Original Article

Percutaneous retropelvic endopyelotomy for treatment of ureteropelvic junction obstruction

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Abstract

Purpose: A new minimally invasive approach for endopyelotomy for the treatment of ureteropelvic junction obstruction (UPJO) is described. The results are compared with those of other lines of treatment.

Materials and Methods: A total of 39 patients with UPJO underwent percutaneous retropelvic endopyelotomy. Retrograde percutaneous renal access, using the Lawson catheter and deflecting guidewire, was done for creation of the nephrostomy tract. Using holmium laser through a 28-Fr nephroscope, a small window was made in the posterolateral surface of the renal pelvis. The nephroscope was advanced from the renal pelvis to the retropelvic space through that window. Crossing vessels were easily detected and were either coagulated or avoided. The window incision was extended distally, and the narrow ureteropelvic junction (UPJ) was incised using holmium laser.

Results: The entire procedure was done in the supine position within 1 h. The presence of secondary stones, hugely dilated renal pelvis, high insertion of the UPJ, and whether UPJO was primary or secondary, did not alter the results. The only factor that affected the results was split function of the obstructed renal unit. The success rate was 100% when the split function exceeded 35%. When the split function was <35%, the success rate dropped to 56%.

Conclusion: Percutaneous retropelvic endopyelotomy is a promising approach for the treatment of UPJO that gave favorable results. The use of the nephroscope provided a wide visual field. The wide-field facilitated detection of crossing blood vessels with no incident of vascular injury. It also facilitated endopyelotomy with high precision. Ureteral injury was not a risk factor.

Keywords: Endopyelotomy, laser, obstruction, percutaneous renal surgery

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INTRODUCTION

Percutaneous antegrade and retrograde endopyelotomies, as well as surgical and laparoscopic pyeloplasty, have their advantages as well as their limitations for the treatment of ureteropelvic junction obstruction (UPJO).[1,2] Unlike other methods of endopyelotomy, the nephroscope with its wide visual field was used instead of the ureteroscope during percutaneous retropelvic endopyelotomy. The technique is discussed, and its results are compared to those of the previously mentioned procedures.

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MATERIALS AND METHODS

A total of 39 patients (23 males and 16 females) aged 13–55 years (mean: 37 years) underwent retropelvic endopyelotomy for UPJO between March 1998 and April 2017. The procedure was approved by the Review Board of the Institution (IRB) and performed by one surgeon (KAO) after obtaining informed consent from the patient. The diagnosis of UPJO was made by ultrasound, computed tomography urography, and/or intravenous urography (IVU). Tc99 m-MAG3 radioisotope was performed to assess differential renal function. Preoperative imaging for aberrant renal arteries or crossing vessels was not done. Postoperative follow-up within 27 months (19–32 months) was assessed by IVU as well as by symptomatic relief in patients who had preoperative renal pain.

The entire procedure was performed in the supine lithotomy position. It included both retrograde renal access for the creation of the nephrostomy tract and percutaneous retropelvic endopyelotomy. The percutaneous retrograde renal puncture was done using the Lawson retrograde nephrostomy wire puncture set as described in a previous report.[3] Supports to the hemipelvis and scapula were used on the operated side during the establishment of the nephrostomy tract [Figure 1]. The exit route of the skin puncture was made through the middle calyx (30 patients) or the upper calyx (9 patients). Two guide wires were retrogradely advanced in the ureter to keep the ureter widely open during laser endopyelotomy. High-pressure nephromax was used to create the nephrostomy tract for passage of a 30-Fr Amplatz sheath.

A 28-Fr nephroscope was advanced along the nephrostomy tract to reach the renal pelvis. A 365-micron laser fiber was introduced through a 5-Fr catheter for fiber stabilization. A 1.5-cm long full thickness incision was made in the posterolateral wall of the renal pelvis using holmium laser to create a window just above the ureteropelvic junction (UPJ). The nephroscope entered the retropelvic space through the created window. Retropelvic fat, any existing posterior crossing blood vessels, and the UPJO were all clearly visualized by the nephroscope. Crossing vessels were coagulated if small or avoided if larger in caliber. Retropelvic endopyelotomy was performed using holmium laser. The window incision initially made in the renal pelvis was extended distally through the narrow UPJ and continued for at least 1 cm along the proximal ureter till healthy ureteral mucosa was reached [Figure 2]. The depth and adequacy of the laser endopyelotomy incision were easily achieved with high precision. The incised UPJ was widely separated to minimize the risk of recurrence.

At the end of the procedure, a 7–14 Fr double-J endopyelotomy tapered stent was placed over the guide wire in the ureter, and a 22-Fr nephrostomy catheter was inserted in the renal pelvis [Figure 3]. On the 2nd postoperative day, the nephrostomy catheters were removed after excluding extravasation of contrast by nephrostograms. The endopyelotomy stents were removed 8 weeks later as an outpatient procedure.

