DOI: 10.7860/JCDR/2021/46995.14803

Original Article

Surgery Section

Retrospective Study on Safety and Efficacy of Transperitoneal Laparoscopic Surgery and Open Surgery for Retrocaval Ureter

DILIP KUMAR PAL[1], ASHUTOSH KUMAR TIWARI[2], KRISHNENDU MAITI[3]

ABSTRACT

Introduction: Retrocaval ureter is a rare congenital anomaly which remains silent until the 3rd or 4th decade of life. But once a patient develops symptoms, it mandates treatment in the form of surgical management. Open surgery has traditionally been considered as the standard of care but it has its own downside or limitations. It requires a relatively large skin incision causing significant postoperative pain and thus prolonging convalescence. Transperitoneal laparoscopic approach is the preferred approach by most surgeons owing to large working space and familiar anatomy.

Aim: To compare the safety and efficacy of transperitoneal laparoscopic and open surgery for definitive management of retrocaval ureter.

Materials and Methods: Clinical data of fifteen patients, that underwent surgery for retrocaval ureter from December 2013 to January 2020 and the study of this data was done from June 2020, at Urology Department were analysed retrospectively. Out of 15 patients, seven were treated by open surgery while eight underwent transperitoneal laparoscopic surgery. Ureter was transpositioned to normal anatomic position followed by uretero-ureterostomy. Student t-test was applied to interpret and analyse the data obtained in both the groups using Statistical Package for the Social Science (SPSS) version 24.

Results: Total of 15 patients data was studied (7 open surgery + 8 transpertional laparoscopic surgery, age group between 21-45 years). Intraoperative and postoperative data were compared between the transperitoneal laparoscopic and open surgery group. A statistically significant difference was found for operative time (p-value <0.001), estimated blood loss (p-value <0.05), analgesic requirement (p-value <0.001), drain removal (p-value <0.05) and hospital stay (p-value <0.001) between the two groups. Superficial surgical site infection was noted in two patients in open surgery group. For rest 13 patients postoperative period was uneventful. The follow-up of all patients was done for 12-36 months.

Conclusion: Transperitoneal laparoscopic uretero-ureterostomy as a definitive treatment of retrocaval ureter is safe, effective and reliable option with less trauma and faster recovery. This minimally invasive technique can be considered as the first choice for treatment of retrocaval ureter on account of familiar anatomy and easier learning curve in contrast to retroperitoneal laparoscopic or robotic surgery.

Keywords: Circumcaval ureter, Congenital anomaly, Retrocaval ureter, Surgical site infection, Uretero-ureterostomy

INTRODUCTION

Retrocaval ureter also known as circumcaval ureter or pre-ureteral vena cava is a rare congenital anomaly. It is actually a developmental anomaly of Inferior Vena Cava (IVC) rather than an aberration in ureteric development. It occurs as a consequence of persistence of posterior cardinal veins. Hochstetter F, is credited with describing the first case of retrocaval ureter in 1893 while performing an autopsy [1]. Left-sided retrocaval ureter is often associated with situs inversus or caval duplication [2]. Kozyrakis D et al., reported a case of left retrocaval ureter associated with urothelial malignancy without situs inversus [3].

Various techniques for the management of retrocaval ureter include- open surgery, transperitoneal laparoscopic surgery, retroperitoneal laparoscopic surgery and even robotic surgery. All the modalities have their pros and cons. Traditionally, open surgery was considered as the standard of care but now the focus has shifted to minimally invasive options as open surgery requires a wide skin incision, causes greater postoperative pain, prolongs healing and also the hospital stay [4].

Transperitoneal laparoscopic surgery is the preferred approach owing to large working space and familiar anatomy in addition to all the advantages of a minimally invasive procedure [5]. Retroperitoneal laparoscopic surgery is yet another minimally invasive option but it is limited by relatively unfamiliar anatomy, less working space making suturing difficult and in turn prolonging the operative time [6]. Robotic surgery, as an option for retrocaval ureter, offers the advantage of facilitating intracorporeal suturing but is limited by its high cost and limited availability, though experienced laparoscopists have found no significant advantage of robotic over laparoscopic reconstruction [7,8].

This study retrospectively compared the safety, efficacy and feasibility of two treatment modalities for definitive management of retrocaval ureter, namely the- open surgery and transperitoneal laparoscopic surgery.

