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Research Article

Observations On the Curative Effect of a Holmium Laser Under a Flexible Ureteroscope in The Treatment of Endogenous Renal Cysts Combined with Renal Calculi

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Abstract

Background: To explore and analyse the curative effects of a holmium laser under a flexible ureteroscope in the treatment of endogenous renal cysts complicated with renal calculi.

Methods: Seven patients with endogenous renal cysts and renal calculi were admitted to our hospital from April 2019 to April 2021. The renal calculi was smashed by a holmium laser under a flexible ureteroscope, and the kidney cysts were opened by holmium laser endotomy. Window decompression was performed, indwelling the ureteral double-J tube for 1 month after the operation. After 1 month, inserting a flexible ureteroscope into the renal pelvis to confirm the effect of window opening and lithotripsy after removing the double-J tube by the way. CT or B-ultrasound was reviewed before check out.

Results: Among the 7 patients with endogenous renal cysts and kidney stones, one patient was scheduled to undergo an internal incision after successful lithotripsy. The renal cyst wall tissue was surrounded by the renal artery, and the internal incision was terminated. One patient had an unsuccessful lithotripsy due to the poor angle of calyceal but was successfully treated for the renal cyst. The remaining 5 patients successfully underwent lithotripsy and internal incision surgery, of which 2 cases had difficulty finding kidney cysts and stones during the operation and needed assistance in locating kidney cysts and kidney stones under B-ultrasound monitoring. The average operation time was 42 minutes. When the catheter was extubated, the diameter of the renal cyst window was 0.5 cm to 2.5 cm under a flexible ureteroscope. The stone discharge was fair. There were residual gravels in the lower calyx of the kidney in two patients, and the stone basket was removed. After extubation, the maximum diameter of the renal cyst was reduced by more than half by CT or B-ultrasound, the effect of fenestration and decompression was achieved, and there were no obvious residual stones.

Conclusions: A holmium laser under a flexible ureteroscope has a reliable curative effect in the simultaneous treatment of endogenous renal cysts with kidney stones, with little damage, quick recovery, and low cost. It can be used as the first choice for the treatment of endogenous renal cysts with kidney stones.

Keywords: flexible ureteroscope; holmium laser; endogenous renal cyst; kidney calculi; curative effect analysis

Introduction

Renal cysts can be divided into abduction type and endogenous type according to their anatomical location. The endogenous type is also called a parapelvic cyst, which refers to cortical cysts adjacent to the renal sinus, including simple renal cysts that originate from the renal parenchyma and project to the renal sinus. A parapelvic lymphatic cyst or lymphatic dilation originates from the lymphatic tissue of the renal sinus. If there are pain symptoms or psychological stress, if the lesion is > 4 cm or if there are compression obstruction imaging changes, active surgical treatment is often required [1]. Traditional surgical treatment of renal cysts includes percutaneous renal cyst sclerotherapy under B-ultrasound positioning and

laparoscopic decapsulation of renal cysts [2], but renal cyst puncture sclerotherapy has a high recurrence rate, and for renal pelvic cysts, after injecting a sclerosing agent, the renal pelvis and ureter will be narrowed and cause hydronephrosis [3]. Laparoscopic renal cyst removal and decompression have advantages for abducted renal cysts, but for endogenous renal cysts, the operation is difficult, the window range is small, the trauma is large, and the operation time is long. In recent years, with the development of ureteroscopy technology, flexible ureteroscopy combined with holmium laser surgery has advantages for the treatment of endogenous renal cysts and is widely used in clinical practice [4]. However, patients with renal cysts and kidney stones are rare. For the treatment of kidney stones smaller than 2 cm, most clinicians choose ureteroscopic holmium laser lithotripsy, which is safe and reliable in efficacy [5]. The author uses flexible ureteroscopy in clinical work. We have accumulated some experience in the simultaneous treatment of endogenous renal cysts and kidney stones with a holmium laser under a microscope. The following report outlines our results:

Methods

General information: We retrospectively analysed the data of 7 patients with endogenous renal cysts and kidney stones admitted to Tongde Hospital Of Zhejiang Province from April 2019 to April 2021. All patients underwent routine CTU examination before surgery, and the data of the cysts and kidneys were collected. Close proximity of the system was defined as an endogenous renal cyst with a kidney stone less than 2 cm. Seven cases were enrolled in this study, including 3 cases on the left side and 4 cases on the right side. The sizes of the cysts were 4–7.7 cm, the sizes of the kidney stones were 0.6–2.2 cm, and the patient ages ranged from 33 to 76 years.

