doi.org/10.36721/PJPS.2021.34.6.SP.2423-2427.1

Complex renal calculi treated with traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy

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Abstract: To analyze the effect of traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy and lithotripsy in the treatment of complex kidney stones. Totally 100 patients with complicated kidney stones admitted to our hospital from January 2019 to January 2021 were selected and randomly divided into a control group and an experimental group, with 50 cases in each group. The control group was treated with laparoscopic ureterectomy for stone removal, the experimental group was treated with traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy for stone removal. The therapeutic effects of the two groups were compared. The total effective rate of treatment in the control group was 76% and that of the experimental group was 96%. The stone clearing time, time to pain resolution and time to hematuria disappearance time in the experimental group were significantly shorter as compared with the control group. After treatment, the levels of serum creatinine and blood urea nitrogen in the experimental group were significantly lower than those in the control group. Traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy and lithotripsy for treatment of complex kidney stones ameliorates the treatment efficacy, shortens the time of stone removal, mitigates the clinical symptoms of patients, and helps restore renal function, which is worthy of clinical promotion and application.

Keywords: Traditional Chinese medicine *Paishi* decoction, laparoscopy, ureterectomy lithotripsy.

INTRODUCTION

Complex kidney stones are defined as partial or complete staghorn stones or multiple stones with abnormal kidney anatomy and function, which induces more detrimental clinical symptoms than ordinary kidney stones, severely compromising the quality of life of patients (Xiao *et al.*, 2019; Andolfi *et al.*, 2019). Complex kidney stones mainly include horseshoe kidney stones, multiple kidney stones, and staghorn stones, whose etiology is complicated with a high incidence of relapse. Surgery is the main treatment method for complex kidney stones to remove stones (Mizuno *et al.*, 2018). Traditional lithotripsy is characterized by large trauma, slow recovery after surgery, and poor treatment outcome, which has been considered unfavorable in term of clinical efficacy (Kaneko *et al.*, 2019; Chewcharat and Curhan, 2021). With the constant advancements of medical technology, laparoscopic ureterectomy and lithotripsy, a minimally invasive surgery, has gained widespread attention, and its effectiveness has been confirmed by previous studies (Berger *et al.*, 2021). Traditional Chinese medicine believes that kidney stones belong to the category of "urolithiasis" and "hematuria", which are mostly symptoms of exterior excess and interior deficiency, with kidney deficiency as the interior deficiency and damp-heat as the exterior excess (Acharya *et al.*, 2021). Treatment of kidney stones in traditional Chinese medicine mainly focuses on diuresis and leaching, dissipating stones, promoting blood circulation, and removing blood stasis. Therefore, this study was conducted to evaluate the effect of traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy for the treatment of complex kidney stones. The report is as follows.

MATERIALS AND METHODS

General information

Totally 100 patients with complicated kidney stones admitted to our hospital from January 2019 to January 2021 were selected and randomly divided into a control group and an experimental group, with 50 cases in each group. In the control group, there were 26 males and 24 females, aged between 28-65 years, with an average age of (47.52±12.35) years. Their course of disease ranged from 3 months to 4 years, with an average of (2.43±1.26) years. In the experimental group, there were 27 males and 23 females, aged between 25-68 years, with an average age of (48.17±12.27) years. Their course of disease ranged 2 months to 3 years, with an average of (2.50±1.19) years. The general information of the two groups of patients was comparable (P>0.05).

Inclusion criteria and exclusion criteria

Inclusion criteria: (1) Met the diagnostic criteria for kidney stones in Chinese and Western medicine (Türk et al., 2016); (2) Heart, lung, and kidney functions were normal; (3) No systemic bleeding disease; (4) The patients and their families were aware of the purpose and process of the study and signed an informed consent form. Exclusion criteria: (1) Combined with coagulation

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dysfunction, malignant tumor, mental illness; (2) Pregnant or lactating women; (3) Combined with other urinary system diseases; (4) Congenital malformation or stricture of the ureter, urethral stricture.

