

Is primary ureteroscopy an alternative to emergency stenting in terms of quality and cost?

Mudassir Wani, Javed Burki, Motaz Melhem, Syed Gilani, Faisal Ghumman, Shikohe Masood

Medway Maritime Hospital, Department of Urology, Gillingham, Kent, United Kingdom

Citation: Wani M, Burki J, Melhem M, Gilani S, Ghumman F, Masood S. Is primary ureteroscopy an alternative to emergency stenting in terms of quality and cost? Cent European J Urol. 2021; 74: 446-450.

Article history

Submitted: Feb. 7, 2021
Accepted: May 19, 2021
Published online: June 2, 2021

Corresponding author

Mudassir Wani
Medway Maritime Hospital
Department of Urology
7 Rotary Gardens
ME7 2AB Gillingham,
Kent, UK
phone: +44 0745 9513 007
Mudassir.wani@nhs.net

Introduction The aim of this article was to investigate quality and cost benefits of managing urolithiasis by primary ureteroscopic procedures (P-URS) during index admission to hospital. With the rise in prevalence of urolithiasis, the focus has shifted to manage these patients during their first admission rather than using temporary measures like emergency stenting (ES) or nephrostomies which are followed by deferred ureteroscopic procedures (D-URS). We compared results of P-URS, D-URS and ES procedures in terms of quality and cost benefits.

Material and methods Data was collected retrospectively for all P-URS, D-URS and ES procedures performed during year 2019. A total of 85 patients underwent ES while as 138 patients underwent elective URS (26 had P-URS and 112 had D-URS). The quality assessment was based in relation to patient factors including- number of procedures per patient, number of days spent at hospital, number of days off work. Cost analysis included theatre and hospital stay expenses, loss of working days.

Results This study revealed that the average hospital stay of patients on index admission who had a ES was 1.35 days (Total 3.85) and who had P-URS was 1.78 days (Total 2.78). Overall, additional expenditure in patients who did not undergo primary URS was in the range of 1800–2000€ (excluding loss of work for patients, who needed to return for multiple procedures).

Conclusions We conclude approach of P-URS and management of stones in index admission is very effective in both improving quality of patients as well as bringing down cost expenditure effectively.

Key Words: acute urolithiasis ↔ emergency stenting ↔ primary ureteroscopy
↔ quality of life ↔ cost advantages

INTRODUCTION

Urolithiasis is a very common clinical entity in urological science with a life time prevalence of around 14% [1]. In USA there has been an increase in incidence of urolithiasis from 3.2% in 1976–1980 to 8.8% in 2007–2010, similar trends have been reported from other regions around the globe [2, 3, 4]. In patients aged ≥ 75 years, the increase is highest in the range of about 51% [1]. The change in trends has been associated with lifestyle and diet changes as well as use of more sensitive imaging [3]. Urolithiasis, although benign, does increase burden on healthcare expenditure including –direct cost involved with evaluation, treatment, re-treatment; indirect cost involved from

administration, maintenance and productivity loss [5, 6]. It is estimated that in US by 2030, economic burden due to urolithiasis will need an additional \$1.24 billion/year [7]. Urolithiasis has a wide spectrum of clinical presentations-asymptomatic, acute and chronic. Among acute presentations, renal/ureteric colic is one of the commonest presentations. It is characterized by acute onset of flank pain, often with radiation to the groin, and may be associated with hematuria either visible or non-visible. The number of patients in Emergency Department (ED) presenting with acute renal colic is variable depending on geography, studies from US reveal it to be in range of 6–9%, out of which 12% need admission after initial assessment [8]. The three most common

procedures performed to treat urinary tract stones are ureterorenoscopy (URS), shockwave lithotripsy (SWL), and percutaneous nephrolithotomy (PCNL). URS has become a routine procedure during the last few decades for reasons including widened indications, endoscopic in nature, relatively short operating time due to miniaturization of instruments and minimal risk of complications including bleeding [9, 10]. These properties have resulted in URS being used as a feasible modality for stone management as a day case procedure across the globe [11, 12].

However, we did not come across any study which has evaluated URS in treatment of patients presenting with stones (mainly as acute renal/ureteric colic) as a primary procedure rather than going for ES and subsequent URS in few weeks afterwards. This study was registered as an audit, to evaluate Getting it right first time (GIRFT), a UK government, National Health Services (NHS) initiative for stone management. One year data was retrospectively collected for the year 2019, for all procedures carried out for urolithiasis (Acute/Elective) at our trust. The data was evaluated comparing number of initial stenting procedures carried for acute renal/ureteric colic with total URS procedures related to stone procedures performed at our hospital. The primary aim was look at quality and cost advantages of Primary Ureteroscopy (P-URS) compared to Emergency Stenting (ES).

