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Original Article

Intractable chyluria: experience of 314 cases in a single center in China

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Abstract: This study aimed to retrospectively evaluate the clinical outcomes of 317 patients with intractable chyluria and present our experience with conservative and surgical management of intractable chyluria by different approaches. From September 2004 to June 2013, 314 patients with chyluria (133 men and 181 women) were recruited at our center. Instillation of povidone iodine (0.2%) was used for 46 patients. 53 patients with chyluria underwent renal pedicle lymphatic disconnection (RPLD) via the retroperitoneoscopic and conventional open approaches. 42 (91.3%) patients showed immediate clearance and chyluria recurred in 14 patients (33.3%). Retroperitoneoscopic renal pedicle lymphatic disconnection (RRPLD) or open surgery was performed successfully in all patients. With regard to operative time, intraoperative blood loss, postoperative intestinal recovery and hospital stay, retroperitoneoscopy was superior to conventional open surgery. Simplified RRPLD has the advantages of shorter operative time, shorter postoperative bed stay, shorter postoperative hospital stay and less pain while it does not significantly increase the recurred risk of chyluria at the same time compared with Standardized RRPLD and Modified RRPLD. In cconclusion, single dose of 0.2% povidone iodine sclerotherapy is safe and effective treatment for chyluria. RRPLD can achieve the same clinical efficacy as open surgery and Simplified RRPLD is a feasible and effective surgical procedure for chyluria.

Keywords: Chyluria, povidone iodine, renal pedicle lymphatic disconnection

Introduction

Chyluria is defined as the presence of chyle, the high concentration of chylomicrons, which gives the urine a characteristic appearance [1]. Chyluria may lead to massive loss of fat and protein via urine, resulting in anemia, hypoproteinemia, general fatigue, body weight loss, systemic edema, and immunodeficiency.

Chyluria can be elicited by parasitic or nonparasitic factors. Treatment of chyluria consists of conservative and surgical measures. Among surgical management, RPLD has been confirmed to be the most effective strategy [2]. In this study, we retrospectively reviewed the clinical outcomes of 317 patients with intractable chyluria and present our experience with conservative and surgical management of intractable chyluria by different approaches.

Materials and methods

Patients

From September 2004 to June 2013, 314 patients with chyluria (133 men and 181 women) were recruited at our center. All patients had chyluria, with or without hematuria, lumbago, and malnutrition symptoms. The age of patients ranged from 21 to 83 years (59.2±11.8). The disease duration varied from 3 months to 10 years. All patients received preoperative cystoscopy and urine chyle test to confirm the diagnosis and lesion location. This study was approved by the Ethics Committee of Xuzhou Medical College (Xuzhou, China), and informed written consent was received from patients.

Renal pelvic instillation sclerotherapy (RPIS)

All patients were assessed by cystoscopy under local anesthesia. The patients were advised to take a fatty meal (100 g butter with bread) the night before to help lateralizing the chylous efflux. A 5F open-ended ureteric catheter was passed up to the renal pelvis of the affected side. Freshly prepared 7-10 ml of 0.2% povidone iodine solution was instilled via a ureteric catheter over a minute with the patient in Trendelenburg position. Patients remained in

