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Research Article

Evaluation of the Effects of Silver Nitrate Renal Pelvic Instillation and Retroperitoneoscopic Renal Pedicle Lymphatic Disconnection for Chyluria

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ABSTRACT

Introduction: In this study, the efficacy, advantages, and disadvantages of transurethral cystoscopic silver nitrate renal pelvic instillation and retroperitoneoscopic renal pedicle lymphatic disconnection for chyluria were compared to provide a clinical reference.

Methods: Forty patients with chyluria who were admitted to our hospital between June 2007 and June 2017 were selected as the research subjects and divided into two groups. The patients in group A (n=25) were treated with transurethral cystoscopic silver nitrate renal pelvic instillation regimen, while those in group B (n=15) were treated by retroperitoneoscopic renal pedicle lymphatic disconnection. Operative time, intraoperative blood loss volume, length of postoperative hospital stay, cure rate, complication rate and recurrence rate were compared between the two groups.

Results: All the 40 patients were successfully treated. Group B had a higher cure rate, lower complication rate and lower recurrence rate than in group A, the differences were statistically significant ($P < 0.05$). But group A had a shorter length of hospital stay and less surgical trauma, the differences were statistically significant ($P < 0.05$).

Conclusion: Retroperitoneoscopic renal pedicle lymphatic disconnection for chyluria can be used as one of the first choices of treatment for chyluria. Although the recurrence rate with transurethral cystoscopic silver nitrate renal pelvic instillation is high, the treatment can be administered again when the disease recurs. At the same time, it is less invasive to the patients and they are more receptive.

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Introduction

Chyluria is an endemic disease that is common in India, China, Southern Japan, Southeast Asia, and some parts of Australia and Africa. Interestingly, these areas correspond to the filarial belt [1]. As a urological disease, it can be classified into nonparasitic and parasitic types. The nonparasitic causes include surgical trauma, lymphatic malformation, malignancy, infections (such as tuberculosis, leprosy and mycosis), radiation, aortic aneurysm and pregnancy [2]. Nonetheless, the

most common etiology of chyluria is parasitic infection. In Asian countries, chyluria is almost entirely the result of *Wuchereria bancrofti* infection [3]. The most common manifestation of chyluria is the intermittent or continuous passage of milky white urine. The symptoms are prominent after a fatty meal and can eventually lead to body weight loss, anemia, immunodeficiency, even left the workforce and affect patients' mental health. It is sometimes accompanied by hematuria and chyle clots, which can also cause symptoms such as renal colic and bladder outlet obstruction [4].

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Chyluria is essentially a benign disease that requires active diagnosis and treatment. Some conservative treatments such as a fat-restricted, high-protein diet, have an apparent curative effect in patients with mild symptoms. However, they have little effect on chyluria caused by parasites [5]. Hence, other treatments such as renal pelvic instillation sclerotherapy and surgical treatment are needed for such cases. Sclerosants include silver nitrate solutions, povidone-iodine, and meglumine diatrizoate. For patients with chyluria, 1% silver nitrate is a relatively effective agent [6]. To our knowledge, renal pedicle lymphatic disconnection is one of the most effective surgical treatments for chyluria [7]. With the development of laparoscopic techniques, retroperitoneoscopic renal pedicle lymphatic disconnection is the most commonly used surgical operation at present. Therefore, in our study, we reviewed the medical records of 40 patients with chyluria from June 2007 to 2017 and randomized the patients into two treatment groups. All the patients were followed up for 3 years, and the efficacies of the two treatments were compared to provide a reference for clinical practice.

Patients and Methods

The medical records of the 40 patients with chyluria from June 2007 to 2017 in our hospital were reviewed. The chief complaint of all the patients was intermittent or persistent passage of milky urine for several weeks to several years. Exercise, alcohol drinking, and high-fat diets usually precipitate or aggravate the condition. All the patients completed the relevant examinations after admission and underwent cystoscopy after a fatty meal to identify the affected side. Chyle-like urine (Figure 1) or chyle clots (Figure 2) were pulsed out from the ureter on the affected side. The affected side was the left in 28 patients and the right in 12 patients.



Figure 1: Cystoscopic picture showing chylous efflux.



Figure 2: Cystoscopic picture showing chyle clots.

After communicating with the patients and obtaining their informed consent, they were divided into two groups. Twenty-five patients who were treated with transurethral cystoscopy silver nitrate renal pelvic instillation regimen were assigned to group A, and 15 patients who received retroperitoneoscopic renal pedicle lymphatic disconnection regimen were assigned to group B. The patients in both groups received the appropriate medical treatment to recover from water-electrolyte disturbances before surgery. Their weights, heights, and vital signs were assessed. If patients had an infection, the corresponding operation treatments were performed after the antibiotic treatment. All the patients were hypodermically injected (qd) with nadroparin calcium (3075 IU, sc) in the abdomen immediately after surgical treatments to prevent deep vein thrombosis.

