

Minimally invasive versus open pyeloplasty in pediatric population: Comparative retrospective study in tertiary centre

Naif Hajar Alqarni, Fahad Ali Alyami, Mohammed Abdullah Alshayie, Alhasan Mohamed Abduldaem, Mohammed Sultan¹, Sultan Sulaiman Almaiman, Hazim Mohammed Alsufyani², Ibrahim Sami Abunohaiah³

Department of Urology, King Faisal Specialist Hospital and Research Centre, ³Department of Surgery, Division of Urology, College of Medicine and King Saud University Medical City, King Saud University, Riyadh, ¹Pediatric Surgery and Urology Department, Maternity and Children Hospital, Makkah, ²Urology Department, King Faisal Complex Hospital, Taif Saudi Arabia

Abstract

Background: Ureteropelvic junction obstruction (UPJO) is the most common cause of antenatal hydronephrosis. The incidence is around 1: 750–1500 live births. The standard treatment for (UPJO) is open pyeloplasty (OP) with a high success rate of 90%–95%. In the last 20 years, minimal invasive pyeloplasty (MIP) became an excellent alternative technique to OP which was historically the standard of care.

Materials and Methods: The study participants were male and female patients aged 14 years old or less who had undergone open/minimally invasive pyeloplasty during 2015–2020 and who had at least 1-year follow-up after surgery. The data were collected retrospectively from patients' charts. The patients were categorized into two cohort groups: OP and on the other arm minimally invasive pyeloplasty (robotic/laparoscopic) comparing the outcomes as a 1ry endpoint. 2ry endpoints were hospital stay, duration of surgery, and anteroposterior diameter of renal ultrasound.

Results: A total of 133 patients were included in the study. Eighty-four underwent MIP while 49 patients underwent OP. 1ry endpoint was the success rate in both groups. The success rate was 94% (n : 79) and 98% (n : 48) in patients who underwent MIP and OP, respectively. $P < 0.05$ is considered significant.

Conclusion: Open and minimally invasive pyeloplasty are comparable in terms of success rate. However, OP was associated with shorter hospital stays and shorter operative times.

Keywords: Minimally invasive, pyeloplasty, ureteropelvic junction obstruction

Address for correspondence: Dr. Alhasan Mohamed Abduldaem, Department of Urology, King Faisal Specialist Hospital and Research Center, Riyadh, Saudi Arabia. E-mail: alhasan.md.a@gmail.com

Received: 01.10.2023, **Accepted:** 01.04.2024, **Published:** 03.07.2024.

INTRODUCTION

Ureteropelvic junction obstruction (UPJO) is the most prevalent cause of antenatal hydronephrosis. Its incidence is approximately 1:750–1500 live births. It occurs more commonly in males than in females, with a ratio of

2:1.^[1] The definitive therapy for UPJO is dismembered Anderson–Hynes pyeloplasty with a high success rate of 90%–95%.^[2,3] In the last 20 years, minimally invasive pyeloplasty (MIP) has become an excellent alternative to

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Alqarni NH, Alyami FA, Alshayie MA, Abduldaem AM, Sultan M, Almaiman SS, *et al.* Minimally invasive versus open pyeloplasty in pediatric population: Comparative retrospective study in tertiary centre. *Urol Ann* 2024;16:215-7.

Access this article online	
Quick Response Code:	Website: www.urologyannals.com
	DOI: 10.4103/ua.ua_101_23

open pyeloplasty (OP), historically the standard of care. MIP has many advantages over OP, such as a good cosmetic appearance, shorter hospital stays, and less postoperative pain.^[2] However, MIP requires a longer training curve, sufficient practice, and experience.^[4] There is no definitive evidence of the optimal surgical approach in complex UPJO cases such as horseshoe kidney, high ureteral insertion, or long ureteral stricture.^[2] This study compared the long-term outcomes of OP and MIP.

MATERIALS AND METHODS

After obtaining approval from our research center, the data of all pediatric patients aged 14 years or younger who underwent pyeloplasty by different surgeons from one tertiary institute between 2015 and 2020 were collected.