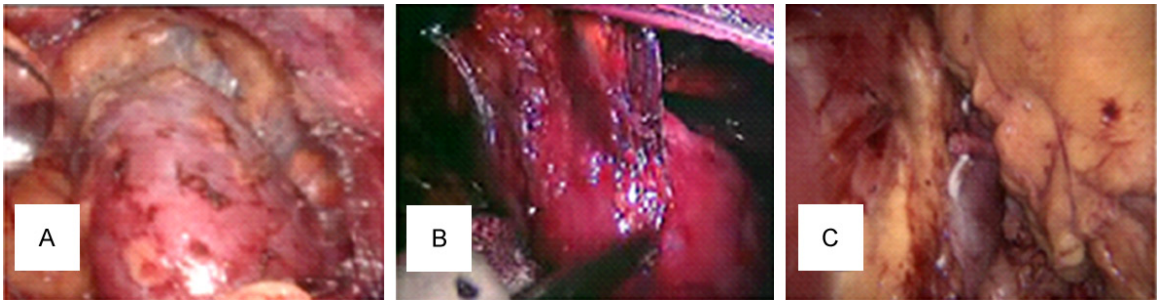

Figure 1. Representative intraoperative images of adipose capsule by RRPLD, MRRPLD and SRRPLD. A. Standardized RRPLD: Adipose capsule were dissected close to the surface of renal capsule. The kidney was lastly fixed with the psoas. B. Modified RRPLD: Adipose capsule at outer edge of the upper pole were preserved. The kidney was not lastly fixed with the psoas. C. Simplified RRPLD: Renal hilum was straightly exposed, and hilar vasculature was skeletonized carefully without the dissection of adipose capsule.

same position for 5 min with ureteric catheter in situ to prevent sclerosant from being drained into the bladder. The immediate response to treatment was recorded on completing RPIS as the persistence or clearance of chyluria; the former was considered as failed therapy. Relapse of whitish urine after initial clearance of chyluria was recorded as a recurrence. Success was defined as patients who had no relapse of chyluria up to the last follow-up.

Renal pedicle lymphatic disconnection (RPLD)

All patients underwent general anesthesia and was placed in the lateral decubitus position with overextension to widen the space between the costal margin and iliac crest. Briefly, a 10-12 cm Turner-Warwick incision was made. The perinephrium and adipose capsule of the kidney were cut and the kidney was isolated from its surrounding tissues to expose the renal pedicle clearly. Then, the lymphatic vessels and fibrous tissues around the renal pelvis, renal hilus, and upper ureter were stripped and ligated completely. At the end of process, the connection between the kidney and body was maintained only by the renal artery, renal vein, and ureter. The kidney was lastly fixed with the psoas by intermittent suturing.

Retroperitoneoscopic approach

A 2-cm transverse skin incision was made above the iliac crest in the midaxillary line. Visual retroperitoneal dilator was inserted into the retroperitoneal space and dilated using 550-650 ml air to expand the operative space for 5 min. Other 2 trocars were placed as follows: a 12-mm trocar below the 12th rib in the posterior axillary line, and a 5-mm trocar below the 12th rib in the anterior axillary line. A 10-mm trocar was inserted along the 2-cm incision for the laparoscopic observation.

Standardized RRPLD: Lymphatic disconnection via the retroperitoneoscopic approach was similar to traditional open surgery, including four important steps as follows: Nephrolympholysis, Renal hilar lymphatic, vessel dissection, Ureterolympholysis, Nephropexy (**Figure 1A**).

Modified RRPLD: In order to deduce back pain and bed time after operation, prevent nephroptosis and renal vessel torsion, the kidney was not completely isolated from its surrounding fascia. The adipose capsule on the 3/4 lower poles and the surface of the kidney was separated from the renal parenchymal surface. Then, adipose tissues on the 1/4 upper pole were retained (**Figure 1B**), not to fix the renal capsule of the upper pole to the psoas fascia.

Simplified RRPLD: The stripping of hilar vessels and ureterolympholysis were performed thoroughly outside the renal adipose capsule without nephrolympholysis, renal hilum was straightly exposed, and hilar vasculature was skeletonized carefully without the dissection of perirenal tissues (**Figure 1C**).

The drainage tube and Foley catheter were indwelled routinely. Patients were required to have postoperative bed rest. Patients were followed up for 6-12 months. Before 2003, the patients mainly underwent open operations. From 2006, the patients almost underwent RRPLD. From 2008, the patients underwent

Table 1. Demographic and preoperative clinical characteristics of 246 patients

Clinical Characteristics	Open Surgery (n=48)	Standardized RRPLD (n=64)	Modified RRPLD (n=59)	Simplified RRPLD (n=75)
Age (year)	57.1±12.2	61.7±11.6	58.3±11.1	58.1±10.0
Sex (n)				
Male	20	25	23	33
Female	28	39	36	42
Duration (month)	33.4±18.5	31.6±15.3	29.7±16.9	38.0±20.1
Lesion laterality (n)				
Left	26	35	32	41
Right	21	26	24	32
Bilateral	1	3	3	2
BMI (kg/m^2)	19.5±2.1	19.1±2.4	19.4±2.0	19.7±2.7