Surgical Procedures

In group A, all the patients were given 2% lidocaine (5 ml) to induce local anaesthesia in the lithotomy position. A 5-F or 6-F ureteric catheter was then passed up to the renal pelvis on the affected side, and 10 ml of 1% silver nitrate was quickly injected through the affected side (completed in 15s). Subsequently, the patients were adjusted to the 15° Trendelenburg position, which was maintained for around 10 minutes. Then, the renal pelvis was rinsed with physiological saline. A urethral catheter was then placed, and the ureteric catheter was fixed on the axis of the urethral catheter with adhesive tape to avoid downward movement of the ureteric catheter. After 24 hours, the patients were given the second instillation in the ward. They were then injected with 10 ml of 1% silver nitrate solution through the ureteric catheter in the 15° Trendelenburg position. The ureteric and urethral catheters were gently removed after flushing with physiological saline. After the operation, the patients were advised to drink plenty of water, rest in bed, have a low-fat diet, and undergo symptomatic treatment if they experience any discomfort.

In group B, all the patients underwent induction of general anaesthesia, endotracheal intubation and routine catheterization before the procedure. Then, they were placed in the lateral decubitus position, with their waist bridge raised. First, the skin around the surgical site was cleansed well and draped. Next, a 2.0-cm incision was made between the lower edge of the 12th rib and the posterior axillary line (point 1). Vascular forceps were used to bluntly dissect the muscular layer and lumbodorsal fascia, and the retroperitoneal space was separated using the forefinger. Then, a balloon dilator was placed through the skin incision, and approximately 700 ml of air was injected to establish the retroperitoneal space. Under the guidance of the forefinger extending into the retroperitoneal space, a 5-mm trocar was placed 2 cm below the costal margin at the front axillary (point 2) and a 10-mm trocar was placed 2 cm above the superior border of the iliac crest in the mid-axillary line (point 3). Another 10-mm trocar was inserted in the retroperitoneal space through point 1, and the skin incision was sutured closely to avoid air leakage. The pneumoretroperitoneal pressure was maintained at 13-15 mmHg with CO₂ insufflation. The laparoscope was placed at point 3, while points 1 and 2 were the working ports for surgical manipulation.

At first, Gerota's fascia of the kidney was opened longitudinally close to the greater psoas muscle. The adipose capsule of the kidney was cleared away, and the conglutinations around the kidney surface were cut off.

Then, the renal pelvis and upper ureter were isolated by cutting off the surrounding lymphatic vessels. During this process, approximately 3-4 cm of the upper ureter was stripped off carefully to avoid disrupting the blood supply of the ureter. Next, the renal artery and vein were carefully separated, and the lymphatic vessels around them were ligated completely. Vasa vasorum are especially abundant on the surface of the renal arteries; thus, attention must be paid to ensure gentle manipulation to prevent vascular injuries. After that, nephropexy was performed after confirming the absence of another tissue connection in the kidney except for renal arteries, veins, and ureter. Finally, a drainage tube was placed retroperitoneally. Each layer of incision was sutured closely after the absence of active bleeding was confirmed.

Results

The treatment was completed successfully in both groups. In group A, the operation time was 15 to 30 min (mean 18.8 ± 4.4), the length of postoperative hospital stay was 1 to 2 days (mean 1.2 ± 0.4), and no obvious intraoperative blood loss was observed. After the treatment, 10 patients complained of varying degrees of flank pain, nausea, vomiting, and occasionally hematuria, which improved after conservative treatments. The complication rate was 40% (10/25 cases). Cystoscopy showed chyluria disappeared in 18 patients one month after treatment (Figure 3), and the remaining patients were instilled again with satisfactory results. The cure rate was 72.0% (18/25 cases). On follow-up, 8 patients had a recurrence between 5 months and 3 years after treatment. Moreover, cystoscopy revealed a recurrence on the original affected side. The recurrence rate was 32.0% (8/25 cases).



Figure 3: Cystoscopic picture showing chyluria disappeared.

In group B, the operation time was 80 to 110 min (mean 92.7 ± 9.8); intraoperative blood loss, 30 to 70 ml (mean 48.0 ± 13.2); and length of postoperative hospital stay, 5 to 8 days (mean 5.7 ± 0.9). One patient complained of fever with a high body temperature after operation, which improved after symptomatic treatment. All the patients had complete symptomatic relief within 1 month after the operation, with a complication rate of 6.7% (1/15 cases) and cure rate of 100.0% (15/15 cases). None of the patients had a relapse during the 3-year follow-up; thus, the recurrence rate was 0.0% (0/15 cases). Operative time, length of postoperative hospital stay, cure rate, complication rate, and recurrence rate showed significant differences between the two groups (Table 1).

