with percutaneous drainage, dietary modification, and octreotide as an adjunct, without lymphatic intervention or reoperation.

How to cite this article
Katari Gopalakrishnan V, M J, Yedulla Reddy R, et al. (November 06, 2026) Beyond Drainage: Octreotide for Persistent Chyle Leak Following Robotic Partial Nephrectomy. Cureus 18(11): e119233. DOI 10.7759/cureus.119233

Case Presentation

A 66-year-old man was incidentally found to have a left renal mass. Contrast-enhanced CT urography demonstrated a well-defined, predominantly exophytic lesion measuring 1.6 × 1.7 × 2.1 cm arising from the lower pole of the left kidney, with heterogeneous arterial enhancement and venous-phase washout (Figures *1*, *2*). The RENAL (Radius, Exophytic/endophytic properties, Nearness, Anterior/posterior, Location) nephrometry score [11] was 4a, and the PADUA (Preoperative Aspects and Dimensions Used for an Anatomical) score [12] was 6. Following preoperative evaluation, the patient was advised transperitoneal robotic left partial nephrectomy.

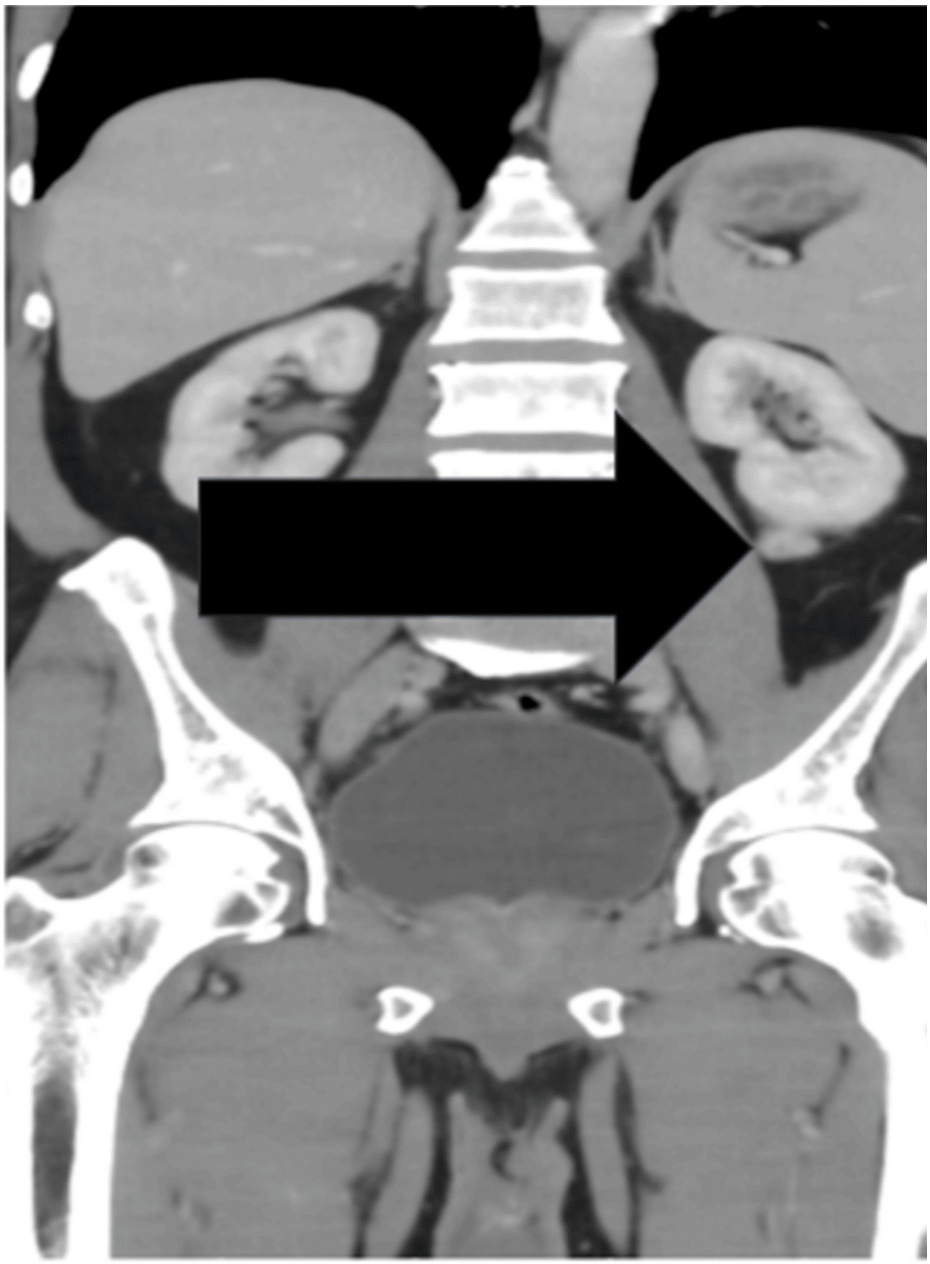


FIGURE 1: Contrast-enhanced CT urography (coronal view) showing an iso- to hypodense exophytic lesion measuring 1.6 × 1.7 × 2.1 cm arising from the lower pole

