



Original Research Article

Comparative Study between Continuous and Interrupted Suturing in Laparoscopic Pyeloplasty

Dr. Md. Ibrahim Ali^{1*}, Dr. Md Majedul Islam², Dr. S.M. Golam Moula³, Dr. M.M. Hasnat Parvez⁴, Dr. A. S. M. Badruddoza⁵

¹Assistant Registrar, Department of Urology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh

²Assistant Registrar, Department of Surgery, 250 Bed General Hospital, Pabna, Bangladesh

³Jr. Consultant, Department of Surgery, Upazila Health Complex Gurudashpur, Nator, Rajshahi, Bangladesh

⁴Medical Officer, Department of Urology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh

⁵Assistant Registrar, Department of Urology, Dhaka Medical College Hospital, Dhaka, Bangladesh

*Corresponding Author

Dr. Md. Ibrahim Ali

Assistant Registrar, Department of Urology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh

Article History

Received: 04.07.2024

Accepted: 12.08.2024

Published: 28.08.2024

Abstract: **Background:** Ureteropelvic junction obstruction (UPJO) is a common cause of symptomatic ureteral obstruction. Dismembered pyeloplasty is the most commonly employed procedure for the repair of UPJO. Both interrupted and continuous suturing is being practiced in laparoscopy. As satisfactory anastomosis determines the success of dismembered pyeloplasty and recovery of renal function, the success rate and the complications associated with the suturing technique need to be evaluated. **Objective:** To compare the outcome between continuous and interrupted suturing in laparoscopic pyeloplasty. **Methods:** This hospital-based, quasi-experimental study was done in the Department of Urology, Dhaka Medical College Hospital (DMCH), Dhaka and the National Institute of Kidney Diseases & Urology (NIKDU), Dhaka from July 2022- June 2023. A total of 60 patients were purposively selected for the study. According to the suture method for ureteropelvic anastomosis, patients were divided into two groups: 30 patients (group A) underwent surgery with the continuous suture method, and 30 patients (group B) underwent surgery with the interrupted suture method. Data on suturing time, post-operative drain output, post-operative hospital stay and post-operative complications were collected. Patients were followed up at 01, 03 and 06 months. At 06 months, a DTPA renogram with split GFR was done to evaluate the patients. **Results:** The mean ages were 30.0 (± 8.3) years for Group A and 33.9 (± 9.3) years for Group B, with males comprising 56.7% and 63.3% of each group, respectively. Group B had significantly higher mean suturing time, post-operative drain output, and hospital stay compared to Group A ($p < 0.001$). No significant differences in GFR were noted between the groups ($p > 0.05$). Post-operative complications were observed in 10.0% of Group A and 23.3% of Group B ($p = 0.166$). **Conclusion:** Continuous suturing technique for pyeloplasty is found to have a lower mean suturing time, mean drain output and post-operative hospital stay.

Keywords: Ureteropelvic Junction Obstruction, Laparoscopic Pyeloplasty, Renal Function.

Copyright © 2024 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

Citation: Md. Ibrahim Ali, Md Majedul Islam, S.M. Golam Moula, M.M. Hasnat Parvez, A. S. M. Badruddoza (2024). Comparative Study between Continuous and Interrupted Suturing in Laparoscopic Pyeloplasty. *Glob Acad J Med Sci*; Vol-6, Iss-4 pp- 213-219.

INTRODUCTION

Ureteropelvic junction obstruction (UPJO) is a prevalent condition that significantly impacts renal function and patient quality of life [1]. It is commonly caused by an adynamic or peristaltic segment of the ureter, congenital stenosis, or external compression from aberrant lower polar vessels of the kidney. These etiologies lead to impaired urine flow from the renal pelvis to the ureter, resulting in symptoms such as loin pain, recurrent urinary tract infections, and progressive ipsilateral renal damage, both anatomical and functional if left untreated. The primary goal of intervention is to preserve or enhance renal function and relieve symptomatic discomfort. Surgical reconstruction through pyeloplasty has become the gold standard treatment for UPJO, demonstrating high efficacy in most cases [2].