MATERIALS AND METHODS

Clinical data of all patients, that underwent surgery for retrocaval ureter from December 2013 to January 2020 and the study of this data was done from June 2020, at Urology Department IPGMER Kolkata, were retrospectively analysed. Institutional Ethical Committee approved the study (Approval no.- IPGMER/IEC/2020/109).

Patients were divided into two groups- open surgery group and transperitoneal laparoscopic surgery group, depending on the type of surgery they underwent. Preoperative, intraoperative and postoperative characteristics were compared in both the groups- age, gender ratio, operative time in minutes, estimated blood loss in millilitres, numbers of days for which analgesics were required, time after which drain was removed postoperatively and hospital stay.

Operative time was defined as the time interval between incision to completion of surgery in minutes. Estimated blood loss was calculated by adding the suction output to the difference of wet and dry mop. Analgesic requirement was counted as the number of days before the patient was pain free or had minimal pain not

requiring analgesic drugs in the postoperative period. Intravenous infusion of 1 gram paracetamol was given eight hourly on the day of surgery followed by tablet paracetamol 650 milligram eight hourly till the patient was pain free. Drain was removed when the drain output was less than twenty millilitres. Hospital stay was defined as duration from the day of surgery till the discharge of patient. Patient case records were looked into to see the various imaging modalities used to clinch the diagnosis. Imaging modalities included Ultrasound Kidney Ureter Bladder (USG KUB), X-ray KUB, Intravenous Urogram (IVU), Retrograde Pyelogram (RGP) and Computed Tomography Urogram (CTU). Hydroureteronephrosis revealed by IVU was also noted wherever found and graded [9]. The collected data was compared between the two surgical groups [10,11] and position and type of ureter was also noted as relevent data for surgical outcome [12].

STATISTICAL ANALYSIS

Two sample t-test was used to compare the intraoperative and postoperative parameters in the two groups. Statistical significance was set at a p-value of less than 0.05. Data obtained in both the groups were analysed using the software SPSS Version 24.

RESULTS

Fifteen patients underwent surgery for retrocaval ureter during the study period. Patient's age ranged from 21 years to 45 years, with a mean of 32.5 years. Patients presented with symptoms ranging for a duration of 4 months to 24 months. Clinical manifestations chiefly consisted of repeated right loin pain, intermittent haematuria, urinary tract infection and right loin swelling/fullness. All patients were offered USG KUB, X-ray KUB and IVU initially. RGP and CTU were offered to patients having diagnostic uncertainty. Subsequently, ten patients had undergone RGP while five patients had their CTU done. USG revealed right renal calyceal, pelvic and proximal ureteric dilatation in all patients. IVU revealed mild to moderate hydronephrosis in eleven patients while four patients had severe hydroureteronephrosis [9].

Imaging showed the right ureter to be displaced to the median line before the 3rd to 4th lumbar vertebrae giving the appearance of a typical S or reverse J sign. CTU revealed right hydronephrosis, dilatation of right proximal ureter. Ureter was found to be coursing medially posterior to the inferior vena cava. All fifteen patients in this study had type 1 retrocaval ureter [12]. The demographic and perioperative characteristics of patients in both the groups were compared as shown in [Table/Fig-1,2]. The chief perioperative characteristics under evaluation consisted of operative time, estimated blood loss, analgesic requirement, drain removal and duration of hospital stay.

Patient profile	Laparoscopic surgery	Open surgery
No. of patients	8	7
Age (years)	29.1±7.4	36.4±7.2
Gender (male:female)	3:5	3:4

[Table/Fig-1]: Preoperative patient characteristics.
Values are presented as number or mean±Standard Deviation

Parameters	Laparoscopic surgery (mean±SD)	Open surgery (mean±SD)	p-value[a]
Operative time (minutes)	123.8±14.1	92.9±15.8	**<0.001**
Estimated blood loss (mL)	63.8±14.1	107.1±37.4	**<0.05**
Analgesic* requirement (days)	3±0.8	6.4±1.9	**<0.001**
Drain removal (days)	2.9±0.8	5.4±1.9	**<0.05**
Hospital stay (days)	5.4±1.4	9.4±1.9	**<0.001**

[Table/Fig-2]: Comparison of intraoperative and postoperative data.
[a]: Student t-test; *Intravenous infusion Paracetamol 1 gram 8 hourly on the day of surgery followed by oral tablet Paracetamol 650 milligram 8 hourly on postoperative day 1 and thereafter oral paracetamol 650 milligram 1 tablet SOS for pain; p-value <0.05 considered statistically significant

Open Surgery Group

Open surgery was successfully performed in seven patients. A statistically significant difference was seen in all the perioperative parameters as depicted by p-value obtained in [Table/Fig-2] Superficial surgical site infection was seen in two patients prolonging their hospital stay. Postoperative follow-up ranged from 12 months to 36 months. In the follow-up period, patients were symptom free without any complications.