Ethical concern of the study

The study was conducted in accordance with the ethical guidelines of the 2020 Revised Declaration of Helsinki (Shrestha and Dunn, 2020). Ethical approval was granted by the Ethical Committee for Health Policy Studies located in Wenzhou Medical University (Ethics approval numbers: Chi-2018-12-223).

Method

The control group was treated with laparoscopic ureterectomy and lithotripsy (Ghani *et al.*, 2016). Preoperatively, the patients received routine preoperative examination to identify the presence of ureteral stenosis, dietary instructions, and appropriate skin preparation. With the patients in a lateral position and the lumbar region elevated, tracheal intubation anesthesia was performed. A transverse incision was made at the intersection of the midaxillary line and the iliac crest to place a laparoscope, followed by a blunt separation of the muscle layers and pushing the peritoneum aside. An airbag was used for the dilation of the retroperitoneal space and then removed. A Trocar was made at the intersection of the anterior axillary line and the 12 inferior costal margins at a position approximately 2 fingers above the posterior axillary iliac crest, where corresponding surgical instruments were placed. The establishment of the retroperitoneal space was accomplished by filling it with carbon dioxide gas with the air pressure maintained at about 15 mmHg. The Gerota fascia was incised to free the shoulder fat and psoas muscle, the ureter was located and freed at the inner edge of the psoas major muscle, the ureter was secured with a non-invasive grasping forceps, and the ureteral stone was cut longitudinally. Small stones were removed through the Trocar in the lower abdominal wall after stripping with separator forceps, and large stones were placed in a removal bag and removed through the incision. The incision was then irrigated, followed by the excision of inflammatory granulation and the insertion of a double-J tube. The ureteral incision was sutured with 4-0 non-invasive absorbable sutures and the operation was completed after no abnormal bleeding was observed. The drainage tube was then indwelled.

The experimental group was treated with traditional Chinese medicine *Paishi* decoction on the basis of the control group. Its prescriptions consisted of Astragalus 30g, Salvia 15g, Chinese yam 15g, Rehmannia glutinosa 10g, Dogwood 10g, Imperata root 30g, Haijinsha 10g, Gallus gallus domesticus 10g, Qumai 10g, Lysimachia 30g, licorice 6g. The above herbs were decocted twice a day with one dose, to obtain 600mL of filtrate, 3 times per week through oral administration.

Evaluation indicators and evaluation standards

(1) Clinical efficacy. Cured: If clinical symptoms and signs disappeared, urine routine showed no hematuria, and ultrasound showed no residual stones. Effective: If clinical symptoms and signs were significantly improved, urine routine showed alleviation of hematuria, and ultrasound showed discharge of stones. Ineffective: If the above symptoms have not improved, and the above standards have not been met. Total effective rate = cured rate + effective rate. (2) Time of clearing the stones, time to pain resolution, and time to hematuria disappearance were recorded. (3) Renal function. 10 mL of venous blood was collected from all patients before and after treatment and centrifuged using a TL-4.7W centrifuge (Shanghai Nai Sheng Kalan Industrial Co., Ltd.) to separate the serum, and a 300A/X automatic biochemical analyzer (Beijing Pulang New Technology Co., Ltd.) was used to determine patients' blood creatinine (SCr) and urea nitrogen (BUN) levels.

STATISTICAL METHODS

The data were processed using SPSS20.0, and GraphPad Prism 7 (GraphPad Software, San Diego, USA) was used for graphics plotting. The count data were analyzed using the chi-square test and expressed by [n (%)]. The measurement data were analyzed using the t-test and expressed as ($\bar{x}$±s). A difference was considered statistically significant at $P<0.05$.

RESULTS

Comparison of the stone-removal effect

The total effective rate of treatment in the control group was 76%, which was significantly lower than that of the experimental group was 96% ($P<0.05$). See table 1.

Comparison of the time to clear stones, pain disappearance, and urine blood disappearance

The stone clearing time, time to pain resolution, and time to hematuria disappearance in the experimental group were remarkably shorter than those in the control group ($P<0.05$), see table 2.