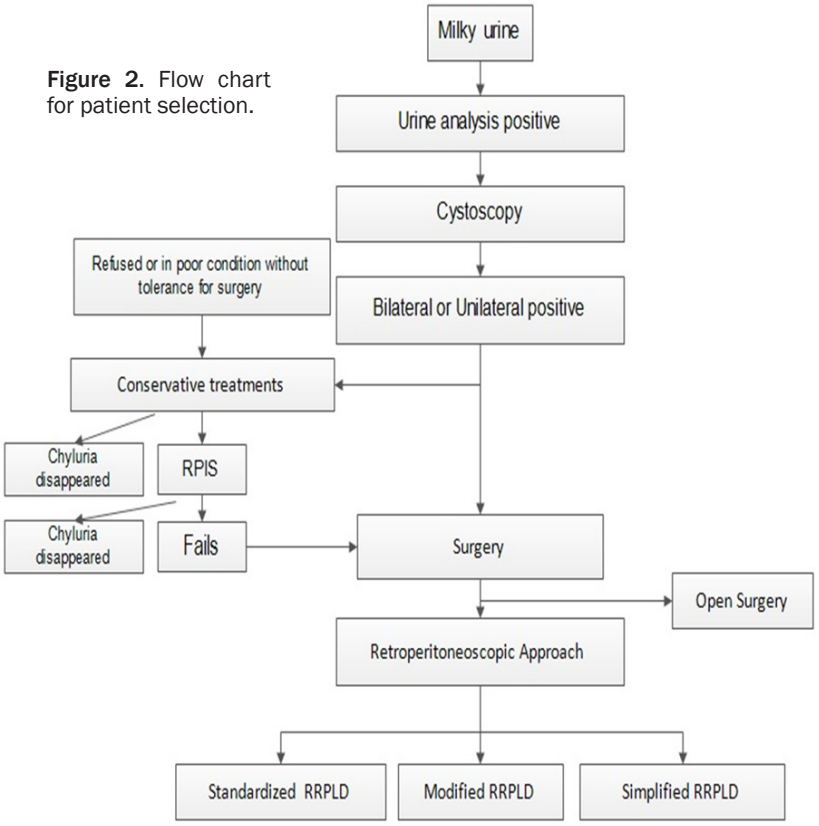

Figure 2. Flow chart for patient selection.

modified RRPLD. From 2010, all patients underwent simplified RRPLD.

Results

The basic information of al patients is listed in **Table 1** and the flow chart for patient selction was shown in **Figure 2**.

Conservative treatments, including bed rest, more water, and a fat-restricted, high-protein diet combined treatment of traditional Chinese Medicine are recommended for 68 patients who refused or in poor condition without tolerance for surgery. The symptoms declined for 22 patients without further treatment. Instillation of povidone iodine (0.2%) was used for other 46 patients. 42 (91.3%) patients showed immediate clearance and the chyluria recurred in 14 patients (33.3%).

The surgical disconnection of lymphorenal communication provides a simple, safe and effective method of treatment with a high rate of cure for severe chyluria. All operations by RRPLD and open surgery were performed successfully (**Figure 3**). Urine in all patients became clear immediately after the operations and was confirmed negative with a urine chyle test. Nutritional status was improved, suggested by index changes including weight gain and hemoglobin level increase after one month. There were no significant differences between four groups. Postoperative outcomes of all patients were listed in **Table 2**.