Pyeloplasty can be performed via open, laparoscopic, or robot-assisted laparoscopic surgery. The dismembered pyeloplasty, also known as Anderson-Hynes (A-H), is the most frequently employed technique for UPJO repair [3]. This technique allows for the excision of the pathological ureteropelvic junction along with a portion of the redundant renal pelvis, facilitating a mucosa-to-mucosa anastomosis between the spatulated ureter and the renal pelvis. The success rate of this procedure exceeds 90%, reflecting its effectiveness in resolving obstruction and restoring normal urinary flow [4].

Laparoscopic pyeloplasty, a minimally invasive variant of this procedure, offers numerous benefits, including reduced morbidity, enhanced visualization, decreased intraoperative blood loss, less post-operative pain, faster recovery times, and improved cosmetic outcomes [5]. This approach has been shown to effectively reduce pain in 92% of patients and improve renal function in 47% of cases, underscoring its therapeutic value.

Both continuous and interrupted suturing techniques are utilized in laparoscopic pyeloplasty, each with its proponents and advantages. Continuous suturing, where a single suture line is used without interruption, is often preferred for its efficiency. It requires less time than interrupted suturing, where multiple separate sutures are placed individually. This reduced suturing time translates into shorter overall operation times, which can be a significant advantage in surgical practice [6]. Continuous suturing is associated with less post-operative drain output or anastomotic leakage, shorter hospital stays, and fewer post-operative complications, making it an attractive option for many surgeons [7]. However, continuous suturing is not without its drawbacks,

including the risk of a purse-string effect, where the suture line tightens unevenly, and potential tissue damage from continuous tension [8]. In contrast, interrupted suturing involves placing multiple individual sutures, which can offer more precise control over tension and alignment of the anastomosis. This technique might mitigate some risks associated with continuous suturing, such as the purse-string effect. However, it is generally more time-consuming and may result in longer operation times and potentially increased post-operative drain output and hospital stays.

Despite the distinct characteristics of these suturing techniques, some studies suggest that the differences in outcomes between continuous and interrupted suturing are becoming less significant as neurosurgeons gain more experience and expertise. These studies report no significant differences in suturing time, post-operative drain output, complication rates, hospital stays, or recurrence rates of UPJO between the two methods [9]. Additionally, no definitive guidelines from major urological associations, such as the European Association of Urology (EAU) or the American Urological Association (AUA), recommend one suturing technique over the other for dismembered pyeloplasty.

Given the lack of consensus and the potential benefits and drawbacks of each suturing technique, this study aims to perform a detailed comparative analysis of continuous versus interrupted suturing in laparoscopic pyeloplasty. The study will evaluate key outcomes, including suturing time, post-operative drain output, hospital stay duration, complication rates, and overall patient recovery. By providing a comprehensive assessment of these parameters, the study seeks to determine the optimal suturing technique for enhancing surgical outcomes and improving patient care in cases of UPJO. This information will be valuable for guiding clinical practice and informing surgical decision-making, ultimately contributing to better patient outcomes and higher success rates in treating UPJO.

OBJECTIVES

General Objective

- To compare the outcome between continuous and interrupted suturing in laparoscopic pyeloplasty.

Specific Objectives

- To determine the suturing time in continuous and interrupted suturing in laparoscopic pyeloplasty.
- To measure the post-operative drain output in two groups

- To observe post-operative hospital, stay in two groups
- To assess and compare the pre-operative and post-operative renal functional status in two groups by DTPA diuretic renogram
- To assess recurrent renal outflow obstruction due to PUJO

MATERIALS AND METHODS

Study Design

This quasi-experimental study compared the outcomes of continuous versus interrupted suturing in laparoscopic pyeloplasty. The study occurred at the Department of Urology, Dhaka Medical College Hospital (DMCH), and the National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, from July 2022 to June 2023. A purposive sampling method selected 60 patients diagnosed with PUJ obstruction. These patients were divided into two groups comprising 30 individuals to undergo continuous or interrupted suturing during their laparoscopic pyeloplasty procedure. Data on various outcomes were collected and analyzed to determine the optimal suturing technique.