RESULTS

All patients had unilateral UPJO with normal contralateral kidneys and normal serum creatinine levels. A total of 30 patients complained from preoperative renal pain. The remaining nine were asymptomatic and were diagnosed accidentally by abdominal imaging studies performed for unrelated purposes. The average time required to establish the retrograde nephrostomy tract was 14.4 min (11–18),

Figure 1: Patient in the supine lithotomy position

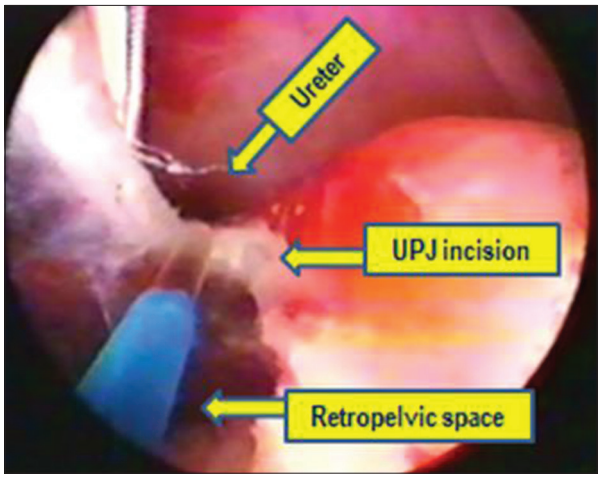

Figure 2: The extended laser endopyelotomy at the ureteropelvic junction

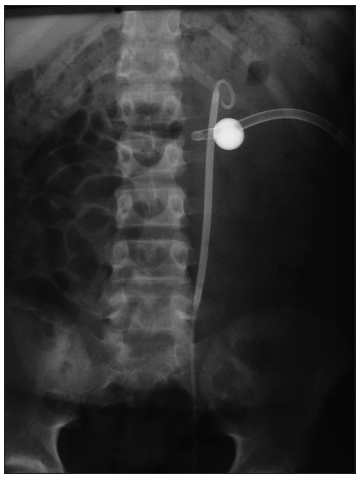

Figure 3: Postoperative kidney, ureter, and bladder for the double-J endopyelotomy stent

and the procedure was completed in an average of 40 min (34–47). Follow-up was made within an average period of 9 months (6–14). Criteria of long-term success included radiographic resolution by IVU and symptomatic relief in patients with preoperative pain.

Preoperative imaging, as well as isotope studies, revealed mild-to-moderate hydronephrosis in 30 patients. The renal function of the obstructed unit in those patients was more than 35%. They all had a successful outcome following retropelvic endopyelotomy (100%). The remaining nine patients had advanced hydronephrosis with the split renal function of the obstructed unit >35%. Five out of the nine patients had a successful postoperative outcome (56%). The overall success was in 35 out of 39 patients (90%) [Table 1].

Six patients had preoperative urinary tract infection (UTI) and were symptomatic. The infection was managed and controlled before surgery. Secondary stones were present in eight patients. Four had stones in the renal pelvis, two in the lower calyx and two in both the renal pelvis and lower calyx. All stones were removed during the procedure. Nine patients had a hugely dilated renal pelvis, and five had a high insertion of the UPJ [Table 2]. Thirty patients had primary UPJO, and nine had secondary UPJO following failed surgical pyeloplasty. When the renal function of the obstructed unit was <35%, the outcome was successful in three out of six patients (50%) with primary UPJO, and in two out of three patients (66%) with secondary UPJO [Table 3]. The presence of preoperative UTI, secondary stones, hugely dilated renal pelvis, and high insertion of the UPJ or secondary UPJO did not affect the results. The only factor that reduced the success rate was an impaired renal function of the obstructed unit below 35% [Tables 2 and 3].

Table 1: Correlation of the success rate and renal function

Renal function of obstructed unit	Success rate
> 35%	30/30 (100%)
< 35%	5/9 (56%)
Total	35/39 (90%)

Table 2: Associated factor affect the success rate

Obstructed renal unit	No	Renal function of obstructed unit	
		> 35%	< 35%
UTI treated pre-operatively	6	5/5 (100%)	1/1 (100%)
Secondary stones	8	6/6 (100%)	1/2 (50%)
Hugely dilated renal pelvis	9	6/6 (100%)	2/3 (67%)
High insertion of UPJ	5	4/4 (100%)	0/1 (0%)

Table 3: Primary versus secondary ureteropelvic junction obstruction outcome

Obstructed renal unit	No	Renal function of obstructed unit	
		> 35%	< 35%
Primary UPJO	30	24/24 (100%)	3/6 (50%)
Secondary UPJO	9	6/6 (100%)	2/3 (66%)
Total	39	30/30 (100%)	5/9 (56%)

On entering the retropelvic space through the renal pelvic window, no aberrant renal arteries or major posterior crossing vessels were seen in any of the patients by the nephroscope; however, smaller crossing vessels were frequently noted. They were either coagulated using holmium laser or avoided if large in caliber. There was no operative or postoperative bleeding in any of the patients. The double-J stent was not placed in the ureter during endopyelotomy because of the risk of its damage by the laser beams. Ureteral dilation was maintained by two guidewires next to each other during laser endopyelotomy.