Comparison the renal function

The comparison of renal function between the two groups before treatment was not statistically significant ($P>0.05$). After treatment, the levels of SCr and BUN in the experimental group were significantly lower than those in the control group ($P<0.05$). See table 3.

DISCUSSION

In recent years, the incidence of kidney stones has shown a rising trend, which mainly occurs in the joints of the kidney, renal pelvis and ureter of the human body (Adelman *et al.*, 2021). Stones with a diameter greater

Table 1: Comparison of the stone-removal effect [n (%)]

Groups	N	Cured	Effective	ineffective	Total effectiveness
Control group	50	22(44.00)	16(32.00)	12(24.00)	38(76.00)
Experimental group	50	33(66.00)	15(30.00)	2(4.00)	48(96.00)
X2					8.306
P					<0.05

Table 2: Comparison of the time to clear stones, pain disappearance and urine blood disappearance ($\bar{x}$±s, d)

Groups	N	Stone removal time	Pain disappearance time	Blood urine disappearance time
Control group	50	14.13±5.45	13.97±4.55	22.46±7.95
Experimental group	50	10.49±4.16	10.58±4.09	14.17±6.43
t		3.754	3.918	5.733
P		<0.001	<0.001	<0.001

Table 3: Comparison of renal function between the two groups ($\bar{x}$±s)

Groups	N	SCr (μmol/L)		BUN (mmol/L)	
		Before treatment	After treatment	Before treatment	After treatment
Control group	50	105.51±8.15	124.76±10.62	6.39±1.12	8.47±1.43
Experimental group	50	105.79±9.04	109.83±10.27	6.42±1.15	7.01±1.05
t		0.163	7.146	0.132	5.819
P		>0.05	<0.001	>0.05	<0.001

than 2.5cm are difficult to be removed through the abnormal renal anatomical structure or abnormal function, such as ectopic kidney stones, solitary kidney stones, multiple kidney stones, staghorn or hoofed kidney stones (Chen *et al.*, 2021). All aforementioned conditions are considered as complex kidney stones (Hegazy *et al.*, 2021). The etiology of complex kidney stones is more complicated, and its symptoms include hemorrhage, vomiting, and abdominal cramps (Guler *et al.*, 2021). With the improvement of medical technology, laparoscopic ureterectomy is used in the treatment of complex kidney stones, with favorable characteristics of less surgical trauma, less pain during the operation, and faster postoperative recovery (Sung *et al.*, 2020). In traditional Chinese medicine, the treatment of kidney stones mainly relies on invigorating the spleen and kidney, clearing damp-heat and regulating *qi* and promoting blood circulation and softening the hard masses (Feng *et al.*, 2020). The astragalus in the *Paishi* Decoction used in this study invigorates the spleen and replenishes the *qi*, which activates the *Qi* and blood. Salvia miltiorrhiza is a ministerial medicine that invigorates blood, removes blood stasis and dredges collaterals. Yam can nourish the spleen and stomach, clear heat, and detoxify. Rehmannia glutinosa and dogwood nourish kidney *yin*, reinforce the essence and replenish the marrow. Dianthus, sea jinsha, and Lysimachia can soak dampness, diuresis, and remove stones. Gallus gallus domesticus can astringent essence and relieve effusions, and leach stones. Licorice can relieve pain and reconcile the whole prescription (An *et al.*, 2020; Zhao *et al.*, 2020).

