

# The approach of retroperitoneal laparoscopic partial dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels to the treatment of chyluria

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**Abstract. – OBJECTIVE:** To compare the clinical effect of two surgical methods of treating chyluria, namely, retroperitoneal laparoscopic partial dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels and retroperitoneal laparoscopic complete dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels.

**PATIENTS AND METHODS:** Thirty-eight cases have been divided into A and B groups. Retroperitoneal laparoscopic partial dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels has been performed on Group A patients and retroperitoneal laparoscopic complete dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels has been performed on Group B cases, and then their respective clinical efficacy has been compared.

**RESULTS:** All the operations for the 38 cases were successful. The average operation time for Group A was  $76.35 \pm 23.11$  min, and that for Group B was  $97.35 \pm 16.20$  min. The average post-operative length of stay for Group A was  $5.43 \pm 1.21$  days, and that for Group B was  $7.22 \pm 1.34$  days. No complications were found in both groups, and all cases were tested negative for chyluria when discharged. No recurrences were reported.

**CONCLUSIONS:** Retroperitoneal laparoscopic ligation of renal pedicle lymphatic vessels is a reliable method of treating chyluria. Compared with complete dissection of adipose renal capsule plus ligation of renal lymphatic vessels, partial dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels boasts the advantages of shorter operation time, less bleeding, shorter term of hospitalization, and no renal pedicle torsion.

*Key Words:*

Chyluria, Retroperitoneal laparoscopy, Partial dissection of adipose renal capsule, Ligation of renal pedicle lymphatic vessels.

## Introduction

Chyluria is a disease caused by changes in the dynamics of the lymphatic system, and can be treated clinically by ligation of renal pedicle lymphatic vessels<sup>1</sup>. With the development of retroperitoneal laparoscopy and its wide application in urinary surgeries<sup>2</sup>, retroperitoneal laparoscopic complete dissection of perirenal fat plus ligation of renal pedicle lymphatic vessels has become a reliable therapy for chyluria. What applied anatomy<sup>3,4</sup> has reminded us is that intrarenal lymphatics, which are the root cause of chyluria<sup>5,6</sup>, leave the kidneys through the renal hilum, and that on top of our good command of retroperitoneal laparoscopy, it is no longer necessary to completely dissociate perirenal fat in order to cut apart the dorsal and ventral renal pedicle lymphatics for the purpose of treating chyluria. Combining theory with practice, our hospital has treated 38 patients with chyluria by retroperitoneal laparoscopic complete or partial dissection of perirenal fat plus ligation of renal pedicle lymphatic vessels since 2009, and according to our follow-up visits, the operations effects are very desirable.

## Patients and Methods

### *Patients*

Clinical data: The 38 cases admitted to our hospital between the year of 2009 and 2015 had a history of excreting milky urine ranging from 6 months to 18 years. Twenty-five cases had the hi-

story of living in an affected area, among which 11 cases had the history of filariasis infection. For the rest 13 cases, although they were not identified with filariasis infection, the possibilities of tumor and trauma were ruled out. All patients were tested positive for chyluria. After fatty meal tests, cystoscopy was performed in these patients to detect the location of chyluria.

Grouping of patients: Patients were randomly divided into 2 groups. For Group A, there were totally 22 cases; 12 were male and 10 were female; 16 cases had problems with their left kidney while 6 with their right kidney; they were aged from 45 to 73, and the average age was 58. A retroperitoneal laparoscopic partial dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels was performed on this group of patients. For Group B, there were altogether 16 cases; 6 were male and 10 were female; 12 cases had problems with their left kidney while 4 with their right kidney; they were aged from 45 to 76, and the average age was 60. A retroperitoneal laparoscopic complete dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels was performed on this group of patients.

### ***Surgical Method***

The patients were instructed to lie on their uninjured side, and general anesthesia is applied to them after tracheal intubation. The method and position of pneumoperitoneum preparation and intubation are the same with those mentioned in the reference 7.