The endopyelotomy incision along the UPJO segment was 5–12 mm in length. An extended endoureterotomy (1.5–2.0 cm) was made in seven patients who had a high insertion of the ureter at the UPJ. In those patients, the incision reached the level of the lower boundary of the renal pelvis. Upper calyceal access through a supracostal puncture above the 11th rib was done in two patients. They both developed postoperative pleural effusion that was managed conservatively by physiotherapy in one patient and by pleural tap in the other.

DISCUSSION

The success rates of surgical and laparoscopic pyeloplasty for the treatment of UPJO are higher (90%–100%) than those of percutaneous antegrade and retrograde endopyelotomies (85%–90%).[4-8] However, the surgical pyeloplasty is an invasive procedure that

requires a long hospital stay and can be associated with wound problems, whereas laparoscopic pyeloplasty is a complex procedure that requires a steep learning curve.[9] On the other hand, vascular and ureteral injuries are concerns when percutaneous antegrade or retrograde endopyelotomy is performed.[2,10] Those limitations were not encountered with percutaneous retropelvic endopyelotomy.

The success rate of percutaneous retropelvic endopyelotomy was 100%. However, impaired split renal function had a negative impact on the success rate following this as well as other methods of endopyelotomy.[2] On the other hand, variations in split renal function did not compromise the results of laparoscopic pyeloplasty,[11] making it the first line of the treatment for UPJO in the presence of poorly functioning renal units.

Preoperative imaging studies for the detection of crossing vessels were usually performed before percutaneous and retrograde endopyelotomy.[12-15] Those studies were not required before percutaneous retropelvic endopyelotomy. The posterior crossing vessels were easy detected in the retropelvic space before endopyelotomy. They were safely secured with no risk of vascular injury. Anterior crossing vessels, that occur more commonly,[15] were away from the retropelvic surgical field and did not pose a threat for injury. Whether the major crossing vessels were anterior or posterior, their presence seems to have little impact on UPJO and treatment outcome.[2,16]

The nephroscope was advanced through a window from the renal pelvis to enter the retropelvic space outside the urinary tract. The retropelvic space was clearly visualized, crossing blood vessels were dealt with, and laser endopyelotomy was performed with no adverse effects. The intentional exit of an endoscope from the urinary tract was previously reported for endoscopic urethral realignment in patients with traumatic disruption of the posterior urethra.[17,18] The large visual field of the nephroscope facilitated the procedure to a great extent. Moreover, there was no risk of ureteral injury during percutaneous retropelvic endopyelotomy because the antegrade direction of the nephroscope from the renal pelvis to the retropelvic space did not involve the ureter.

The patient was in the supine position throughout the procedure. Retrograde percutaneous renal puncture and establishment of the nephrostomy tract did not require the prone position. The prone position used for antegrade percutaneous renal puncture can be challenging in the presence of compromised respiratory or cardiovascular function,[19,20] and rotation of the patient from the prone to the supine position to proceed with the endopyelotomy is both time-consuming and cumbersome. Performing the entire procedure in the supine position was convenient to the patient, urologist, and anesthetist. The nephrostomy tract was established in a short period with minimal irradiation exposure even in the presence of a collapsed collecting system. Retrograde advancement of the guide wire from the ureter to the renal pelvis following retrograde renal puncture was achieved without difficulty. On the other hand, antegrade passage of the guide wire from the renal pelvis to the ureter following antegrade renal puncture can be hindered by the narrow and often misplaced UPJ in the presence of UPJO.

Limitations of the study

This study had some limitations; being retrospective and subject to bias cannot be excluded. The patient population was low and not adequate for statistical analysis. Another limitation was the relatively short postoperative follow-up period, and its sole assessment by IVU as well as symptomatic relief. Performing selective renal scan after surgery would have been more informative when compared to the already performed preoperative renal scan. Despite these limitations, the outcome results of future multi-institutional studies that would adopt this new approach will be of significant value.