Inclusion Criteria

- Patients feasible for laparoscopic dismembered pyeloplasty
- Patients with grade I-IV hydronephrosis
- Age group: 13-50 years

Exclusion Criteria

- Patients with a history of previous pyeloplasty
- Grade-V hydronephrosis
- Pelviureteric junction obstruction (PUJO) with secondary calculi
- Patients with congenital renal defect

Data Collection

Data were collected from 60 patients diagnosed with PUJ obstruction at DMCH and NIKDU from July 2022 to June 2023. Patients were divided into two groups 30, based on the suturing technique

used during laparoscopic pyeloplasty (continuous or interrupted). Pre-operative, intraoperative, and post-operative data, including suturing time, post-operative drain output, hospital stay duration, and complications, were recorded. Follow-ups were conducted at 1, 3, and 6 months, with DTPA renogram and split GFR performed at 6 months to assess renal function.

Data Analysis

Collected data were compiled and sorted systematically, then entered into Microsoft Excel for initial organization. Analysis was performed using SPSS version 26.0. Quantitative data were expressed as means with standard deviations, while qualitative data were presented as frequencies and percentages. The chi-square and Fisher Exact tests were used to assess associations between categorical variables, and the independent sample t-test was used for quantitative variables. A p-value of less than 0.05 was considered statistically significant. Results were presented in tabular and diagrammatic forms to facilitate interpreting and comparing outcomes between the two suturing techniques.

Ethical Consideration

Ethical clearance for the study was taken from the Ethical Review Committee of DMCH before the commencement of this study. After the committee approved the research protocol, permission to study was obtained from the Department of Urology of DMCH and NIKDU. The aims and objectives of the study, along with its procedure, risks, and benefits of this study were explained to the study subjects in an easily understandable local language. Written informed consent was obtained from all the study subjects without exploiting their weaknesses. All the study subjects were assured of adequate treatment of any complications developed concerning the purpose of the study. All the study subjects were assured of their confidentiality and freedom to withdraw from the study at any time.

RESULTS

Table 1: Comparison of Age Between Two Groups (N=60)

Age Group (in years)	Group A (n=30)	Group B (n=30)	P value
18-27	13 (43.3%)	7 (23.3%)	0.227a
28-37	11 (36.7%)	13 (43.3%)	
38-49	6 (20.0%)	10 (33.3%)	
Mean ± SD	30.0 ± 8.3	33.9 ± 9.3	0.092b

a = Chi-square test, b = Independent Sample t-test N = total number of samples, n = sample size in each group

In Group A, 13 (43.3%) patients were in the 18-27 age group, and 11 (36.7%) patients were in the 28-37 age group. In Group B, 7 (23.3%) patients were in the 18-27 age group, and 13 (43.3%) patients were

in the 28-37 age group. The mean age of the patients in Groups A and B were 30.0 (±8.3) and 33.9 (±9.3) years, respectively. There was no significant

statistical difference between the groups regarding the age of the patients, as $p > 0.05$.