Data included patient demographics, operative time, technique used, side of surgery, and hospital stay. The patients were categorized into OP and MIP groups. The surgical success rate was compared between the groups and was labeled as the primary endpoint. Secondary endpoints were hospital stay, duration of surgery, laterality, and age at the time of intervention. The success rate was defined as an anterior-posterior diameter (APD) on renal ultrasound (US) of <10 mm postoperatively. Dismembered pyeloplasty (Anderson–Hyens) was performed on all patients in both groups. The exclusion criteria were redo pyeloplasty, UPJ associated with other anomalies, and patients who underwent various surgical techniques other than dismembered pyeloplasty. Notably, all patients underwent at least 2 renal US examinations, in which APD was calculated pre- and postoperatively. At the surgeon's discretion, a diuretic renal scan was conducted in some cases. Statistical analyses were performed using the SPSS software version 23. Categorical variables were analyzed using the Chi-square test, and statistical significance was set at a $P < 0.05$. t -test and Fisher's exact test were not used for data analysis.

RESULTS

A total of 156 patients were initially included in this study, of whom 133 met the inclusion criteria. Of these, there were 84 patients with a mean age of 79 months (range: 3–168) who underwent MIP and 49 patients with a mean age of 27 months (range: 2–132) who underwent OP. The incidence of UPJO in our study was higher in the male group, with 101 (75.9%) patients than in the females (32 [24.1%] patients [$P = 0.006$]). The incidence of UPJO was higher in the right kidney than in the left kidney [Table 1].

Table 1: Demographic data

Procedure	Age		Gender		Laterality	
	<i>n</i>	Mean (months)	Male	Female	Right	Left
MIP	84	79	57	27	65	19
Open	49	27	44	5	31	18

MIP: Minimal invasive pyeloplasty

The success rates were 94% ($n = 79$) and 98% ($n = 48$) in patients who underwent MIP and OP, respectively ($P = 0.4$).

Hospital stay in the MIP group was significantly prolonged compared with that in the OP group, with a mean of 4.01 (range: 1–11) and 2.4 days (range: 1–7), respectively ($P = 0.00$).

The operative time was recorded in minutes for both groups. The mean was significantly lower in the OP group at 182 min (range: 90–300) than in the MIP group at 94 min (range: 118–469) ($P = 0.00$).

The APD on renal ultrasound was measured and evaluated in millimeters in both groups before and after surgical intervention. In the MIP Group, the mean APD before surgery was 19 mm (range: 2–57). A significant improvement was observed in the postoperative period, measuring 11 mm (range: 1–57). In contrast, the APD was 28 mm (range: 3–86) in the OP group before the surgical intervention, and the postoperative measurement showed significant improvement, measuring 12 mm (range: 3–37). Notably, both groups showed no statistical difference in APD postoperatively using the t -test ($P = 0.6$).

DISCUSSION

UPJO is a typical congenital anomaly with male predominance.^[1–3] OP was the gold standard of UPJO therapy until the 2000s, when MIP became one of the standard care options for such patients.^[2] In our study, we retrospectively compared the outcomes of MIP with those of OP between 2015 and 2020 in tertiary care centers. We defined the postpyeloplasty success rate as an improvement in the degree of hydronephrosis, APD, and symptoms. According to the literature, most studies have the same definition of postpyeloplasty success rate.^[5] In the literature, >90% of the cases showed an improvement in hydronephrosis grade and APD. Our results showed a similar success rate to what has been published in the literature, 94% and 98% in the MIP and OP groups, respectively. Moreover, our results in the MIP group could be compared with the success rate in the OP group, as proven by many previous studies.^[4,6–14]

Our failure rate was 7%; 5 were in the MIP group, and 1 was in the OP group. Notably, all patients underwent

uneventful repeat pyeloplasty. Our failure rate and detection time were similar to those reported in the literature.^[14] One patient (1%) in the MIP group developed a urine leak postoperatively, similar to that in previous studies.^[15,16] The mean operative time was 182 min and 94 min in the MIP and OP groups, respectively, comparable with those reported in previous studies.^[17]

CONCLUSION

Open and minimally invasive pyeloplasty have comparable success rates and are equally effective and safe for children with UPJO. OP was associated with shorter hospital stays and shorter operative time. Minimally invasive pyeloplasty is becoming one of the gold-standard options for children with UPJO; however, it has a long learning curve.