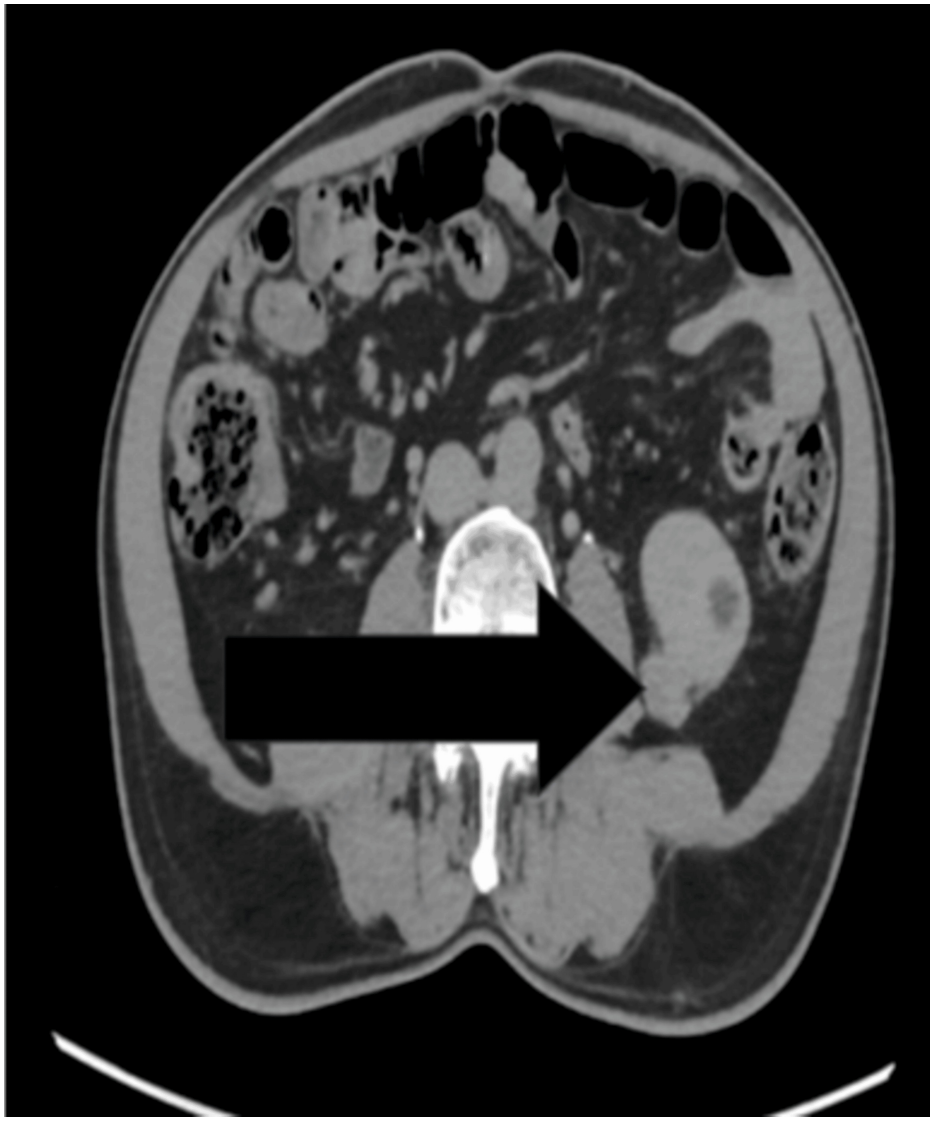


FIGURE 2: CT urography (axial view) showing an iso- to hypodense exophytic lesion measuring 1.6 × 1.7 × 2.1 cm arising from the lower pole

The kidney was mobilized, and the renal hilum was approached posteriorly. The renal artery was meticulously dissected, looped, and clamped, while the renal vein was preserved. The tumour was sharply excised with a margin of normal renal parenchyma, followed by renorrhaphy using 4-0 PDS (polydioxanone) sutures reinforced with Weck Hem-o-lok polymer ligation clips (Teleflex Incorporated, Wayne, Pennsylvania, United States). The warm ischaemia time was 25 minutes, with an estimated blood loss of approximately 100 mL. No apparent injury to the collecting system or identifiable lymphatic channels was noted intraoperatively. A drain was placed in the renal fossa at the completion of the procedure.

The immediate postoperative course was uneventful. The drain output remained serosanguinous, measuring 35 mL, 45 mL, and 25 mL on postoperative days (PODs) 1, 2, and 3, respectively, and the drain was removed on POD 4, following which the patient was discharged. Histopathological examination confirmed renal cell carcinoma, pT1a, Grade 2, measuring 2.1 cm, with negative surgical margins.

At routine follow-up on POD 10, the patient was asymptomatic and afebrile. Surveillance ultrasonography, however, revealed a heterogeneous collection in the left perinephric space adjacent to the lower pole of the left kidney with internal solid components (likely clots) and a few septations noted in the left lumbar region, inferior and