

## Original Article



# Retroperitoneal Laparoscopic Surgery for Retrocaval Ureter: A case Series

Md. Fazal Naser<sup>1</sup>, Mizanur Rahman<sup>2</sup>, Md. Rokonuzzaman Khan<sup>3</sup>,  
Md. Mostafizur Rahman<sup>4</sup>, Md. Muazzem Hossain<sup>5</sup>.

### Abstract

**Background:** Retrocaval ureter also referred to as circumcaval ureter or preureteral venacava is a rare congenital anomaly with the ureters passing posterior to the inferior vena cava (IVC). The ureter classically course medially behind the inferior venacava winding around it and then passes laterally in front of it to then course distally to the bladder. Though it is a congenital anomaly, patients do not normally present with symptoms until the 3<sup>rd</sup> and 4<sup>th</sup> decades of life from a resulting hydronephrosis. This hydronephrosis may be due to kinking of the ureter. The ureteric segment is a dynamic or compression against the psoas muscle. It was initially considered as aberration in ureteric development; however current studies in embryology have led to it being considered as an aberration in the development of the inferior vena cava. **Objectives:** The aim of our study was to explore the safety, feasibility and usefulness of retroperitoneoscopic surgery for retrocaval ureter performed in a single centre and to assess the short-term outcomes of patients treated with this surgical approach. **Materials and methods:** Eight patients underwent retroperitoneoscopic transposition of ureter between March 2014 and November 2016, A 3-port, ballon-dissecting, retroperitoneal approach was used, no open conversion was required. Follow-up studies were performed with intravenous urography and ultrasonography. **Results:** Mean operating time was 121 minutes (range 92-178) and mean anastomotic time was 56 minutes for all cases. Blood loss was minimum. None of the patients required blood transfusion. No intraoperative complications occurred. Hydronephrosis in all patients were decreased substantially after surgery. **Conclusion:** Our results have demonstrated that retroperitoneoscopic transposition of ureter is an excellent minimally invasive treatment option for a retrocaval ureter that can be accomplished quickly and safely.

**Keywords:** Retrocaval ureter, Inferior venacava, Retroperitoneal laparoscopic surgery.

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### Introduction

Retrocaval ureter also referred to as circumcaval ureter or preureteral venacava is a rare congenital anomaly with the ureters passing posterior to the inferior vena cava (IVC). The ureter classically course medially behind the inferior venacava winding around it and then passes laterally in front of it to then course distally to the bladder. Though it is a congenital anomaly, patients do not normally present with symptoms until the 3<sup>rd</sup> and 4<sup>th</sup> decades of life from a resulting hydronephrosis. This hydronephrosis may be due to kinking of the ureter. The ureteric segment is a dynamic or compression against the psoas muscle. It was initially considered as aberration in ureteric development; however current studies in embryology have led to it being considered as an aberration in the development of the inferior vena cava. Two types of retrocaval ureters according to the radiological appearance and

the site of the ureteral narrowing: type 1 in which the ureter crosses behind the IVC at the level of the L3 vertebra and exhibits an s-shaped deformity and type 2 in which the renal pelvis and the upper ureter lies horizontally. In the latter type retrocaval segment of the ureter is at the same level of the renal pelvis and it exhibits a sickle shaped deformity. Retrocaval ureter almost always involves the right side; when present of the left side it is commonly associated with either a partial or a complete situs inversus or a duplication of IVC.

In 1994, Baba et. al.<sup>1</sup> introduced the first laparoscopic pyeloplastomy for retrocaval ureter using a transperitoneal approach; later in 1999, Salmon et. al.<sup>2</sup> performed the first retroperitoneal laparoscopic uretero-ureterostomy. The aim of our study was to explore the safety, feasibility and usefulness of retroperitoneoscopic surgery for retrocaval ureter performed in a single centre and to assess the short-term outcomes of

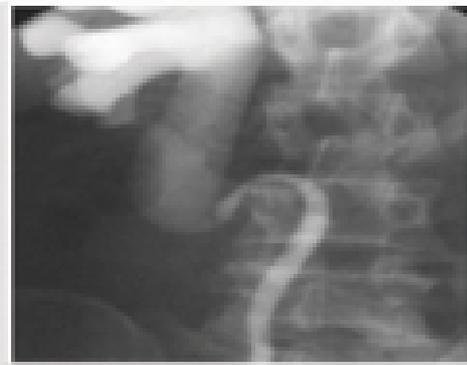
1. Associate Professor, Department Urology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh.
2. Professor of Urology, Dhaka Medical College and Hospital, Dhaka, Bangladesh.
3. Assistant Professor, Urology, M Abdur Rahim Medical College Hospital, Dinajpur, Bangladesh.
4. Assistant, Professor, Urology, Khwaja Yunus Ali Medical College and Hospital, Enayetpur, Sirajganj, Bangladesh.
5. Assistant professor, Urology, Sheikh Abu Naser Specialized Hospital, Khulna, Bangladesh.