In this study, the total effective rate of treatment in the control group was 76% and the experimental group was 96%, which was similar to the results of the study by ZHANG [18] (Zhang *et al.*, 2020) who pointed out that the total effective rate of traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy and lithotripsy in the treatment of complex kidney stones is 93.33%, indicating that the combination of the two has a significant effect on the treatment of complex kidney stones, which serves to mitigate the clinical symptoms of patients and boost postoperative recovery. The time of stone clearing, time to pain resolution and time to hematuria disappearance in the experimental group were significantly shorter than those in the control group, indicating that the combination of the two can improve the stone-eliminating effect, shorten the stone-elimination time, relieve pain, and speed up the hematuria disappearance (Ordon *et al.*, 2020). Theoretically, Chinese medicine *Paishi* decoction of Imperata cylindrica, dianthus, Haijinsha and Lysimachia can increase the ureteral action potential, accelerate the contraction of the ureteral smooth muscle, and accelerate the discharge of stones, while licorice acts on the smooth muscle terminal nerves, to relax the ureteral smooth muscle and accelerate ureteral peristalsis, which also promotes the discharge of stones (Ganesan *et al.*, 2020).

Kidney stones can cause urinary tract obstruction, hydronephrosis, and damage to renal function. SCr and BUN are commonly used indicators to evaluate renal function (Wang *et al.*, 2020). SCr is a human metabolite that is catabolized and metabolized by the liver to produce

creatinine, which reaches the kidneys through blood circulation, is filtered by the glomeruli, absorbed by the renal tubules, and finally excreted in the form of urine (Zhang *et al.*, 2021). BUN is a serum nitrogen substance that is mainly excreted through the kidneys. Kidneys damages will result in an increase in the levels of SCr and BUN. In this study, the comparison of renal function levels between the two groups before treatment was not statistically significant. After treatment, the levels of SCr and BUN in the experimental group were significantly lower than those in the control group, suggesting that the traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy and stone removal for complex kidney stones can minimize the renal function impairment of patients.

CONCLUSION

The traditional Chinese medicine *Paishi* decoction combined with laparoscopic ureterectomy and removal of complex kidney stones can improve the effect of stone removal, shorten the time of stone removal, mitigate the clinical symptoms of patients, and help restore renal function. It is worthy of promotion in clinical practice.

REFERENCES

Acharya P, Acharya C, Thongprayoon C, Hansrivijit P, Kanduri SR, Kovvuru K, Medaura J, Vaitla P, Garcia Anton DF, Mekraksakit P, Pattharanitima P, Bathini T and Cheungpasitporn W (2021). Incidence and characteristics of kidney stones in patients on ketogenic diet: A systematic review and meta-analysis. *Diseases,* **9**(2): 39.

Adelman A, Shilo Y, Modai J, Leibovici D, Dror I and Berkowitz B (2021). Do organic substances act as a degradable binding matrix in calcium oxalate kidney stones? *BMC Urol.,* **21**(1): 46.

An LY, He ZC, Chang ZL, Huang YP, Zhang SK and Wu WQ (2020). Bacteria-mediated TRPV5 activity promote kidney CaOx stones: A story too good to be true? *Am. J. Physiol Renal. Physiol.,* **318**(2): F506.

Andolfi C, Kumar R, Boysen WR and Gundeti MS (2019). Current status of robotic surgery in pediatric urology. *J. Laparoendosc Adv. Surg Tech. A.,* **29**(2): 159-166.

Berger AJ, Wang Y, Rowe C, Chung B, Chang S and Haleblian G (2021). Racial disparities in analgesic use amongst patients presenting to the emergency department for kidney stones in the United States. *Am. J. Emerg Med.,* **39**: 71-74.

Chen Q, Wang X, Min J, Wang L and Mou L (2021). Kidney stones and moderate proteinuria as the rare manifestations of Gitelman syndrome. *BMC Nephrol.,* **22**(1): 12.

Chewcharat A and Curhan G (2021). Trends in the prevalence of kidney stones in the United States from 2007 to 2016. *Urolithiasis,* **49**(1): 27-39.

Feng X, Wu W, Zhao F, Xu F, Han D, Guo X and Lyu J (2020). Association between physical activity and kidney stones based on dose-response analyses using restricted cubic splines. *Eur. J. Public Health,* **30**(6): 1206-1211.