anterior to the left kidney, measuring ~ 8.3 x 7.5x 6.4 cm, volume ~ 200 cc. Color Doppler ultrasound showed no internal vascularity, and there was no hydronephrosis. On POD 11, ultrasound-guided pigtail drainage yielded approximately 200 mL of curdy-white fluid (Figure *3*).



FIGURE 3: Post ultrasound-guided drain insertion yielding approximately 200 mL of curdy-white fluid

Biochemical analysis demonstrated a drain-fluid triglyceride concentration of 4490 mg/dL with positive chylomicrons (Table *1*). Drain-fluid creatinine was 0.8 mg/dL, and bacterial culture showed no growth. These findings confirmed the diagnosis of a postoperative chyle leak.

Drain Fluid	Observed value	Reference value
Triglycerides	4490 mg/dl	187 mg/dL (2.13 mmol/L)
Chylomicron	Present	Absent
Creatinine	0.8 mg/dL	100mg/dl (urine creatinine) 1.0mg/dl (serum creatinine)

TABLE 1: Biochemical parameters of drain fluid suggestive of chylous ascites

A conservative management strategy comprising continued percutaneous drainage, dietary fat restriction, and octreotide. Octreotide LAR (long-acting release) 30 mg IM, single dose (long-acting depot formulation), was initiated on POD 12. Following initiation of therapy, drain output declined progressively to 40 mL on POD 13, 25 mL on POD 14, and 10 mL of serous fluid on POD 15. Follow-up ultrasonography demonstrated near-complete resolution of the perinephric collection, with approximately only 2 mL of residual fluid. The pigtail drain was subsequently removed on POD 15 (Table *2*), and the patient remained asymptomatic on follow-up at two weeks, one month, and three months.