Table 1: Comparison of treatments index between the two groups.

Group	operative time/min	postoperative hospital stay /d	cure rate %	complication rate %	recurrence rate %
A	18.8±4.4	1.2±0.4	72.0(18/25)	40.0(10/25)	32.0(8/25)
B	92.7±9.8	5.7±0.9	100.0(15/15)	6.7(1/15)	0.0(0/15)
t value	-27.586	-20.145	-	-	-
p value	0.000	0.000	0.033 [#]	0.016 [#]	0.030 [#]

Values denote means ± SD or numbers

[#] Fisher's Exact Test

Discussion

Patients with chyluria typically describe the presence of chyle in urine. Chyluria can be divided into three grades according to symptoms severity. Cases with milky white urine were designated as grade I; cases associated with passage of chyle clots, as grade II; and cases of hematochyluria, as grade III [8]. Although no definite conclusion has been reached on the pathogenesis of chyluria, the regurgitative theory is

gradually accepted by the public. Lymphatic vessels and their valves are damaged after recurrent filarial attacks, thereby losing their normal physiological functions. Increases pressure in the lymphatic vessel results in the regurgitation of chyle into the urinary system at the weak points between the urinary tract and lymphatic vessel wall [9, 10].

Numerous studies have shown that abnormal lympho-urinary connections are most common in the renal pelvis system. Thus, the

purpose of our treatment with sclerosants is to block the abnormal channels. Instillation of silver nitrate solutions into the renal pelvis induces an inflammatory reaction of the lymphatic vessels initially. Then, the resultant inflammatory oedema can block the abnormal connection, thereby inducing immediate relief to the patients. Eventually, lymphatics fibrosis will result in a permanent remission [11]. Although this treatment method is simple and feasible, some patients still relapse after treatment according to our study. Moreover, it has many side effects such as flank pain, nausea, vomiting, interstitial nephritis, ureteric strictures, chemical cystitis, acute renal failure, and even death [5, 12-14]. Dash *et al.* reported a case of acute renal failure and renal papillary necrosis after instillation of silver nitrate for the treatment of chyluria, and Kulkarni *et al.* reported a case of fulminant hepatic and renal failures after instillation of silver nitrate [12, 14]. Therefore, to minimize the incidence of treatment complications, care should be taken in the clinical application of the procedure and attention should be paid to the changes in the patients' condition after the instillation therapy.

For severe or refractory cases of chyluria, other treatments are ineffective and usually require surgical treatment. In addition, various kinds of operative methods have been used, and the traditional renal pedicle lymphatic disconnection has still achieved satisfactory results [15]. From the earliest open surgery to the current laparoscopy, good therapeutic effects have been achieved. Zhang *et al.* compared the clinical effectiveness of retroperitoneoscopy and open surgery for chyluria [16]. They considered that retroperitoneoscopy is associated with less blood loss, fewer complications, and faster recovery than in the conventional open surgery. It can enlarge the field of view, making the operation more convenient. Likewise, Zhang *et al.* also conducted a similar work and reached analogous conclusions, that is, to recommend retroperitoneoscopic renal pedicle lymphatic disconnection as the first choice of surgical treatment [17].

In addition, high-intensity focused ultrasound (HIFU) is also used as a non-invasive and effective technology in the treatment of chyluria. It can only be performed on target tissue locally without damaging surrounding cells [18]. Xiao *et al.* completed a study to evaluate the effect of HIFU on chyluria and concluded that HIFU ablation therapy is an effective and feasible solution for the treatment of chyluria [19].

Conclusion

The outcomes of this study show that in the comparison of the treatment methods for patients with chyluria, retroperitoneoscopic renal pedicle lymphatic disconnection had a higher cure rate and lower recurrence rate than in transurethral cystoscopic silver nitrate renal pelvic instillation. Thus, it can be one of the first choices of treatment for chyluria. However, the latter has shorter hospitalization time and operative times, and has less intraoperative blood loss. For patients with mild symptoms and no intention to undergo a major surgery, it can also be a better option. With the continuous elimination of filariasis, the main cause of and therapeutic method for chyluria may also change. The necessity of a major surgical treatment is gradually decreasing. Many studies aim to identify more effective and safer drugs for renal pelvic instillation. In our clinical work, patients must be informed about the advantages and disadvantages of all treatment methods, and the wishes of patients and

their families to choose the appropriate individualized treatment methods should be granted to maximize the benefits of patients.

Conflicts of Interest

None.

Availability of Data and Materials

All the data that support the findings of this study are included within the article. Please contact author for data requests.

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