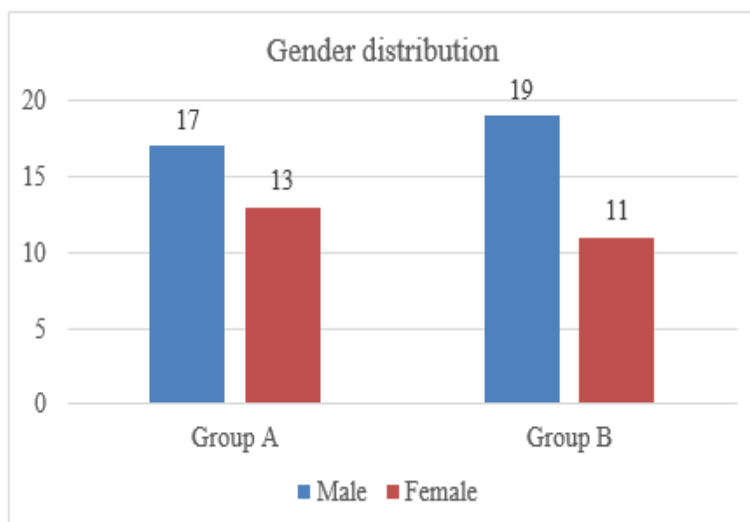


Figure 1: Gender Distribution of the Patients

Most of the patients in both groups were male (Group A: 56.7% and Group B: 63.3%). In Group A, 13 (43.3%) were female, while in Group B,

11 (36.7%) were female. The chi-square test showed no significant statistical difference between the groups regarding gender, as $p = 0.598$.

Table 2: Comparison of Side Involvement Between Two Groups (N=60)

Side Involvement	Group A (n=30)	Group B (n=30)	P value
Right	14 (46.7%)	13 (43.3%)	0.795a
Left	16 (53.3%)	17 (56.7%)	

a = Chi-square test N = total number of samples, n = sample size in each group

In Group A, 16 (53.3%) patients had PUJ obstruction on the left side, while in Group B, 17 (56.7%) patients had PUJ obstruction on the left side.

The chi-square test showed no significant statistical difference between the groups regarding side involvement, as $p = 0.795$.

Table 3: Comparison of Grade of Hydronephrosis Between Two Groups (N=60)

Grade of Hydronephrosis	Group A (n=30)	Group B (n=30)	P value
Grade-I	2 (6.7%)	1 (3.3%)	0.877a
Grade-II	2 (6.7%)	2 (6.7%)	
Grade-III	11 (36.7%)	14 (46.7%)	
Grade-IV	15 (50.0%)	13 (43.3%)	

a = Fisher Exact test N = total number of samples, n = sample size in each group

In Group A, 11 (36.7%) patients had grade III hydronephrosis and 15 (50.0%) had grade IV hydronephrosis. In Group B, 14 (46.7%) patients had grade III hydronephrosis and 13 (43.3%) had grade

IV hydronephrosis. Fisher Exact test showed no significant statistical difference between the groups regarding the grade of hydronephrosis, as $p = 0.877$.

Table 4: Comparison of Various Pre-operative and Post-operative Parameters Between Two Groups (N=60)

Parameter	Group A (n=30)	Group B (n=30)	P value
Suturing Time (minutes)	35.5 ± 4.6	55.0 ± 6.7	<0.001a
Post-operative Drain Output	2.1 ± 0.5	4.2 ± 0.8	<0.001a
Hospital Stay (days)	3.2 ± 0.6	5.1 ± 1.0	<0.001a

a = Independent Sample t-test N = total number of samples, n = sample size in each group

Group B's mean suturing time and post-operative drain output were significantly higher than in Group A ($p < 0.001$). The mean hospital stay was

also significantly lower in Group A compared to Group B ($p < 0.001$).

Table 5: Comparison of Pre-operative and Post-operative GFR on DTPA Diuretic Renogram Between Two Groups

GFR (ml/min)	Group A (Mean ± SD)	Group B (Mean ± SD)	P value
Pre-operative	26.09 ± 7.47	25.90 ± 6.11	0.913a
Post-operative	30.12 ± 7.63	30.28 ± 5.98	0.922a
Improvement	4.09 ± 0.13	3.99 ± 0.23	0.062a

a = Independent Sample t-test

There was no significant statistical difference between the groups regarding the GFR of the patients at any time point, as $p > 0.05$.