**Correspondence:** Dr. Md. Fazal Naser, Associate Professor, Urology, Shaheed Suhrawardy Medical College Hospital, Dhaka, Bangladesh, Cell: +8801711-822562, E-mail: fazaltamim01@yahoo.com

patients treated with this surgical approach.

## Materials and methods

Between March' 2014 and November' 2016, total 8 patients were underwent retroperitoneoscopic transposition of ureter. Six patients out of 8 were symptomatic, present with mild to moderate, intermittent flank pain, and 2 patients were asymptomatic and were incidentally discovered to have hydronephrosis by renal ultrasonography. All patients were preoperatively evaluated with renal ultrasonography, intravenous pyelography and/or reconstructed spiral computed tomography, which demonstrated a typical s-shaped deformity of the ureter at the level of either the third or fourth lumbar vertebra, as well as a moderate hydronephrosis and a dilated proximal ureter in all patients. All patient demonstrated type 1 of retrocaval ureter, according to the classification. Repeat IVU and renal ultrasonography were performed 3 and 6 months postoperatively. Thereafter, yearly follow-up was performed with either IVU or renal ultrasonography for next 2 years.



**Figure 1.** IVU showing Retrocaval ureter

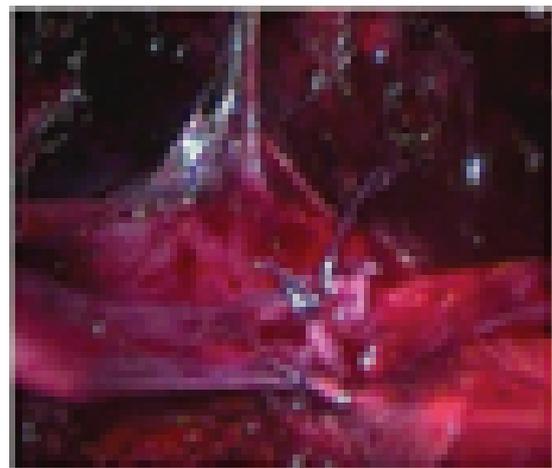
## Laparoscopic techniques

Under general anaesthesia and with the patients in the lithotomy position, a cysto-retrograde pyelography was performed and retrocaval ureter was confirmed. Then the patients were placed in a full lateral decubitus position. Retroperitoneoscopic anterior transposition of ureter was performed with three ports. A 2-cm skin incision was made below the 12<sup>th</sup> rib in the posterior axillary line. The muscular layer and lumbodorsal fascia were bluntly divided by using vascular forceps; and then, an index finger was inserted to bluntly separate the retroperitoneal space. Retroperitoneal fat and peritoneal reflection were pushed laterally and retroperitoneal working space was widened as possible by the index forefinger and 1000-1200 ml air was inflated into a balloon. Then under the guidance of the index finger extending into the retroperitoneal space through the incision, a 10-mm trocar was inserted 2-cm above the superior border of the iliac crest in the midaxillary line for the laparoscope, and a 5-mm trocar was inserted below the costal margin in the anterior axillary line. Another 10-mm trocar was inserted below 12<sup>th</sup>

rib, and the skin incision was sutured to avoid gas leakage. Pneumoretroperitoneum was established by carbon dioxide insufflations at 12-14mm Hg. After the retroperitoneal fat had been freed and removed out, Gerota's fascia was then incised longitudinally. The perirenal fat was dissected to reveal the posterior surface of the mid and lower pole of the kidney. The dilated ureter was fully mobilized using both blunt and sharp dissection, followed by the upper ureter. The upper ureter was then mobilized behind the vena cava, and the distal segment of the dilated ureter should be enough to facilitate tension-free uretero-ureteral anastomosis. Then the ureter at the lower part of the dilated ureter was transected, and the ureter was repositioned to the anterior to the vena cava. Both end of ureter was spatulated. Then uretero-ureteral anastomosis was made with continuous suture with D-J stenting over guide wire. Hemostasis was checked carefully after lowering the pressure of the pneumoretroperitoneum. A closed suction drain was placed into the retroperitoneal space adjacent to the repair.



**Figure 2.** Ureter behind the venacava



**Figure 3.** After completion of the procedure

## Results

All procedures were laparoscopically completed with no open conversion. The mean operating time was 121 minutes (range 92-178 min) and the mean anastomosis time was 56 minutes for all cases. The mean blood loss was minimum. None of the patients required blood transfusion. No intraoperative complications occurred. The Foley catheter was removed 3-5 days postoperatively. The closed suction drain placed in the retroperitoneal space was removed 3-5 days postoperatively. The double-J ureteral stent was removed 4-6 weeks postoperatively. Mean postoperative hospital stay was 6 days (range 5-7). Postoperative period was uneventful in all cases. All patients achieved a rapid and uneventful recovery within the follow-up period. Patients were checked by renal ultrasonography and IVU at 3 and 6 months postoperatively. Hydronephrosis in all patients was decreased substantially after surgery, and all patients declared that they were symptoms free. Yearly follow-up was performed with either IVU or renal ultrasonography for next 2 years.