Treatment method: We administered general anaesthesia for tracheal intubation, lithotomy positioning, routine disinfection and draping, ureteral opening under hard ureteroscope monitoring, guide wire into the ureter, and hard ureteroscope into the upper ureter under the guide wire (if the ureter was found). If the ureteroscope is too thin, it is difficult to enter the ureteroscope; then, a double-J tube is indwelled for two weeks, and then a second-stage operation is arranged. The mirror is withdrawn, a soft ureter sheath (12/14F) is placed along the guide wire, and the soft ureteroscope is inserted into the renal pelvis through the soft ureteroscope sheath. According to the preoperative CT location, kidney stones and cyst walls were located. Generally, holmium laser lithotripsy is performed first, and then the cyst is treated, Setting the holmium laser power to 30W (1.5JX 20 hz) . The cyst wall is generally dark blue, with few blood vessels, thick and clear, and there may be fluctuations under water pressure (Figure 1). If it is difficult to find a cyst and the cyst wall cannot be confirmed, B-ultrasound is used to assist in positioning. A holmium laser was used to make a point-like thin-layer incision at the cyst wall. When the incision was made, the cyst wall was characterized by cotton-like mucosal fibres, and there was a "black hole" in the cyst cavity (Figure 2). After the incision, the "smoky-like" cyst fluid could be seen to gush out (Figure 3). After the cyst was confirmed, the window continued to expand. At this time, the soft lens could enter the cyst cavity to observe the bottom and border of the cyst cavity and open the window to the greatest extent. Holmium laser lithotripsy could be performed after the cyst was verified. After lithotripsy, the tip of the guide wire was placed into the cyst cavity, the double J tube was placed along the guide wire, and the tip of the double-J tube was placed into the cyst cavity. On the first day after the operation, a flat abdominal film was placed in the supine position to check the position of the double-J tube. One month later, when the patient was hospitalized and the double-J tube was removed, a flexible ureteroscope was inserted into the renal calyx to confirm the effect of window opening and stone removal (Figure 4) and recheck with CT or B-ultrasound.

Results

Among the 7 patients with endogenous renal cysts and kidney stones, 1 patient had a renal artery surrounding the renal cyst wall tissue when the holmium laser was used, and the endotomy was terminated. One patient had an unsuccessful lithotripsy due to the poor angle of calyceal but was successfully treated for the renal cyst. The remaining 5 patients were successfully subjected to lithotripsy and internal incision surgery, of which cysts were difficult to find in 2 cases during the operation, and the renal cysts were located under B-ultrasound monitoring. The operation times ranged between 30–58 minutes, with an average of 42 minutes. When the tubes were extubated, the diameters of the opening windows of the renal cysts were approximately 0.5 cm to 2.5 cm. The stone discharges were fair. Two patients had residual gravel in the lower calyx of the kidney. The basket was removed. After extubation, the maximum diameter of the renal cyst was reduced by more than half by CT or B-ultrasound (Figure 5, 6), and the effect of window decompression was achieved. There were no obvious residual stones.

Discussion

Endotomy of renal cysts under flexible ureteroscopy is a new technology for the treatment of endogenous renal cysts [6]. It is a product of the development of endoscopic technology. Because of the natural cavity of the human body, there is no scar to achieve for the purpose of treating renal cysts, which is accepted by the majority of patients. If kidney cysts are combined with kidney stones or other diseases, they can be treated at the same time under flexible ureteroscopy, which is superior to the other two methods of surgical treatment for renal cysts. To smoothly enter the renal pelvis, flexible ureteroscopy requires a thicker ureter tube diameter and a smooth placement of the flexible ureteral sheath. Therefore, many scholars first indwell a double-J tube for pre-dilation and perform flexible ureteroscopy in the second stage. In fact, with the continuous accumulation of clinical surgical experience, an increasing number of urologists are able to master flexible ureteroscopy techniques. With the support of skilled professionals, doctors can calmly perform one-stage flexible ureteroscopy, thus preserving the double-J tube [7]. Under normal circumstances, if the 7–8/9.5–12F rigid ureteroscope can enter the upper ureter smoothly, then the flexible ureteroscope operating sheath can also be successfully inserted. The flexible ureteroscope reaches the renal pelvis to locate the renal cyst for internal incision and fragmentation. Of the 7 cases reported by the author, only 2 patients had a double-J tube placed for two weeks due to thinner ureters, and the second stage underwent flexible ureteroscopy. The remaining 5 patients successfully underwent first-stage flexible ureteroscopy.

