RESEARCH ARTICLE

Understanding ureteroscopy complications according to modified Clavien classification system

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Abstract

Objective: To determine the complications of ureteric stone treatment with semi-rigid uretero-renoscopy in accordance with the modified Clavien classification system.

Method: The descriptive, prospective study was conducted at the Department of Urology, Sindh Institute of Urology and Transplantation, Karachi, from June 30, 2020, to December 29, 2021, and comprised patients of either gender aged 18-70 years having ureteric stones. All patients were subjected to ureterorenoscopy using a semi-rigid ureteroscope under general anaesthesia. The patients were followed up for 2 months. All complications were noted and graded in line with the Modified Clavien Complication System. Ultrasound and X-ray were used to determine the stone-free rate. Data was analysed using SPSS 23.

Results: Of the 414 patients, 304(73.4%) were males and 110(26.5%) were females. The overall mean age was 40.22±13.10 years. There were 106(25.6%) proximal, 134(32.3%) middle, and 174(42%) distal ureteric stones. Stent placement was done in 56(13.5%) cases. There were 260(62.8%) patients with no complication, 90(21.7%) with grade I complications, 34(8.2%) with grade II complications, 10(2.4%) with grade IIIa, 8(1.9%) with grade IIIb, and 12 (2.9%) with grade IVa complications.

Conclusion: Uretero-renoscopy was found to be a safe procedure, as it had minimal associated complications with optimal stone clearance and great dexterity. The Modified Clavien classification system was found to be an easy way to classify surgical complications of uretero-renoscopy.

Keywords: Ureteroscopy, Modified Clavien classification system, Ureteric calculi, ESWL. (JPMA 74: 485; 2024)

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Introduction

The uretero-renoscopy (URS) procedure is essential to the practice of urology. Hugh Hampton Young used a rigid cystoscope for the first time to carry out this surgery in 1912.[1] Since then, the method has substantially improved and is now the go-to minimally invasive treatment for ureteric ailments. URS achieved new potentials in terms of efficiency, safety and manoeuvrability with the introduction of flexible technology.[2-5] Surgical complications are reported using certain classification schemes. The modified Clavien classification system (MCCS) is the most popular and widely accepted classification system for complications in urological procedures.[6,7] Ogreden et al. observed grade I complications in 29.8% of patients, and more severe grade IV complications in just 1.2% patients after URS.[8] In contrast, Mandal et al. found that grade I complications affected 38.3% patients, grade II 15%, grade IIIa 2.5%, grade IIIb 8.3%, and grade IV affected 1.6% patients.[9] Ibrahim AK, employing semi-rigid URS, reported grade I complications in 26.1% patients, and just 2.03% grade IV complications.[10]

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There is a significant stone burden in Pakistan as well as in the South Asian region, and many treatment modalities, including URS, are used for managing ureteric stone.[11] The current study was planned to determine URS complications in accordance with MCCS.

Patients and Methods

The descriptive, prospective study was conducted at the Department of Urology, Sindh Institute of Urology and Transplantation (SIUT), Karachi, from June 30, 2020, to December 29, 2021. After approval form the institutional ethics review committee, the sample size was calculated using the formula n=(Z2×P(100–P))/e2,[8] with estimated grade IIIb complications 11% post-URS, while keeping the desired precision level 5% and confidence level 95%. The sample was raised using non-probability, consecutive sampling technique from among those presenting at the SIUT stone clinic. Those included were patients of either gender aged 18-70 years having ureteric stones of size ≤1.5cm. Patients with urinary tract infections and renal failure were excluded.

After taking informed consent from all the subjects, a senior urologist performed all procedures with a semi-rigid ureteroscope under general anaesthesia (GA). Prophylactic antibiotics were given to each patient as per institutional guidelines. Preoperative laboratory and radiological investigations in the form of a blood complete picture (CP),

serum creatinine, electrolytes, ultrasound, X-ray and computed tomography (CT) scan of kidney, ureter and bladder (KUB) of each patient was performed, and postoperatively they were followed for 60 days.

Complications occurring during the follow-up period were noted and graded as per MCCS,[6,7] according to which, grade I=any deviation from the normal postoperative course without the need for pharmacological treatment or surgical, endoscopic and radiological interventions; grade II=requiring treatment with drugs and/or blood products transfusion; grade III = requiring surgical or radiological intervention, with anaesthesia (IIIa) and without anaesthesia (IIIb); grade IV=life-threatening complication leading to single organ failure (Iva) or multi-organ failure (IVb), requiring intensive care unit (ICU) support; and grade V=death. For stone clearance, an ultrasound and X-ray KUB were done, while for radiolucent stones, a CT KUB was performed on the 60th day.