MATERIAL AND METHODS

This study was registered in our hospital as a quality improvement project. The data for year 2019 was collected retrospectively from Emergency Theatre systems (CEPOD Register) followed by confirmation from hospital business intelligence department. All patient records- admission/procedure details were reviewed by two authors through electronic discharges (EDNs), Out patient letters (OPNs) and Imaging software (PACS).

Inclusion criteria included (patients undergoing surgical intervention ES/P-URS)

1. Patient had any one or more clinical indication pain, bacteruria, fever, impaired renal function and prolonged unrelieved obstruction.
2. Patient decided and consented for Stent/URS procedure.

Exclusion criteria included

1. Patient had Nephrostomy
2. Patient had stent insertion unrelated to urolithiasis.
3. Patients opting for conservative/ other modalities of treatment like ESWL.

Patients who underwent emergency stenting had a rigid cystoscopy, retrograde study followed by guidewire insertion (usually Sensor Boston Scientific) and stent insertion (variable sizes). Patients who underwent P-URS or D-URS, used flexible (Olympus) or rigid Ureteroscopy depending on location of stone followed with Laser fragmentation (MOSES, Olympus) or basketting of stone. Post procedure stent removal was performed using flexible cystoscopy.

The demographic details of patients undergoing emergency and elective stone procedures are given in table 1. Quality evaluation included number of hospital admissions/procedures, hospital stay days.

RESULTS

85 patients underwent ES with one patient requiring bilateral stenting. 82 patients had stenting for stone related causes. Further, out of 138 elective procedures, 112 had ES initially and only 26 patients underwent PURS. It was observed that the most important reason for ES was ureteric stones. The monthly distribution pattern is given on Figure 1.

Average hospital stay for ES was 1.35 days and was usually performed by a middle grade doctor. These patients subsequently had to return for delayed ureteroscopy (D-URS) for definitive stone management in around 4–6 weeks. If during D-URS, a stent was re-inserted, patient had to be booked for flexible cystoscopy for its removal, usually in 1–2 weeks. In comparison, if patient was offered P-URS the total stay in hospital was 2.78 days and had to have maximum 2 procedures. The quality comparison is given in Table 1.

On cost evaluation, there was difference among the two groups. On an average total treatment cost for ES group was on an average 5900€ compared to 4450€ for P-URS group. Further details are given in

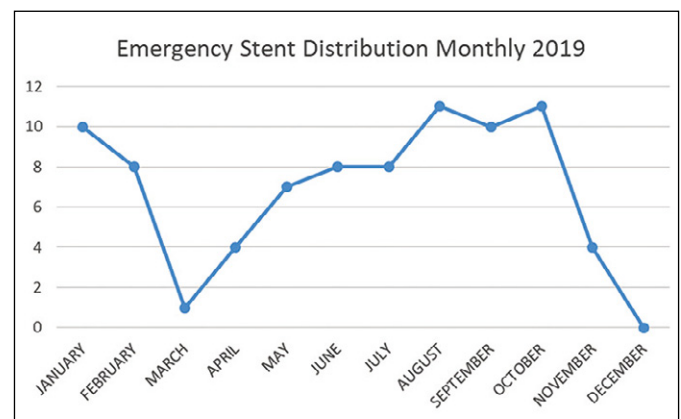


Figure 1. Monthly distribution of emergency stent procedures.

Table 1. Comparative analysis between ES and P-URS groups

Procedure related	ES Group	P-URS Group
Average age	55.9 years	52.5 years
Total surgical procedures for urolithiasis	82	72
Ureteric stones	65	56
Renal /PUJ stones/Upper ureteric stones	17	16
Total ES Procedures	82	34 ^{*1}
Total P-URS	0	38 ^{**1}
Quality Related	ES Group	P-URS Group
Stay during primary procedure (ES)	1.35 days	1.35 days (If P-URS not performed)
Stay during primary procedure (P-URS)	N/A	1.78 days
Stay during delayed URS (D-URS)	1.5 days	Not applicable
Max number of days of work loss ²	3.85 ^{**2}	2.78 ^{***2}
Cost related	ES Group (In Euros)	P-URS Group (In Euros)
Expenditure for ES	1050€	1050€ (If P-URS not performed)
Expenditure P-URS	N/A	2100€
Expenditure D-URS	2100€	N/A
Expenditure for stent removal under local anesthesia	1050€	1050€
Total expenditure procedures (Maximum)	4200€	3150€
Hospital charges [#]	1700€	1300€
Total cost estimation	5900€	4450€
Patient loss due to loss of work (Approximately) ³	450 ^{**3€}	300 ^{***3€}