The main surgical procedures for retroperitoneal laparoscopic complete dissection of affected perinephric fat capsule and renal pedicle lymphatic ligation were as follows: after the creation of a working space in the retroperitoneum, perinephric fascia and perinephric fat capsule were divided along a line close to the psoas magnum muscle, the renal parenchyma and the perirenal fat space were separated with an ultrasonic scalpel by blunt and sharp dissections. All adhered tissues were disconnected with an ultrasonic scalpel. Firstly, the dorsal perinephric fat capsule and the upper segment of the ureter were completely dissected, and the lymphatic vessels around the dorsal renal arteries and veins were isolated and ligated. Then, the ventral perinephric fat capsule was dissected, the kidney was lifted or flipped properly, and the lymphatic vessels on the ventral side of the renal pedicle were isolated and ligated. Lastly, after hemostasis was confirmed, the drainage tube was placed

in the retroperitoneum before the closure of the incision.

The main surgical procedures for retroperitoneal laparoscopic partial dissection of affected perinephric fat capsule and renal pedicle lymphatic ligation were as follows: firstly, the perinephric fascia was divided along a line close to the psoas magnum muscle with an ultrasonic scalpel, the renal dorsal hilum region was exposed. Based on the distribution of the renal pedicle lymphatic vessels, the perinephric fat capsule close to the renal hilum and in the renal hilum region were dissociated: superior to the inferior margin of the adrenal gland and inferior to the upper segment (3-4 cm) of the ureter; interior to 1 cm away from the renal hilum, and lateral to renal pedicle tissues could be seen. The specific surgical techniques included: (1) the lymphatic vessels around the renal arteries and veins were completely dissected, and the loose connective tissues around renal vessels containing numerous lymphatic vessels were isolated in bunches and ligated and dissected using absorbable clips, and the thick lymphatic vessels were ligated individually; (2) the vascular sheaths of the renal pedicle were dissociated and ligated, the lymphatic vessels around the renal pedicle vessels and the upper segment of the ureter were fully striped; (3) the renal pedicle lymphatic vessels were easily exposed on the ventral side because patients with chyluria were mostly thin and had little perirenal fat. The following techniques could be adopted to locate and dissect the renal pedicle lymphatic vessels on the ventral side: first, the renal pedicle vessels should be gently lifted with silk sutures to expose the ventral lymphatic vessels. Secondly, a 30° laparoscope should be placed between the anterior layer of the perirenal fascia and the renal pedicle vessels to observe the distribution of the renal pedicle lymphatic vessels on the ventral side. Thirdly, the renal pedicle vessels and the surrounding lymphatic vessels should be gently and carefully dissociated with right-angle clamp, and the lymphatic vessels were dissected using an ultrasonic scalpel.

### **Results**

All the operations for the 38 patients were completed uneventfully without conversions to open surgery or dilapidations of renal arteries, veins, or ureters. The average operation time for Group A was  $76.35 \pm 23.11$  min, the average amount of bleeding was  $47.64 \pm 36.33$  ml, and the

average time of post-operative hospitalization was  $5.43 \pm 1.21$  days. As to Group B, the average operation time was  $97.35 \pm 16.20$  min, the average amount of bleeding was  $75.11 \pm 27.59$  ml, and the average time of post-operative hospitalization was  $7.22 \pm 1.34$  days. As shown in the t-tests, the operation time, amount of bleeding, and post-operative length of stay for Group A were obviously less than those for Group B ( $p < 0.05$ ). Both groups showed no obvious surgical complications and were tested negative for urine protein and chyluria. No occurrences happened in the follow-up of 6 months to 5 years.