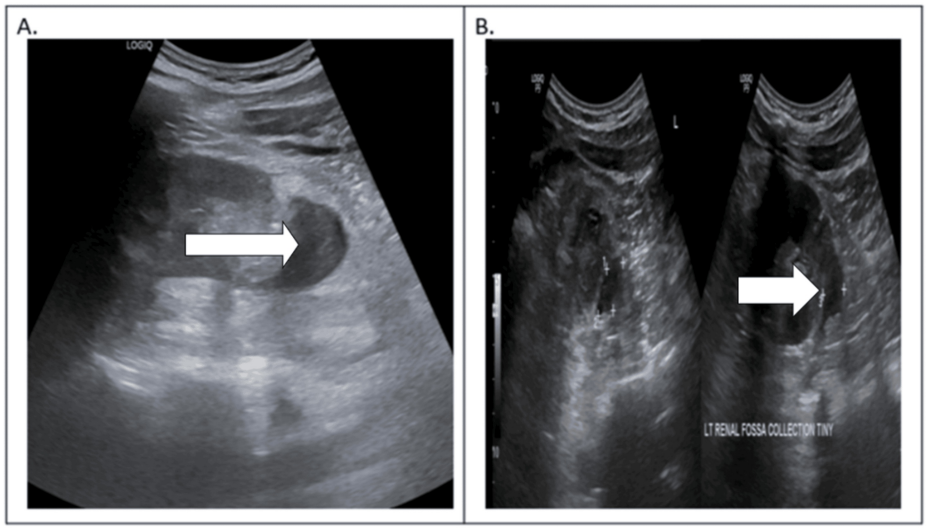


FIGURE 4: Ultrasound images of the left kidney.

(A) POD 10: a perinephric fluid collection of approximately 200 mL adjacent to the lower pole of the left kidney (white arrow), before pigtail drainage. (B) POD 15, after percutaneous drainage, dietary fat restriction, and octreotide: near-complete resolution of the collection, with approximately 2 mL of residual fluid (white arrow).

POD: postoperative day

Day	Event/Details
Day 0	Robotic partial nephrectomy with left renal tumour (2.1 cm). Warm ischaemia time: 25 minutes; Estimated blood loss: ~100 mL; No apparent collecting-system or lymphatic injury; Drain placed in renal fossa
Days 1–3	Uneventful postoperative recovery; Drain output (serosanguinous): Day 1: 35 mL, Day 2: 45 mL, Day 3: 25 mL
Day 4	Drain removed. Patient clinically well
Day 10	Delayed asymptomatic collection. Patient asymptomatic, afebrile, and pain-free; USG abdomen: ~200 mL perinephric collection
Day 11	Chyle leak confirmed. Pigtail drainage performed → ~200 mL curdy-white fluid; Triglycerides: 4490 mg/dL; Chylomicrons: positive; Drain creatinine: 0.8 mg/dL; Culture: no growth
Day 12	Octreotide initiated management: octreotide + low-fat diet + percutaneous drainage
Day 13	Drain output: 40 mL
Day 14	Drain output: 25 mL
Day 15	Conservative resolution. Drain output: 10 mL (serous); USG abdomen: ~2 mL residual collection; Pigtail drain removed; Patient well on follow-up
Outcome: Complete conservative resolution – No re-intervention	

TABLE 2: Clinical timeline of delayed chyle leak and its resolution following robotic partial nephrectomy.

The table illustrates the postoperative course from robotic partial nephrectomy through delayed detection and biochemical confirmation of the chyle leak, followed by conservative management and progressive resolution.

Discussion

Chyle leak is a recognised complication of retroperitoneal surgery, particularly when extensive hilar, caval, or para-aortic dissection and lymph node harvesting are performed. In a series of 445 patients who underwent radical nephrectomy with thrombectomy, chyle leak occurred in 9.9% [9]. It has also been reported after laparoscopic donor nephrectomy, in which the left renal hilum is dissected close to the para-aortic lymphatics [13]. After partial nephrectomy, in which hilar dissection is more limited, chyle leak is considerably less common and is described mainly in isolated case reports.