## Discussion

Retrocaval ureter, also known as circumcaval ureter, is a rare congenital anomaly in which the ureter passes behind the IVC, with an incidence of 1 in 1000 live births. The failure of the supracardinal vein to develop into the infrarenal IVC seems to be responsible for a retrocavally positioned right ureter. The retrocaval ureter usually manifests in the third or fourth decades of life. All patients suspected of having retrocaval ureter after ultrasonography and IVU demonstrating hydronephrosis of the Right kidney and an S-shape deformity of the ureter should undergo retrograde pyelography to rule out any concomitant diseases or accompanied congenital anomaly. Patients with symptoms and/or with moderate to severe hydronephrosis resulting from ureteral obstruction are recommended to have surgical correction. To facilities a tension free anastomosis, adequate dissection and mobilization of the ureter and periureteral tissue is required. However, unnecessary dissection should be avoided to preserve the blood supply of the ureter. Although the retrocaval segment could be easily freed from the vena cava laparoscopically, the decision of whether to resect or preserve the retrocaval segment of the ureter is controversial. Singh et al.<sup>3</sup> and Li et al.<sup>4</sup> suggested that the retrocaval segment of the ureter should preserve if they have a grossly normal appearance without obvious stenosis, and obvious stenotic retrocaval segment of the ureter should be excised. Zhang et al.<sup>5</sup> and Li et al.<sup>4</sup> suggested to excise the retrocaval segment if a 8F catheter could not pass through the segment easily. Our operative findings showed that the retrocaval segment could be negotiated easily in the majority of the patients, thus being reserved in 6 of 8 cases. This is similar to what is recommended recently that in all of the cases there was no need to remove the retrocaval segment. Conventionally, the open uretero-ureterostomy remains the gold standard surgical approach to treat the retrocaval ureter for many years. However, in the last decade, with the intensive development of

minimally invasive surgery, laparoscopic procedures have almost replaced open surgery, because of their associated rapid recovery, early discharge from the hospital and excellent cosmetic results. In 1994, Baba et al.<sup>1</sup> reported the first case of laparoscopic pyelo-ureterostomy for an RCU in 560 minutes. Then Matsuda et al.<sup>6</sup> performed the LUUS by using the five port approach in 450 minutes. In 1999, Salmon et al.,<sup>2</sup> first did the laparoscopic retroperitoneal ureteroureterostomy of a retrocaval ureter in 270 minutes, and suggested that was a more direct approach with greatly reduced operative time. Mugiya et al.,<sup>7</sup> confirmed that the retroperitoneoscopic treatment could be superior to the conventional transabdominal approach to performed the laparoscopic transposition and re-anastomosis of a retrocaval ureter. We prefer the retroperitoneal approach because it provides a shorter and more direct access to the ureter, without interference from intra-abdominal structures. Although the working space for laparoscopic manipulation is relatively limited. Gupta et al.,<sup>8</sup> and salmon et al.<sup>2</sup> who suggested that the retroperitoneal laparoscopy represented the more direct approach to the urinary tract and the shorter time was obtained because dissection of the retroperitoneal space was not hindered by intra-abdominal organs. Simforooshetal 9 reported a series of 6 cases who underwent laparoscopic pyelopyelostomy for RCU without resection of the retrocaval segment, with advantages of excellent outcome, mean operative time was 3 hours, minimal postoperative morbidity, short hospital stays, and highly satisfactory cosmetics results. Most of the cases reports describe prolong operative time, largely because of the initial difficulties with intracorporeal suture techniques. In our series, the mean operative time was only 121 minutes. The reduction of mean operating time may be explained by two reasons. First, our extensive experience with many retroperitoneal laparoscopic procedures that also required proficient intracorporeal freehand suturing techniques, which overwhelmingly increase our self-confidence, could result in this change. Second, compared with transperitoneal approach, retroperitoneal approach provided rapid and direct access to the urinary tract and avoids mobilization of intraperitoneal organs or retraction of organs, such as, the liver. Our opinions were similar to those of Gupta et al.,<sup>8</sup> who believed that the retroperitoneoscopic approach was safer, easier and less time consuming, and it provided direct access to the urinary tract and IVC. The placement of the double-J ureteral stent is another technical challenge in LUUS for RCU. Some surgeons preferred to place the D-j ureteral stent in a retrograde manner preoperatively using cystoscopy. Other surgeons preferred to place the double-J ureteral stent in a conventional antegrade manner using a ureteral catheter or guide wire during the procedure. In our series, the placement of D-j stent in antegrade manner using guide wire, which was similar to the technique reported by Li, et al.,<sup>2</sup> who used two segments of 4F ureteral catheter passed into the stent from the side holes of the D-J ureteral stent serving as the guide wires.

## Conclusion

Our results have demonstrated that retroperitoneal laparoscopic ureteroureterostomy is an excellent treatment option for a retrocaval ureter because of the advantages of minimally invasive approaches, less intraoperative bleeding, postoperative pain, earlier return to daily activities, and significant superior cosmetics effect. It can be accomplish reasonably quickly and safely.

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