Discussion

According to the etiopathogenesis, chyluria is usually classified as parasitosis-induced and

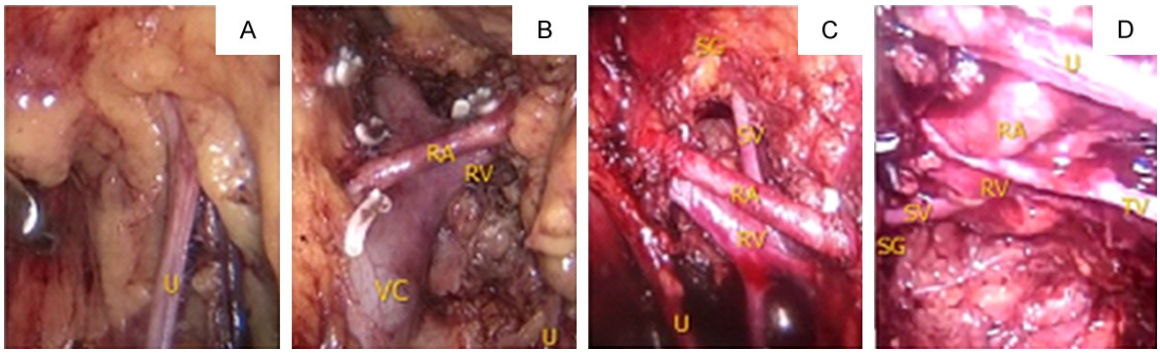

Figure 3. Representative intraoperative images of retroperitoneoscopic renal pedicle lymphatic disconnection. A. Proximal ureter was skeletonized. B. Renal artery and vein were skeletonized. C. The dorsum of renal pedicle. D. The ventral side of renal pedicle.

Table 2. Postoperative clinical outcomes of 246 patients

Clinical Outcomes	Open Surgery RPLD (n=48)	Standardized RRPLD (n=64)	Modified RRPLD (n=59)	Simplified RRPLD (n=75)
Operative time (min)	183.1±32.3#	119.5±45.5*,#	76.7±25.7*,#	56.4±14.3*
Intraoperative blood loss (mL)	201.7±202.8#	65.9±24.6*,#	61.7±20.3*,#	45.2±17.5**
Postoperative bed rest time (d)	11.5±2.5#	10.5±3.5#	4.5±1.5*,#	1.5±0.5**
Anal exhaust time (d)	2.2±0.8	2.7±0.7	2.7±0.7	2.5±0.5
Hospital stay (d)	14.0±3.3#	13.4±2.7*,#	9.3±1.5*,#	6.0±1.5*
Vascular injuries complication (n)	2	3	1	1
Recurrence (n)	2	1	1	2
Lost to follow-up (n)	2	3	2	3

*P<0.05 vs. Open Surgery, **P<0.01 vs. Open Surgery, #P<0.05 vs. Simplified RRPLD.

nonparasitic type. In the present series, there were signs or symptoms suggestive of filariasis in 13 patients among 314 patients, only accounted for 4.1%. In order to further clarify the pathogenesis of nonparasitic type, we analyzed the clinical data of 21 cases whose disease duration of chyluria varied within a week and found that urinary tract infection, high blood cholesterol and lipids levels, high BMI and hypertension may be the risk factors for chyluria, which leads to dynamic changes of lymph vessels, such as obstruction of lymph vessels and increase of intralymphatic pressure.

In this study, 23 patients accepted secondary operations due to the recurrence, 12 cases after open operation and 11 cases after RRPLD surgery. 17 cases had recurrence within 2 years and 5 cases within 2-10 years. The mean operative time, intraoperative blood loss, postoperative time of bed rest, and hospital stay were all decreased in later group compared to former group.

Instillation of the renal pelvis has been used for many years, and because of the drawbacks of recurrence and repeated instillation and pain, this procedure is not the first-line therapy for intractable chyluria in our center. Instillation of povidone was used in 17 recurrent chyluria patients after RRPLD. All patients showed immediate clearance. There was no recurrence in 15 patients following 2 years. Only one patient developed recurrence at 2 months after instillation of the renal pelvis and no recurrence was observed after second instillation of povidone till the last follow-up. These results indicate that single dose of 0.2% povidone iodine sclerotherapy is safe and effective treatment for recurrent chyluria after RRPLD, consitent with recent study [3].