Ganesan C, Weia B, Thomas IC, Song S, Velaer K, Seib CD, Conti S, Elliott C, Chertow GM, Kurella Tamura M, Leppert JT and Pao AC (2020). Analysis of primary hyperparathyroidism screening among US veterans with kidney stones. *JAMA Surg.,* **155**(9): 861-868.

Ghani KR, Andonian S, Bultitude M, Desai M, Giusti G, Okhunov Z, Preminger GM and de la Rosette J (2016). Percutaneous nephrolithotomy: Update, trends and future directions. *Eur. Urol.,* **70**(2): 382-396.

Guler Y, Erbin A, Kafkasli A and Ozmerdiven G (2021). Factors affecting success in the treatment of proximal ureteral stones larger than 1 cm with extracorporeal shockwave lithotripsy in adult patients. *Urolithiasis,* **49**(1): 51-56.

Hegazy M, El-Assmy A, Ali-El-Dein B and Sheir KZ (2021). The alternating bidirectional versus the standard approach during shock wave lithotripsy for upper lumbar ureteric stones: A randomized controlled trial. *World J. Urol.,* **39**(1): 247-253.

Kaneko G, Katsui M, Hattori S and Hara S (2019). Laparoscopic management for a psoas abscess caused by migrated urolithiasis. *IJU. Case Rep.,* **2**(5): 288-291.

Mizuno K, Kojima Y, Nishio H, Hoshi S, Sato Y and Hayashi Y (2018). Robotic surgery in pediatric urology: Current status. *Asian J. Endosc Surg.,* **11**(4): 308-317.

Ordon M, Dirk J, Slater J, Kroft J, Dixon S and Welk B (2020). Incidence, treatment, and implications of kidney stones during pregnancy: A matched population-based cohort study. *J. Endourol.,* **34**(2): 215-221.

Shrestha B and Dunn L (2020). The declaration of helsinki on medical research involving human subjects: A review of seventh revision. *J. Nepal. Health Res. Counc.,* **17**(4): 548-552.

Sung JM, Jefferson FA, Tapiero S, Patel RM, Owyong M, Xie L, Karani R, Ghamarian P, Lall C, Clayman RV and Landman J (2020). Evaluation of a diuresis enhanced non-contrast computed tomography for kidney stones protocol to maximize collecting system distention. *J. Endourol.,* **34**(3): 255-261.

Türk C, Petřík A, Sarica K, Seitz C, Skolarikos A, Straub M and Knoll T (2016). EAU guidelines on diagnosis and conservative management of urolithiasis. *Eur Urol.,* **69**(3): 468-474.

Wang L, Guan HY, Xia HX, Chen XY and Zhang W (2020). Dydrogesterone treatment for menstrual-cycle regularization in abnormal uterine bleeding - ovulation dysfunction patients. *World J. Clin. Cases.,* **8**(15): 3259-3266.

Xiao Y, Li Q, Huang C, Wang P, Zhang J and Fu W (2019). Perioperative and long-term results of retroperitoneal laparoscopic pyelolithotomy versus percutaneous nephrolithotomy for staghorn calculi: A single-center randomized controlled trial. *World J. Urol.,* **37**(7): 1441-1447.

Zhang B, Hu Y, Gao J and Zhuo D (2020). Micropercutaneous versus retrograde intrarenal surgery for the management of moderately sized kidney stones: A systematic review and meta-analysis. *Urol. Int.,* **104**(1-2): 94-105.

Zhang Y, Liu R, Liu C, Li S and Tsao R (2021). Development of ultrasound-assisted mixture extraction and online extraction solution concentration coupled with countercurrent chromatography for the preparation of pure phytochemicals from Phellinus vaninii. *J. Chromatogr B. Analyt Technol. Biomed Life Sci.,* **1171**: 122619.

Zhao Z, Sun H, Zeng T, Deng T, Liu Y and Zeng G (2020). An easy risk stratification to recommend the optimal patients with 2-3cm kidney stones to receive retrograde intrarenal surgery or mini-percutaneous nephrolithotomy. *Urolithiasis,* **48**(2): 167-173.