Transperitoneal Laparoscopic Surgery Group

Transperitoneal laparoscopic surgery was performed successfully in eight patients. Patients in this group consisted of three males and five females. [Table/Fig-2] clearly shows the superiority of laparoscopic surgery over open surgery in terms of less blood loss, lesser requirement of analgesia, earlier drain removal and shorter hospital stay as evidenced by statistically significant p-value. While the operative time in this group of patients was significantly prolonged in comparision to open surgery group. Postoperative follow-up ranged from four months to three years. Stent removal was done at six weeks. Thereafter, patients had no complains during the entire follow-up period.

DISCUSSION

The observations of this study support transperitoneal laparoscopic surgery as the most suited option for definitive management of retrocaval ureter as depicted by shorter operative time, less blood loss, lesser requirement of analgesia, earlier drain removal and in turn markedly reduced hospital stay and thus enabling the patient to return to their normal lifestyle much earlier as supported by statistically significant p-value [Table/Fig-2].

Mao L et al., published a similar study comparing retroperitoneal laparoscopic surgery and open surgery. Retroperitoneal approach enables direct access to kidney thus reducing the incidence of complications but it is challenged by a steeper learning curve. Their findings were similar to the findings of this study advocating laparoscopic surgery over and above open surgery [10].

In this study, all cases had retrocaval ureter on the right side as is the case more often than not. Thirugnanasambandam V et al., reported a case of isolated left retrocaval ureter with a single left sided IVC without situs inversus [11]. In 1982, Bergman classified retrocaval ureter into two clinical types [12]. Type 1 (low loop) is more common, with the dilated proximal ureter resembling a reverse J. Type 1 retrocaval ureter usually presents with obstructive symptoms. In Type 2 (high loop), the ureter passes behind the IVC at the level of pelviureteric junction thus causing minimal or no hydronephrosis [12].

Mugiya S et al., provided the first report of retroperitoneoscopic intracorporeal ureteral anastomosis using automatic suture device to correct retrocaval ureter [13]. Recently, Laparoendoscopic Single Site (LESS) Surgery has been introduced to further improve cosmesis and reduce morbidity. Abdel-Karim AM et al., described the use of LESS for the treatment of retrocaval ureter in a morbidly obese female. Their study clearly mentions, though Laparoscopic Endoscopic Single-site Surgery (LESS) offers a good cosmesis with minimal scar it has its own drawbacks like collision of instruments, lack of triangulation and in line vision making suturing extremely difficult [14]. Kumar S et al., performed single incision multiport laparoendosopy to repair retrocaval ureter using ureteric tacking fixation technique which makes suturing easy and rapid by conventional laparoscopic instruments [15].

Here again the major issue is the limited manoeuvrability of instruments leading to difficulty in suturing and thus prolonging the operative time. Yen JM et al., reported conservative management of two cases of retrocaval ureter with significant proximal hydroureteronephrosis and suggested immediate surgical repair is

not always warranted [16]. In contrast to the findings of Yen JM et al., the present study believes early surgical intervention is required once the patient becomes symptomatic.

In this study, transperitoneal laparoscopic end-to-end uretero-ureterostomy was performed in eight cases for definitive management of retrocaval ureter. As is evident from this study, transperitoneal laparoscopic approach fared much better than open approach in all aspects. Also, when compared to retroperitoneal laparoscopic surgery, transperitoneal approach appears to be much simpler owing to familiar anatomy and a larger working space. Even robotic surgery does not offer any great advantage over laparoscopic technique apart from the ergonomic ease for the surgeon [8]. Though LESS and single incision multiport laparoendoscopic surgeries offer better cosmesis but only at the cost of poor ergonomics, limited maneuverability and difficult suturing [14,15].

Limitation(s)

Firstly, the sample size was small and secondly, the follow-up was also short.

CONCLUSION(S)

Transperitoneal laparoscopic end-to-end uretero-ureterostomy as a definitive treatment of retrocaval ureter is safe, effective and reliable option with less trauma and faster recovery. This minimally invasive technique can be considered as the first choice for treatment of retrocaval ureter even at the hands of relatively less experienced laparoscopic urologists on account of better orientation via familiar anatomical landmarks and shorter learning curve. Further studies with a larger sample size and a longer follow-up are needed to strongly support the conclusions drawn from this study.