Retroperitoneoscopic renal pedicle lymphatic disconnection (RRPLD) for the treatment of chyluria is an effective and efficient surgical procedure and has the advantages of less blood loss, minimal invasion, complete lymphatic vessels ligation, short hospital stay and rapid

recovery compared with traditional open operation. It is an ideal surgical procedure for treatment of chyluria. RRPLD could achieve at least the same clinical efficacy as open surgery and was recommended as the first choice of treatment of intractable chyluria [4, 5]. Furthermore, Xia et al. reported that RRPLD was a safe and minimally invasive surgical approach with satisfactory long-term effects [6].

Since 2010, most patients underwent simplified RRPLD at our center. Simplified RRPLD has the advantages of shorter operative time, shorter postoperative bed stay, shorter postoperative hospital stay and less pain while it does not significantly increase the recurrence of chyluria, compared with RRPLD and Modified RRPLD. Tang et al. only performed RPLD without fasciectomy and nephropexy [7], and other studies suggested that modified technique of renal pedicle lymphatic disconnection is a safe and effective procedure [8, 9].

Chyle leak is a rare complication after RPLD. In this study, nineteen cases of chyle leak were identified between the second and the fourth postoperative day and all of them were managed with conservative treatment including early fasting, parenteral nutrition (PN), 24 hour continuous infusion of somatostatin, and low pressure suction drainage. Ten patients were treated successfully for 6 to 10 days with a significant reduction of the daily drainage volume. Six patients had enteral nutrition (EN) and their drain tubes were washed with 30 ml of compound meglumine diatrizoate every day until the drainage volume decreased to 100 ml/day. The time to resolution of chyle leak in these six patients ranged from 12 to 24 days. Three patients had no significant decrease in fluid drainage and developed abdominal distension after one week of conservative treatment. In three patients drain tubes were washed with 20 ml of 2% Alum every day for 30 minute until the drainage volume decreased to less than 5.0 ml/day. The time to resolution of chyle leak in these patients ranged from 4 to 5 days, one patient felt backache without other toxic or side effects. 2% Alum probably has good effect for treating stubborn chyle leak by retroperitoneal perfusion. Most postoperative chyle leak after RRPLD can be successfully managed with conservative treatment.

Vascular injuries are serious complications during RRPLD in our center. All cases had renal atrophy, which might be due to vascular injury during the operation. To avoid these complications, it is imperative that caution should be given to the handling or probing of the region of the renal hilum in RRPLD. Preoperative computed tomography angiography has been routinely used for the preoperative evaluation of renal vessels for RRPLD in our center regardless of the adopted surgical procedures.

Laparoendoscopic single-site (LESS) surgery has been used for radical cystectomy, radical prostatectomy, nephrectomies, pyeloplasties, and donor nephrectomies [10-14]. We performed LESS-RRPLD surgery in 3 patients. Our experiences showed that the mean operative time, blood loss and risk of complications were increased in LESS compared with traditional laparoscopic surgery for RRPLD. However, Zhang et al. reported that LESS-RPLD was safe and feasible for refractory chyluria treatment, and short-term follow-up demonstrated the efficacy of LESS-RPLD [15]. Nevertheless, more clinical studies are needed to confirm whether LESS can replace traditional laparoscopic surgery in the treatment of patients with refractory chyluria.

Three-dimensional laparoscopic operation may be performed safely and effectively with decreased surgical difficulties [16]. Since 2013, 9 cases of RRPLD were performed and the renal hilum ventral organization structure had good exposure under 3D laparoscopy compared with 2D laparoscopy which can help to avoid the injury of blood vessel.

In conclusion, our study demonstrated that single dose of 0.2% povidone iodine sclerotherapy is safe and effective treatment for chyluria. RRPLD can achieve the same clinical efficacy as open surgery and Simplified RRPLD is a feasible and effective surgical procedure for chyluria.

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Disclosure of conflict of interest

None.

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