Table 6: Comparison of Post-operative DTPA Washout on DTPA Diuretic Renogram Between Two Groups (N=56)

T½ (in minutes)	Group A (n=28)	Group B (n=28)	P value
Mean ± SD	7.8 ± 1.4	7.9 ± 1.1	0.745a

a = Independent Sample t-test n = sample size in each group

The mean T½ of the patients in Group A and Group B were 7.8 (±1.4) and 7.9 (±1.1) minutes, respectively. There was no significant statistical difference between the groups regarding post-operative DTPA washout of the patients, as $p = 0.745$.

However, some studies, such as those by, reported a higher incidence of right-sided obstruction, indicating possible variations in study populations.

DISCUSSION

Laparoscopic pyeloplasty is a well-established alternative to the traditional open technique for treating ureteropelvic junction (UPJ) obstruction. This surgical approach is favored due to its minimally invasive nature, which offers patients reduced post-operative pain, quicker recovery times, and improved cosmetic outcomes [10,11]. Despite its widespread use, there is no consensus on the ideal method, as current reports do not definitively describe whether continuous or interrupted suturing is superior. The present quasi-experimental study was designed to compare continuous and interrupted suturing outcomes in laparoscopic pyeloplasty.

The mean suturing time was significantly shorter in the continuous suturing group (35.5 ± 4.6 minutes) compared to the interrupted suturing group (55.0 ± 6.7 minutes), a statistically significant finding ($p < 0.001$). This outcome is consistent with previous studies that have reported shorter suturing times with continuous suturing techniques [15]. It is important to note that suturing time can vary due to several factors, including the size of the redundant pelvis, the time taken for stenting, and the skill level of different surgeons. Additionally, the transmesocolic approach to the UPJ can reduce overall operative time. While reported to show no difference in parameters, robotic-assisted pyeloplasty might offer easier suturing [16].

In our study, the patient ages ranged from 13 to 50 years, reflecting the broader inclusion of adult cases of UPJ obstruction, which, while often diagnosed in children, are not uncommon in adults [12]. The mean age of patients in Group A (continuous suturing) was 30.0 years, while in Group B (interrupted suturing), it was 33.9 years. These findings are comparable with previous studies, such as those that reported mean ages of 30.1 and 27.6 years for their respective groups and found a mean age of 36 years in their retrospective analysis. Our analysis showed a male predominance in both groups, aligning with other studies that reported similar gender distributions in UPJ obstruction cases [13]. Additionally, most patients had left-sided obstruction, consistent with findings from [14].

The continuous suturing group also had significantly lower post-operative drain output and shorter hospital stays than the interrupted suturing group ($p < 0.001$). Patients in Group A were typically discharged by the 3rd or 4th post-operative day, whereas those in Group B had longer hospital stays, often due to complications or higher drain output. These findings align with other studies that have reported reduced drain output and shorter hospital stays with continuous suturing [17]. However, Ahmed *et al*, found no significant difference between the two techniques when using a 3D camera, suggesting that surgical experience and visualization tools can influence outcomes.

Follow-up evaluations, including DTPA diuretic renograms with split GFR at 6 months

postoperatively, showed no significant differences in renal function or recurrence of obstruction between the two groups ($p=0.745$). Both groups exhibited good washout times, with mean T1/2 values of 7.8 and 7.9 minutes for continuous and interrupted suturing, respectively. These findings are consistent with those of others, indicating that both suturing techniques are comparable regarding long-term renal outcomes. The impact of suturing techniques on tissue vascularity and collagen integrity remains debatable. Some experts advocate for interrupted sutures, especially in infants, to prevent the purse-string effect and ensure appropriate tension [18]. Continuous suturing in laparoscopy can be challenging due to difficulty in maintaining appropriate tension, which can lead to leakage if the sutures are not sufficiently tight. A large study suggested continuous suturing may reduce the risk of urine leakage, hematoma, colonic lesions, and stone formation [19].