How can the renal capsule wall be judged under endoscopy? Under normal circumstances, the cyst wall is dark blue, the surface blood vessel texture is lessened, the single blood vessel is thicker and clearer, and the cyst wall fluctuates under water pressure. When laser incision was performed, the thinnest spot was first found and cut. Irregular cotton-like mucosal fibres can be seen. Sometimes the cyst wall is thicker and needs to be cut slightly deeper. After the incision, "smoky-like" cyst fluid can be seen to gush out, and the cyst cavity the inside appears as a "black hole". If the sac wall is close to the kidney hilum and renal artery pulsation is seen after thin-layer incision, the endotomy should be terminated. In this report, the renal sac wall tissue was surrounded by the renal artery after incision, so the endotomy was terminated. CTU can determine the relationship between cysts and blood vessels before surgery. If it is judged that there are no larger blood vessels, the window can be opened and expanded until the ureteral lens can enter the cyst cavity. The bottom and surroundings of the cyst cavity can be observed under direct vision with a soft microscope to see if there are new organisms

and calcifications and determine the approximate range of the cyst wall that can be removed. Generally, the renal cyst wall 0.5 cm away from the renal parenchyma can be removed by holmium laser cauterization. In this study, cysts were difficult to find in 2 cases during the operation, so the renal cysts were located under B-ultrasound monitoring. Many scholars have reported that some renal cysts cannot be found under a soft microscope, and doctors can be inaccurate. Ultrasound assistance can be used to greatly improve the accuracy of intraoperative positioning and increase the success rate of surgery [8]. Yang Sixing et al. [9] also reported that methylene blue can be injected into the cyst by percutaneous renal puncture under ultrasound before the operation to facilitate the location of stained cysts under flexible ureteroscopy.

Regarding renal cysts, a double-J tube is routinely indwelled after opening the window. To prevent closure of the cyst wall and ensure the effect of opening the window, the guide wire is generally placed in the cyst cavity under direct vision, slowly withdrawn from the flexible ureteroscope, and then placed along the guide wire at the J tube; in this way, the head end of the double-J tube is mostly in the cyst cavity to achieve drainage and prevent the cyst cavity from closing. The operation time for treating cysts ranges between 15–28 minutes, with an average of 20 minutes. Yuan Huixing and others reported that in the treatment of endogenous cysts, the flexible ureteroscopy group was better than the traditional laparoscopy group in terms of operating time, hospital stay and hospitalization costs [10]. One month later, the patients had the double-J tube removed under anaesthesia, and the sizes of the cyst windows were checked under a flexible ureteroscope and whether they were closed. In the author's case, there were no cyst closures, and the fenestration diameters of the renal cysts were 0.5 cm to 2.5 cm, which achieved the decompression effect of fenestration. In one case, the internal incision failed because the surrounding renal artery was seen after cutting part of the cyst wall tissue, and the operation was terminated because of the fear of further incision to the surrounding and deep parts. After the double-J tube was removed, the CT or B-ultrasound was rechecked. Compared with before the operation, the diameter was reduced by more than half. It was considered that fenestration decompression was successful. In 2 cases, the cyst cavity nearly disappeared under CT, and the curative effect was reliable. Zhang Guobin et al. [11] showed that compared with laparoscopic decompression, ureteroscopy and drainage are safe and effective methods for the treatment of simple renal cysts, and the recurrence of cysts can be readdressed.

The success rate of lithotripsy is low in patients with a smaller infundibulum angle between the renal pelvis and inferior calyx (IPA). Jessen et al. [12] found that an IPA<30° was not conducive to the operation of calculus in the lower kidney and ultimately prolonged the operation time of a patient and even led to a failed lithotripsy. In this report, 1 patient failed lithotripsy due to a kidney stone located in the lower calyx of the kidney, and the angle was not good, but a renal cyst was successfully treated. In terms of stone removal rate, there was no significant difference between the two approaches. The stones that were not completely removed were mainly concentrated in the inferior renal calyx for patients with a small renal pelvis-inferior calyx funnel angle (IPA). The smallest included angle between the renal calyx and the long axis of the renal pelvis has been reported in many domestic and foreign reports and has an impact on the success of f-URL stone removal [12-13]. In this study, it was found that two patients had residual gravel in the lower calyx of the kidney, which were removed from the stone basket.

Conclusions

In summary, the holmium laser internal incision method under a flexible ureteroscope for the treatment of endogenous renal cysts combined with renal calculi at the same time has a reliable curative effect, minimal damage, quick recovery, low cost, and safe operation. The majority of patients could preferred the procedure, and it can be used as the first choice for the treatment of endogenous renal cysts combined with renal calculi.

Abbreviations

CTU:Computer Tomography of Urology; IPA: Pelvis-Inferior Calyx Funnel Angle.

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Not applicable.

Authors’contributions

All authors contributed to the study conception and design. QC and KS collected the information and images. QC wrote the manuscript. KS reviewed the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

All data is contained within the manuscript. The datasets used and analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study was approved by the Medical Ethics Committee of Tongde Hospital of Zhejiang Province. In this study, all patients signed a preoperative informed consent form and agreed to participate in the accompanying scientifc research and all methods were performed in accordance with the Declaration of Helsinki.

Consent for publication

Written informed consent was obtained from the patient for publication of the case.

Competing interests

The authors declare that they have no competing interests.

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