Although rarely life-threatening, persistent leakage can complicate an otherwise successful postoperative course through prolonged drainage, recurrent collections, nutritional depletion, and delayed recovery; in Chen et al.'s study of 445 patients, chyle leak significantly prolonged hospital stay, although it did not affect long-term oncological outcomes [9]. The present case is noteworthy for its delayed, clinically silent presentation following an uncomplicated robotic partial nephrectomy, and its successful resolution with conservative management incorporating octreotide.

The retroperitoneum contains an extensive and variable network of lymphatic channels closely related to the renal hilum and great vessels. Renal lymphatics communicate with the para-aortic and paracaval lymphatic pathways, making them susceptible to inadvertent injury during hilar and retroperitoneal dissection. Chyle leakage is reported more frequently following left-sided renal surgery, reflecting the anatomical relationship of the major lymphatic pathways and cisterna chyli to the left para-aortic region; side of surgery was an independent risk factor for chyle leak in Chen et al.'s study [9].

The risk of lymphatic injury appears to depend mainly on the extent of hilar and retroperitoneal dissection, laterality, and individual lymphatic anatomy, rather than on the surgical platform itself. In the study by Chen et al., independent risk factors included the side of surgery, operative approach, operative time, and the number of lymph nodes harvested, all of which reflect the extent of dissection [9]. Identifiable lymphatics can be controlled by suture ligation, clips, or energy-based sealing with any surgical approach, and a leaking lymphatic can be identified and controlled laparoscopically even at re-operation [13]. However, small, thin-walled lymphatic channels may be divided without being recognised during hilar dissection, whichever technique is used. In our patient, the left renal artery was dissected circumferentially through a posterior hilar approach for clamping, close to the left para-aortic lymphatics, which is the most likely site of injury. This supports careful identification and clipping or ligation of lymphatic tissue during hilar dissection, particularly on the left side.

Most chyle leaks become apparent early, while a drain is still in place: in the study by Chen et al., all leaks were evident within six days of surgery, with a median of three days [9]. The current case differed in that the leak was clinically silent and contained within the perinephric space. Drain output remained low and serosanguinous, permitting drain removal on POD 4. The patient remained asymptomatic, and a 200-mL perinephric collection was detected only on surveillance ultrasonography on POD 10. A plausible explanation is that resumption of a normal, fat-containing diet after discharge increased lymph flow through a lymphatic channel divided during hilar dissection. This highlights that absence of early chylous drainage does not exclude lymphatic injury, and delayed postoperative collections following renal surgery should prompt consideration of a chyle leak. Diagnosis rests on analysis of the aspirated fluid. A triglyceride concentration of 187 mg/dL has been proposed as the optimal single cut-off for chylous ascites, and values above 187 mg/dL (2.13 mmol/L) give a specificity of more than 95% [14]. The drain-fluid triglyceride concentration of 4490 mg/dL in our patient, together with positive chylomicrons, was therefore diagnostic. Delayed presentation has also been described after robotic renal surgery: Hargis et al. reported chylous ascites presenting approximately seven weeks after robot-assisted radical nephrectomy with para-aortic lymphadenectomy, and noted a reported incidence of less than 1% to almost 6% after urological surgery [15].

Management of postoperative chyle leak follows a step-up approach, with conservative treatment preferred in clinically stable patients [16]. Percutaneous drainage allows decompression and monitoring, while dietary fat restriction reduces intestinal lymphatic flow. A low-fat diet supplemented with medium-chain triglycerides is preferred, because medium-chain fatty acids are absorbed directly into the portal venous circulation rather than through the intestinal lacteals. Bowel rest with total parenteral nutrition is reserved for high-output or refractory leaks [17].

Octreotide is a long-acting synthetic analogue of somatostatin. By acting on somatostatin receptors in the splanchnic vasculature and gut, it reduces splanchnic blood flow, gastric, pancreatic, and intestinal secretions, and intestinal absorption of triglycerides. This lowers lymph flow through the intestinal lymphatics and thoracic duct and allows disrupted lymphatic channels to seal [17]. It is usually added to drainage and dietary modification when chylous output persists or is high [15,17]. Octreotide has practical advantages: it is easy to administer, allows oral medium-chain triglyceride feeding to continue instead of parenteral nutrition, and has few adverse effects, chiefly gastrointestinal upset and cholelithiasis with prolonged use. Its main limitation is the quality of the evidence. Support comes from case reports and small series in which octreotide was given together with drainage and diet, and no comparative trials have defined its independent effect, optimal dose, or duration of treatment. Nor is it uniformly effective: in the patient reported by Hargis et al., output remained above 1 L/day despite octreotide, a low-fat diet, and parenteral

nutrition, and percutaneous intervention was required [15].