Our findings and others indicate a preference for continuous suturing due to shorter operative times, reduced post-operative drain output, and shorter hospital stays. These studies also reported equal success rates between the two techniques, making continuous suturing more efficient in clinical practice. Conversely, there were no significant differences in surgical outcomes between the techniques, and Esposito *et al.*, found similar results using a 3D camera [20,21]. The higher surgical efficiency and lower complication rates associated with continuous suturing were highlighted. Laparoscopic dismembered pyeloplasty effectively treats UPJ obstruction, providing satisfactory clinical outcomes. Our study demonstrates that continuous suturing offers advantages in reduced suturing time, lower post-operative drain output and shorter hospital stays without compromising renal function outcomes. These findings support the preference for continuous suturing in clinical practice, given its efficiency and comparable success rates to interrupted suturing.

CONCLUSION

For the treatment of Ureteropelvic Junction Obstruction (UPJO), laparoscopic dismembered pyeloplasty can result in satisfactory clinical outcomes. Continuous suturing technique for pyeloplasty is found to have a lower mean suturing time, mean drain output and post-operative hospital stay.

RECOMMENDATIONS

As the success rates are comparable and the post-operative stay, suturing duration, and drain output are superior, the continuous suturing

technique is preferable over the interrupted suturing technique for laparoscopic pyeloplasty.

Limitations

The study has some limitations that should be considered when interpreting the results.

- Improved experience and skill of different surgeons could bring statistical bias to the present study.
- Short follow-up period (six months). So, the long-term outcome (disease recurrence) could not be evaluated.

ACKNOWLEDGMENTS

All praises to Almighty Allah for the strength to complete this thesis. My heartfelt gratitude to Dr. Uttam Karmaker for his scholarly guidance and support. I also thank Prof. Dr. Md Shafiqul Alam Chowdhury and my respected teachers at DMCH and NIKDU for their valuable advice. Special thanks to all colleagues and patients for their cooperation and participation.

Funding: No funding sources

Conflict of interest: None declared

REFERENCES

1. Demirkol, M. K., Barut, O., Şahinkanat, T., Resim, S., & Boran, Ö. F. (2021). Laparoscopic pyeloplasty in ureteropelvic junction obstruction: A single-center experience. *Laparoscopic Endoscopic Surgical Science*, 28(1), 24.
2. Wellé, I. B., Ndoeye, N. A., Mbaye, P. A., Gueye, D., Seck, N. F., Lo, F. B., ... & Ngom, G. (2022). Management and Outcome of Ureteropelvic Junction Obstruction in Senegalese Children. *Open Journal of Urology*, 12(11), 549-555.
3. Alici, Ç. A., Arda, M. S., Alici, U., & Tokar, B. Evaluation of Early and Late Clinical, Radiological and Scintigraphic Datas After Laparoscopic Pyeloplasty in Ureteropelvic Junction Obstruction. *Osmangazi Tıp Dergisi*, 45(2), 222-229.
4. Gao, B., Farhat, W., Zu'bi, F., Chua, M., Shiff, M., Al-Kutbi, R., ... & Koyle, M. (2021). Comparative analysis of suturing technique in pediatric pyeloplasty on surgical outcomes. *Pediatric Surgery International*, 37, 1633-1637.
5. Piyeloplasti, L., & Deneyimimiz, İ. E. İ. O. (2020). Laparoscopic Pyeloplasty, Our Experience of Initial Fifty Two Cases. *Journal of Urological Surgery*, 7(2), 125-129.
6. Szavay, P. (2019). Laparoscopic management of intrinsic ureteropelvic junction obstruction