CONCLUSION

Percutaneous retropelvic endopyelotomy was safe, easy to perform, and had a higher success rate other methods of endopyelotomy. The use of the nephroscope provided a wide visual field that facilitated the procedure. There were no concerns about vascular or ureteral injury. This new approach can be a valid option for the treatment of UPJO, preferably if the split renal function of the obstructed unit is more than 35%.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Stein RJ, Gill IS, Desai MM. Comparison of surgical approaches to ureteropelvic junction obstruction: Endopyeloplasty versus endopyelotomy versus laparoscopic pyeloplasty. Curr Urol Rep 2007;8:140-9.
2. Okhunov Z, Duty B, Okeke Z, Smith AD. Adult endopyelotomy overcoming the difficulties. In: Al-Kanadari AM, Desai M, Shokeir AA, Shoma AM, Smith AD, editors. Difficult Cases in Endourology. London: Springer-Verlag; 2013. p. 203-10.

3. Al-Otaibi KM. Retrograde upper-pole calyceal access for percutaneous nephrolithotripsy of stones in the lower-pole calyx. Arab J Urol 2012;10:353-7.
4. Jabbour ME, Goldfischer ER, Klima WJ, Stravodimos KG, Smith AD. Endopyelotomy after failed pyeloplasty: The long-term results. J Urol 1998;160:690-2.
5. Bauer JJ, Bishoff JT, Moore RG, Chen RN, Iverson AJ, Kavoussi LR, *et al*. Laparoscopic versus open pyeloplasty: Assessment of objective and subjective outcome. J Urol 1999;162:692-5.
6. Lasmar MT, Castro HA Jr., Vengjer A, Guerra FA, Souza EA, Rocha LM, *et al*. Transperitoneal laparoscopic pyeloplasty: Brazilian initial experience with 55 cases. Int Braz J Urol 2010;36:678-84.
7. Kletscher BA, Segura JW, LeRoy AJ, Patterson DE. Percutaneous antegrade endopyelotomy: Review of 50 consecutive cases. J Urol 1995;153:701-3.
8. Shalhav AL, Giusti G, Elbahnasy AM, Hoenig DM, McDougall EM, Smith DS, *et al*. Adult endopyelotomy: Impact of etiology and antegrade versus retrograde approach on outcome. J Urol 1998;160:685-9.
9. Rassweiler JJ, Teber D, Frede T. Complications of laparoscopic pyeloplasty. World J Urol 2008;26:539-47.
10. Sampaio FJ. Vascular anatomy at the ureteropelvic junction. Urol Clin North Am 1998;25:251-8.
11. Ost MC, Kaye JD, Guttman MJ, Lee BR, Smith AD. Laparoscopic pyeloplasty versus antegrade endopyelotomy: Comparison in 100 patients and a new algorithm for the minimally invasive treatment of ureteropelvic junction obstruction. Urology 2005;66:47-51.
12. Mitterberger M, Pinggera GM, Neururer R, Peschel R, Colleselli D, Aigner F, *et al*. Comparison of contrast-enhanced color Doppler imaging (CDI), computed tomography (CT), and magnetic resonance imaging (MRI) for the detection of crossing vessels in patients with ureteropelvic junction obstruction (UPJO). Eur Urol 2008;53:1254-60.
13. Grasso M, Caruso RP, Phillips CK. UPJ obstruction in the adult population: Are crossing vessels significant? Rev Urol 2001;3:42-51.
14. Martin X, Rouvière O. Radiologic evaluations affecting surgical technique in ureteropelvic junction obstruction. Curr Opin Urol 2001;11:193-6.
15. Frauscher F. Value of contrast-enhanced color Doppler imaging for detection of crossing vessels in patients with ureteropelvic junction obstruction. Radiology 2000;217:916-7.
16. Gupta M, Tuncay OL, Smith AD. Open surgical exploration after failed endopyelotomy: A 12-year perspective. J Urol 1997;157:1613-8.
17. White JL, Hirsch IH, Bagley DH. Endoscopic urethroplasty of posterior urethral avulsion. Urology 1994;44:100-5.
18. Moudouni SM, Patard JJ, Manunta A, Guiraud P, Lobel B, Guillé F. Early endoscopic realignment of post-traumatic posterior urethral disruption. Urology 2001;57:628-32.
19. Zhan HL, Li ZC, Zhou XF, Yang F, Huang JF, Lu MH. Supine lithotomy versus prone position in minimally invasive percutaneous nephrolithotomy for upper urinary tract calculi. Urol Int 2013;91:320-5.
20. Al-Dessoukey AA, Moussa AS, Abdelbary AM, Zayed A, Abdallah R, Elderwy AA, *et al*. Percutaneous nephrolithotomy in the oblique supine lithotomy position and prone position: A comparative study. J Endourol 2014;28:1058-63.