In the present case, chylous output persisted at 200 mL/24 h after 10 days of drainage and dietary fat restriction, and octreotide LAR 30 mg IM, single dose, was added on POD 12. Drain output subsequently declined from 40 mL on POD 13 to 25 mL on POD 14 and 10 mL on POD 15, with conversion to serous fluid. Follow-up ultrasonography demonstrated near-complete resolution, permitting drain removal on POD 15, and there was no recurrence over six months of follow-up. The close relationship between octreotide administration and declining drain output is noteworthy and is consistent with a contribution from octreotide. However, drainage and dietary modification were given concurrently; a low-volume leak may close spontaneously, and a single case cannot separate the effect of each measure. Octreotide LAR produces an initial release peak in plasma concentration within hours of intramuscular injection, before sustained levels are reached at about two weeks. This early peak has contributed to the prompt reduction in chyle output observed after administration, although the concurrent effects of drainage and dietary fat restriction cannot be separated. The response should therefore be interpreted as the result of a multimodal conservative strategy rather than of octreotide alone.

Failure of conservative treatment may warrant lymphangiography with embolization, needle maceration of the leaking lymphatics with glue embolization [15], or percutaneous obliteration using adhesive glue [18]. Thoracic duct stenting has been used when obstruction of the distal thoracic duct was found to underlie a persistent leak after left nephrectomy [19], while surgical identification and ligation of the leaking lymphatics are reserved for refractory cases and can be performed laparoscopically [13]. Intervention is generally considered when output remains high, at around 1000 mL/day or more, or when several weeks of conservative treatment have failed [15,17]. Successful conservative resolution in our patient avoided both lymphatic intervention and surgical re-exploration.

This report has the limitations inherent to a single case. The individual contributions of drainage, dietary modification, and octreotide cannot be separated; the leak was of relatively low volume, and lymphangiography was not performed to localise the site of leakage.

This case offers three practical lessons. First, careful identification and clipping or ligation of lymphatic tissue during left hilar dissection may reduce the risk of chyle leak. Second, a chyle leak may present as a silent perinephric collection after an apparently uneventful recovery and early drain removal, so a new collection should be aspirated and its fluid analysed. Third, when chylous output persists despite drainage and diet, octreotide is a reasonable, low-morbidity adjunct that may help avoid lymphatic intervention or re-operation.

Conclusions

A chylous collection can develop silently after robotic partial nephrectomy, even when early drain output is low and the drain has been removed. Surveillance imaging and analysis of fluid triglycerides allowed this to be recognised promptly in our patient. Percutaneous drainage, a fat-restricted diet, and octreotide used together were followed by resolution without lymphatic intervention or reoperation, and there was no recurrence at three months. Because a single case cannot separate the effect of each measure, the role of octreotide needs confirmation in larger series.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Vishnukumar Katari Gopalakrishnan, Roshan Yedulla Reddy

Acquisition, analysis, or interpretation of data: Vishnukumar Katari Gopalakrishnan, Jayasurya M, Velmurugan Palaniyandi, Sriram Krishnamoorthy

Drafting of the manuscript: Vishnukumar Katari Gopalakrishnan, Jayasurya M, Roshan Yedulla Reddy

Critical review of the manuscript for important intellectual content: Vishnukumar Katari Gopalakrishnan, Jayasurya M, Roshan Yedulla Reddy, Velmurugan Palaniyandi, Sriram Krishnamoorthy

Supervision: Roshan Yedulla Reddy, Velmurugan Palaniyandi, Sriram Krishnamoorthy

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support

was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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