Data was analysed using SPSS 23. Mean and standard deviation values were calculated for quantitative variables, while frequencies and percentages were used for categorical variables. Stratification of confounding variables, like age, gender, location and size of ureteric stones, was done. Post-stratification, chi-square test was applied. P<0.05 was taken as significant.

Results

Of the 414 patients, 304(73.4%) were males and 110(26.5%) were females. The overall mean age was 40.22±13.10 years. Mean weight of the patients was 65.89±11.33kg. Mean height was 162.1610.00cm. Mean operative time was 19.68±7.20 minutes, and the hospital stay was 1.18±0.82

Table-1: Descriptive data.

	Mean±SD
Age (years)	40.22±13.10
Weight (Kgs)	65.89±11.33
Height (cm)	162.16±10.00
Duration of Procedure (Minutes)	19.68±7.20
Hospital Stay (days)	1.18±0.82

SD: Standard Deviation.

Table-2: Age, gender, stone size and stone location with modified Clavien classification system (MCCS) complication grade.

		MCCS							*p*-value
		Grade I	Grade II	Grade IIIa	Grade IIIb	Grade IVa	Grade IVb	Grade V	
Age Groups	18-38 Years	44	10	4	2	2	0	0	0.10
	39-70 Years	46	24	6	6	10	0	0	
Gender	Male	68	28	4	6	10	0	0	0.54
	Female	22	6	6	2	2	0	0	
Stone Size	≤ 10 mm	54	20	10	6	6	0	0	0.22
	>10mm	36	14	0	2	6	0	0	
Stone location	Proximal	22	8	4	6	4	0	0	0.46
	Middle	30	12	0	0	6	0	0	
	Distal	38	14	6	2	2	0	0	

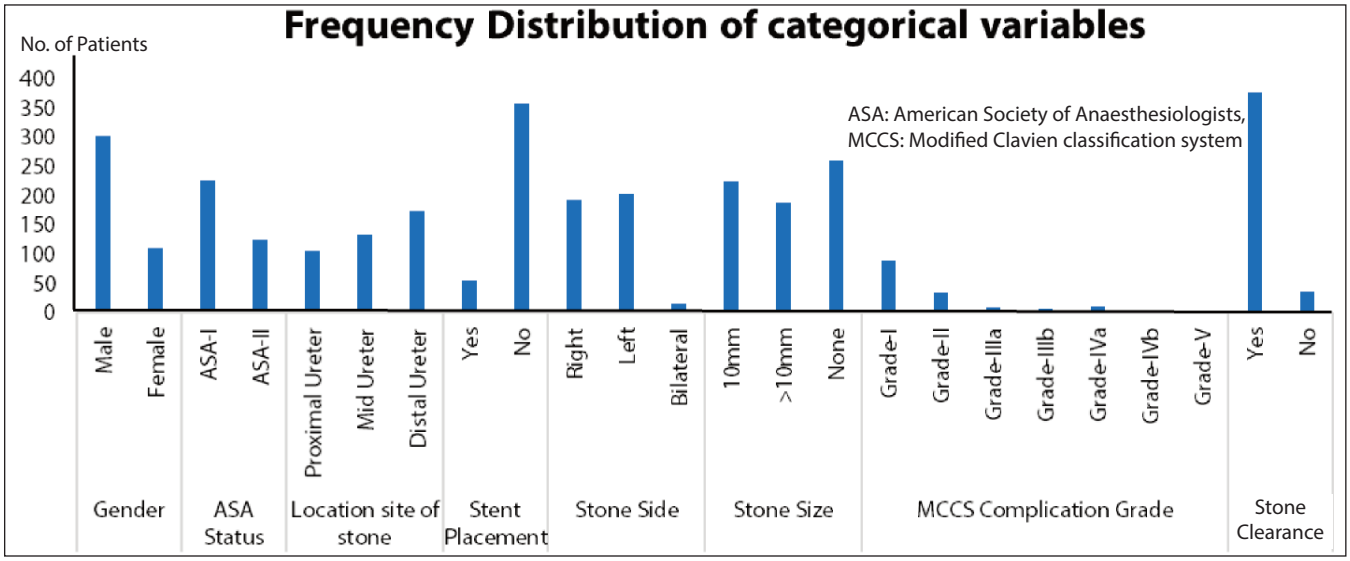

Figure: Distribution of categorical data.

days (Table 1).

There were 106(25.6%) proximal, 134(32.3%) middle, and 174(42%) distal ureteric stones. Of the total, 194(46.8%) patients had a ureteric stone on the right side, 204(49.28%) had on the left, and 16(3.86%) had bilateral URS. There were 224(54.11%) patients with stones measuring 10mm or less, and 190(45.89%) with stones measuring >10mm. Impacted stones were found in 260(62.8%) patients, and they were not found in 154(37.2%). Stent placement was done in 56(13.5%) cases (Figure).