- (UPJO). *ESPEs Manual of Pediatric Minimally Invasive Surgery*, 375-380.
7. Kim, J. K., Lee, M. J., Gao, B., Yadav, P., Ming, J. M., Rickard, M., ... & Chua, M. E. (2022). Comparison of continuous and interrupted suture techniques in pyeloplasty: a systematic review and meta-analysis. *Pediatric Surgery International*, *38*(9), 1209-1215.
 8. Gupta, S., Verma, A., & Pal, D. K. (2021). A comparative study between continuous and interrupted sutures in open pyeloplasty. *Urologia Journal*, *88*(4), 292-297.
 9. Powell, C., Gatti, J. M., Juang, D., & Murphy, J. P. (2015). Laparoscopic pyeloplasty for ureteropelvic junction obstruction following open pyeloplasty in children. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, *25*(10), 858-863.
 10. Han, C., Ma, L., Li, P., Wang, J. N., Zhou, X., Tao, T., ... & Zhou, H. (2022). Modified robotic-assisted laparoscopic pyeloplasty in children for ureteropelvic junction obstruction with long proximal ureteral stricture: the "double-flap" technique. *Frontiers in Pediatrics*, *10*, 964147.
 11. Saravanakumar, R., Maniraj, S. P., Barshan, A. D., Das, S., Hasan, H., & Alazzam, M. B. (2023, November). Clustering big data for novel health care system. In *AIP Conference Proceedings* (Vol. 2587, No. 1). AIP Publishing.
 12. Gad, H. A., Eldahshoury, M. Z., Hussein, M. M., & Hammady, A. (2020). Laparoscopic Versus Open Pyeloplasty for Management of Secondary Ureteropelvic Junction Obstruction. *The Egyptian Journal of Hospital Medicine*, *81*(7), 2300-2304.
 13. Sakr, A. M. N. A., Khalil, S. A. S., Abd Alla, M. M. H., & Elawami, W. M. A. (2022). Outcome of Pyeloplasty in Children with Split Renal Function Less Than 10%: A Retrospective Study. *The Egyptian Journal of Hospital Medicine*, *87*(1), 1928-1931.
 14. Yalçinkaya, F., & Özçakar, Z. B. (2020). Management of antenatal hydronephrosis. *Pediatric Nephrology*, *35*(12), 2231-2239.
 15. Mohamed, H. E., EL-Asmar, K. M., Hassan, T. A., EL-Shafei, E. A. E. A., Soliman, M. H., & Allam, A. M. (2022). Feasibility, safety and effectiveness of laparoscopic transperitoneal pyeloplasty in children: Ain Shams University early experience. *Annals of Pediatric Surgery*, *18*(1).
 16. Moretto, S., Gandi, C., Bientinesi, R., Totaro, A., Marino, F., Gavi, F., ... & Sacco, E. (2023). Robotic versus open pyeloplasty: perioperative and functional outcomes. *Journal of Clinical Medicine*, *12*(7), 2538.
 17. Ahmed, M. M., Ahmad, B. T., & Ahmad, K. I. (2023). Analysis of Two Different Suturing Methods in Laparoscopic Pyeloplasty. *JK Science: Journal of Medical Education & Research*, *25*(1), 43-47.
 18. Arefin, M. M., & Hossain, H. T. (2023). Transitional Cell Carcinoma: Impact of Life Style on Grading of Tumor. *Journal of Cancer Science and Clinical Therapeutics*, *7*(3), 141-145.
 19. Piyeloplasti, L., & Deneyimimiz, İ. E. İ. O. (2020). Laparoscopic Pyeloplasty, Our Experience of Initial Fifty Two Cases. *Journal of Urological Surgery*, *7*(2), 125-129.
 20. Hasan, R. (2024). Rukaiya Khatun Moury, Nazimul Haque. Coordination between Visualization and Execution of Movements. *Sch J Eng Tech*, *2*, 101-108.
 21. Esposito, C., Masieri, L., Castagnetti, M., Pelizzo, G., De Gennaro, M., Lisi, G., ... & Escolino, M. (2023). Current status of pediatric robot-assisted surgery in Italy: epidemiologic national survey and future directions. *Journal of Laparoendoscopic & Advanced Surgical Techniques*, *33*(6), 610-614.