## Discussion

Chyluria is commonly believed to be caused by changes in the dynamics of the renal lymphatic system<sup>7,8</sup>. Normally, the lymphatic capillaries of the kidney are distributed around the renal corpuscles and renal tubules, and gradually become interlobular, arcuate and interlobar lymphatic vessels. When intrarenal lymphatic vessels are widely inosculated with perirenal lymphatic vessels, lymphatic vessels will form in the renal hilum and then spread out the kidney<sup>9</sup>. In the case of chyluria, lymph flows through the lymphatic vessels in the renal hilum and goes back to the intrarenal lymphatic vessels, but drains out through fissures near the renal papilla and mix with urine to form chyluria. Thus, the ligation of renal pedicle lymphatic vessels is a theoretically feasible way of treating chyluria.

As laparoscopy is increasingly developed and mature, it is recognized superior to open surgery because it is less likely to cause trauma and bleeding and can magnify the invisible lymphatic vessels and completely ligate them<sup>10,11</sup>. In 1999, Hemal et al<sup>12</sup> first performed laparoscopic ligation of renal pedicle lymphatic vessels and achieved a desirable effect. In 2003, scholars in China like Xu et al<sup>7</sup> also reported that retroperitoneal laparoscopy has favorable effect on treating chyluria.

Currently, the ligations of renal pedicle lymphatic vessels both at home and abroad are mostly radical nephrectomy of the problematic kidney or simply retaining the adipose capsule in the upper pole of the kidney, complemented with ligation of renal pedicle lymphatic vessels<sup>13,14</sup>. However, this surgical method, compared with the method of partial dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels suggested in this research, will not only cause more

bleeding and longer duration of operation but also can result in renal pedicle torsion, nephroptosis, and some other problems. Conversely, the method proposed in this research, i.e., partial dissection of adipose renal capsule plus ligation of renal pedicle lymphatic vessels, is less likely to cause damages to retroperitoneal tissues and bleeding, and the operation time is shorter. Also, the patients who are treated by this method are more easily to recover. Besides, since patients with chyluria are thin with little perirenal fat, this surgical method is helpful to immobilizing the kidney, and as a result, prevents renal pedicle torsion and nephroptosis from happening. Meanwhile, it avoids the cumbersome process of immobilizing the kidney done laparoscopically, and reduces the occurrence rate of renal damages and surgical complications. These are all advantages absent from traditional retroperitoneal laparoscopic surgery. A previous study<sup>14</sup> showed that the distribution of renal pedicle lymphatic vessels, the renal lymphatic vessels that spread out from the renal papilla region, by interweaving with the renal arteries and veins in the renal sinus, form a lymphatic web, and flounce out the renal hilum through various structures. Therefore, through full dissection of the tissues adhesive to the surface of the part close to the renal hilum and thorough exfoliation and ligation of lymphatic vessels surrounding renal vessels, chyluria can be treated with a lower rate of postoperative recurrence. Such a conclusion echoes with the findings of this research which further proves, both theoretically and practically, the feasibility of the surgical method we proposed.

Nevertheless, this surgical method is by no means an absolute one. To perform it or not depends on specific surgical conditions, for example, whether the renal pedicle lymphatic vessels on the ventral side can be fully exposed or not. If the renal pedicle vessels are too short or have a lot of branches or are identified to be H-Type, which prevents the renal pedicle vessels on the ventral side from full exposure, then partial dissection of the adipose renal capsule should be performed to fully expose these vessels.

The success of dissection and ligation of renal pedicle lymphatic vessels lies in the effective dissociation of the lymphatic vessels surrounding the renal arteries and veins. As the partial dissection is more difficult than the complete dissection of the renal pedicle lymphatic vessels, this kind of operation requires surgeons to be highly experienced in retroperitoneal laparoscopic surgeries. All the operations for our patients were completed

uneventfully without conversions to open surgery or dilapidations of renal arteries, veins or ureters, and nor occurrences of chyluria in the operated kidney were found during our follow-up visits.

### Conclusions

We have improved the retroperitoneal laparoscopic ligation of renal pedicle lymphatic vessels and achieved a good treatment effect.

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### Conflict of interest

The authors declare no conflicts of interest.

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