There were 260(62.8%) patients with no complication, 90(21.7%) with grade I complications, 34(8.2%) with grade II complications, 10(2.4%) with grade IIIa, 8(1.9%) with grade IIIb, and 12(2.9%) with grade IVa complications. Overall, 378(91.3%) patients were stone-free after single procedure.

Age, gender, location and size of the stone had no significant association with MCCS grades (Table 2).

Discussion

The assessment of surgical outcome has always been crucial to the practice of surgery. It effectively aids in enhancing healthcare quality management, aids in analysing the learning curve for certain manoeuvres and/or procedures, and ultimately supports surgical research. A crucial factor in the assessment of any medical intervention is the morbidity rate.[12]

Reporting surgical outcomes and unfavourable events is rife with overlap and lack of specificity. The term "postoperative complications" is described as unwanted and unintentional problems occurring following a surgery.[13]

Although evidence-based medicine has come a long way, both clinical studies and hospital records have shown inconsistent reporting of perioperative adverse events. Between 1990 and 2001, only one-third of large randomised controlled trials (RCTs) in surgery with more than 100 patients used severity grading. The MCCS was used to classify complications in several urological operations, including percutaneous nephrolithotomy, transurethral resection of the prostate (TURP), and radical prostatectomy.[13-16]

Urolithiasis is a very common pathology in South Asia, and a lot of patients suffer from renal and ureteral stone diseases. Numerous medicinal and surgical techniques are available to treat ureteric stones. Medical expulsion therapy was found to be effective in helping spontaneous passage of stone <10mm in size.[17] On the contrary, URS and lithotripsy are considered the main options for treating ureteric calculi.[18] Due to advancements in medical technology and the miniaturisation of instruments, endoscopic management of ureteral stone disease has gained popularity. Globally, URS is recognised as a standard therapeutic modality for ureteral stones that is simple and effective. Procedures' success is influenced by size and site of the stone. URS is more effective than shock wave lithotripsy (SWL) for stones >1cm in size. With success rates between 81% and 94%, URS is deemed safe. However, it can cause morbidity and, in rare cases, fatal consequences.[19,20]

There have been numerous ureteroscopic complications documented in literature, but they are frequently classified as mild and significant or short-term and long-term. These categories are arbitrary, and most urologists do not agree on them. Additionally, the majority were retrospective and, therefore, lack a consistent, organised system.[20,21] A research study that used the modified Satava classification, a distinct structured grading system, revealed URS complications.[20,21]

There are certain classification systems available to report surgical complications. The most commonly used and validated grading system for complications in urological procedures is the MCCS. The overall reported complication rate ranges from 3.5% to 30%.[21,22]

The current study assessed URS outcomes using the MCCS.[6,7] There were 260(62.8%) patients with no complication, 90(21.7%) grade I, 34(8.2%) grade II, 10(2.4%) grade IIIa, 8(1.9%) grade IIIb, and 12(2.9%) with grade IVa complications. None of the patients experienced grade IVb or grade V complications.

Ogreden et al. reported URS complications using MCCS and discovered grade I, grade II, grade IIIa, grade IIIb and grade IV complications in 29.8%, 7.1%, 8.6%, 11% and 1.2% patients, respectively.[8]

Mandal et al. reported grade I complications in 38.3% patients, grade II 15%, grade IIIa 2.5%, grade IIIb 8.3%, and grade IV complications in 1.6% patients.[9]

Another study using semi-rigid URS found grade 1 complications in 26.1% patients, grade II 6.1%, grade IIIa 4.7%, grade IIIb 5.4%, and grade IV in 2.03% patients.[10]

Prophylactic antibiotics were given to all patients in the current study. In only 8 patients, stones were not found, which is due to stones passing through the urethra that the patients may not notice. Stone clearance was seen in the majority of patients. Clinically insignificant residual fragment (CIRF) were seen in a few patients who were being kept on follow-up and observation, and on alpha-blockers. Age, gender, stone site and size had no significant effect over outcomes and complication rate in the current study.

According to the MCCS, grades 1 and II are considered minor complications, while grades iii-V are considered major complications.[6,7] This system made it simple, quick and easy to classify complications.

One of the limitations of the current study is that its data related to a single centre. While the MCCS proved to be accurate, useful, and simple to use, the study should have incorporated other crucial factors, like management expense and readmission rate.

Conclusion

URS was found to be a safe procedure and was associated with minimal complications, with the majority of patients having grade I and II complications As per the MCCS which was found to be a straightforward and efficient tool for evaluating surgical complications.

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Author Contribution:

US: Concept, study design and data acquisition
NAM: Study design, data analysis, literature search, drafting
NM and NA: Data acquisition, literature search, drafting
HHQ: Data analysis literature review, critical analysis of draft
SRK: Data analysis, acquisition, literature search and drafting