Acknowledgment

Prince Naif Health Research Center, Investigator Support Unit for the language editing service provided.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Carr MC, El-ghoneimi A. Anomalies and surgery of the ureteropelvic junction in children. In: Campbell-Walsh-wein Urology. 9th ed. Philadelphia: Saunders; 2007. p. 3359-82.
- Esposito C, Masieri L, Blanc T, Musleh L, Ballouhey Q, Fourcade L, *et al.* Robot-assisted laparoscopic pyeloplasty (RALP) in children with complex pelvi-ureteric junction obstruction (PUJO): Results of a multicenter European report. *World J Urol* 2021;39:1641-7.
- Casale P, Grady RW, Joyner BD, Zeltser IS, Figueroa TE, Mitchell ME. Comparison of dismembered and nondismembered laparoscopic pyeloplasty in the pediatric patient. *J Endourol* 2004;18:875-8.
- Dothan D, Raisin G, Jaber J, Kocherov S, Chertin B. Learning curve of robotic-assisted laparoscopic pyeloplasty (RALP) in children: How to reach a level of excellence? *J Robot Surg* 2021;15:93-7.
- Minnillo BJ, Cruz JA, Sayao RH, Passerotti CC, Houck CS, Meier PM, *et al.* Long-term experience and outcomes of robotic assisted laparoscopic pyeloplasty in children and young adults. *J Urol* 2011;185:1455-60.
- Lee RS, Retik AB, Borer JG, Peters CA. Pediatric robot assisted laparoscopic dismembered pyeloplasty: Comparison with a cohort of open surgery. *J Urol* 2006;175:683-7.
- Riachy E, Cost NG, Defoor WR, Reddy PP, Minevich EA, Noh PH. Pediatric standard and robot-assisted laparoscopic pyeloplasty: A comparative single institution study. *J Urol* 2013;189:283-7.
- Uhlig A, Uhlig J, Trojan L, Hinterthaler M, von Hammerstein-Equord A, Strauss A. Surgical approaches for treatment of ureteropelvic junction obstruction – A systematic review and network meta-analysis. *BMC Urol* 2019;19:112.
- Liu DB, Ellimoottil C, Flum AS, Casey JT, Gong EM. Contemporary national comparison of open, laparoscopic, and robotic-assisted laparoscopic pediatric pyeloplasty. *J Pediatr Urol* 2014;10:610-5.
- Penn HA, Gatti JM, Hoestje SM, DeMarco RT, Snyder CL, Murphy JP. Laparoscopic versus open pyeloplasty in children: Preliminary report of a prospective randomized trial. *J Urol* 2010;184:690-5.
- Gatti JM, Amstutz SP, Bowlin PR, Stephany HA, Murphy JP. Laparoscopic versus open pyeloplasty in children: Results of a randomized, prospective, controlled trial. *J Urol* 2017;197:792-7.
- Masieri L, Sforza S, Cini C, Escolino M, Grosso A, Esposito C, *et al.* Minilaparoscopic versus open pyeloplasty in children less than 1 year. *J Laparoendosc Adv Surg Tech A* 2019;29:970-5.
- Ebert KM, Nicassio L, Alpert SA, Ching CB, Dajusta DG, Fuchs ME, *et al.* Surgical outcomes are equivalent after pure laparoscopic and robotic-assisted pyeloplasty for ureteropelvic junction obstruction. *J Pediatr Urol* 2020;16:845.e1-6.
- Värelä S, Omling E, Börjesson A, Salö M. Resolution of hydronephrosis after pyeloplasty in children. *J Pediatr Urol* 2021;17:102.e1-7.
- Pérez-Bertólez S, Martín-Solé O, García-Aparicio L. Comparison between mini-laparoscopy, conventional laparoscopy and open approach for ureteropelvic junction obstruction treatment in children. *Scand J Urol* 2021;55:307-12.
- Masieri L, Sforza S, Grosso AA, Valastro F, Tellini R, Cini C, *et al.* Robot-assisted laparoscopic pyeloplasty in children: A systematic review. *Minerva Urol Nefrol* 2020;72:673-90.
- Andolfi C, Lombardo AM, Aizen J, Recabal X, Walker JP, Barashi NS, *et al.* Laparoscopic and robotic pyeloplasty as minimally invasive alternatives to the open approach for the treatment of uretero-pelvic junction obstruction in infants: A multi-institutional comparison of outcomes and learning curves. *World J Urol* 2022;40:1049-56.