REFERENCES

[1] Hochstetter F. Beitragezurentwicklungsgeschichte des venen-systems der amnioten: III. Sauger. Morph Jahrb. 1893;20:542.
[2] Gupta P, Khullar M, Sharma R, Singh R. A rare presentation of the double inferior vena cava with an anomalous retrocaval right ureter: Embryogenesis and Clinical Implications. J Clin Diagn Res.2013;7(3):518-21.
[3] Kozyrakis D, Prombonas I, Kyrikos V, Grigorakis A, Pliotas G, Malovrouvas D. Left retrocaval ureter associated with urothelial malignancy: Presentation of a rare case. Urol J. 2012;9(2):527-29.
[4] Tuncer M, Faydaci G, Yazici Ö, Sağlam E, Özgül A, et al. Retrocaval ureter: A rare congenital anomaly. J Kartal TR. 2016;27(2):138-41.
[5] Nagraj HK, Kishore TA, Nagalakshmi S. Transperitoneal laparoscopic approach for retrocaval ureter. J Min Access Surg. 2006;2(2):81-82.
[6] Tobias-Machado M, Lasmar MT, Wroclawski ER. Retroperitoneoscopic surgery with extracorporeal uretero-ureteral anastomosis for treating retrocaval ureter. Int Braz J Urol. 2005;31(2):147-50.
[7] Alkhudair WK, Seyam R, Al Zahrani HM, Al Otaibi MF, Al Taweel W. Robotic uretero-ureterostomy of the retrocaval ureter without excision of the retrocaval segment. Can Urol Assoc J. 2012;6(2):E38-41.
[8] Hemal AK, Rao R, Sharma S, Clement RG. Pure robotic retrocaval ureter repair. Int Braz J Urol. 2008;34(6):734-38.
[9] Onen A. Grading of hydronephrosis: An ongoing challenge. Front Pediatr. 2020;8:458.
[10] Mao L, Xu K, Ding M, Pan J, Guo Z. Comparison of the efficacy and safety of retroperitoneal laparoscopic and open surgery for the correction of retrocaval ureter. Ther Clin Risk Manag. 2017;13:697-701.
[11] Thirugnanasambandam V, Nayak P, Mossadeq A. Left retrocaval ureter without situs inversus or inferior venacava duplication. Indian J Urol. 2015;31:372-73.
[12] Graham RA, Garnsey L, Jessup MJ. Local excision of rectal carcinoma. The American Journal of Surgery. 1990;160 (3):306-12.
[13] Mugiya S, Suzuki K, Ohhira T, Un-No T, Takayama T, Fujita K. Retroperitoneoscopic treatment of a retrocaval ureter. Int J Urol. 1999;6:419-22.
[14] Abdel-Karim AM, Yahia E, Hassouna M, Missiry M. Laparoscopic single site surgery for repair of retrocaval ureter in a morbidly obese patient. Urol Case Rep. 2015;4:61-63. PMC 4719792.
[15] Kumar S, Shankaregowda SA, Devana SK, Jain S, Singh SK. Single-incision multiport laparoendoscopic technique to repair retrocaval ureter using the Santosh PGI ureteric tacking fixation technique. Asian J Endosc Surg. 2014;7(8):337-41.
[16] Yen JM, Lee LS, Cheng CW. Conservative management of retrocaval ureter: A case series. Int J Surg Case Rep. 2015;15:93-95. PMC 4601973.

PARTICULARS OF CONTRIBUTORS:
1. Professor and Head, Department of Urology, IPGMER/SSKMH, Kolkata, West Bengal, India.
2. PDT/MCH Resident, Department of Urology, IPGMER/SSKMH, Kolkata, West Bengal, India.
3. Associate Professor, Department of Urology, IPGMER/SSKMH, Kolkata, West Bengal, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Dilip Kumar Pal,
Institute of Post Graduate Medical Education and Research 244, AJC Bose Road, Kolkata-700020, West Bengal, India.
E-mail: urologyipgmer@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Oct 05, 2020
- Manual Googling: Jan 30, 2021
- iThenticate Software: Mar 06, 2021 (12%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? NA
- For any images presented appropriate consent has been obtained from the subjects. NA

Date of Submission: **Oct 04, 2020**
Date of Peer Review: **Dec 14, 2020**
Date of Acceptance: **Feb 06, 2021**
Date of Publishing: **Apr 01, 2021**