*Out of 34 ES, 18 could have had P-URS, but could not proceed due to non-availability of trained staff on weekends and patient issues in relation to COVID positivity

**In 38 patients who underwent P-URS

a. 24 patients had stent placed after procedure

b. 08 patients had no stent placed after procedure

06 patients had threaded stent placed after procedure

²Number of loss of work in study took into consideration days spent at hospital only

^{**2}1.35 (ES)+1.5(D-URS)+1.0 (Stent removal) = 3.85

^{***2}1.78 (P-URS)+1.0 (Stent removal) = 2.78

[#]Per day hospital charge is 450€ (All values are approximate)

³Number of loss of work in study took into consideration days spent at hospital only.

^{**3}3.85 days x 115€ (per day, average per day UK salary as per office of National Statistics 2019) = 450€

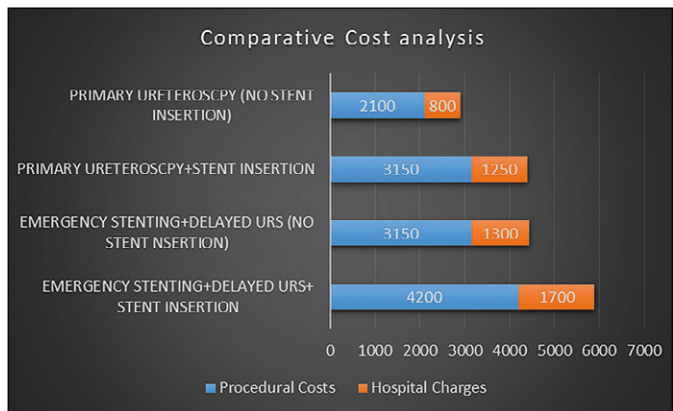
^{***3}2.78 days x 115€(per day, average per day UK salary as per office of National Statistics 2019) = 300€

ES – Emergency Stenting; P-URS – Primary Ureteroscopy, N/A – Not Available;

D-URS – Delayed Ureteroscopy

Table 1. For easy understanding, summarized results are given in Figure 2.

Regarding complications, in ES group, one patient developed urosepsis post stent insertion and other patient developed severe stent symptoms mainly pain. Both patients were managed with early P-URS

**Figure 2.** Estimated cost differences (average in Euros).**Table 2.** Comparative analysis of main postoperative complications

	ES Group (Including D-URS)	P-URS Group
Urosepsis	4 (4.8%)	3 (4.16%)
Urinary retention	2 (2.4%)	1 (1.4%)
Acute pyelonephritis	1 (1.2%)	1 (1.4%)
Haematuria	1 (1.2%)	0

D-URS – Delayed Ureteroscopy; P-URS – Primary Ureteroscopy

after managing infection and symptoms. In elective group (P-URS/D-URS), two patients presented with urosepsis, one with urinary tract infections and one patient presented with urinary retention. All four patients were managed conservatively (Table 2).

DISCUSSION

It is well established fact, that urinary tract stones presenting in emergency can be managed either by emergency temporizing measures (like stenting or percutaneous nephrostomy tube insertion) or by definitive treatments (ESWL/ URS). However, the main limiting factors for later is that not all hospitals have an access to ESWL or LASER or endoscopic surgeons all round the year.

The mean age of patients in our study was around 56 years for emergency group and 55 years for elective group. This is somewhat similar to previous studies in which most common age group is 50-59 years [13]. The ratio of male/female population in our study was about 2:1, which is also reflected in previous studies [13]. It is well known fact that men are at higher risk for kidney stones overall, because of a greater tendency for urine being oversaturated with Calcium Oxalate [14, 15]. The highest

number of emergency stone procedures were carried from August-October and lowest in December and March. This is also consistent with previous studies which have revealed that for renal colic the lowest average monthly rate to ED visits occurred in the month of February and the highest in the month of August [16]. This observation has been strongly correlated with temperature and humidity in these months [16]. The increased number of elective cases in October in our study, is reflection of fact that patients who underwent stenting around August, subsequently had elective procedures performed after 6-8 weeks afterwards. Complications in ES group are well known in previous publications (17). Regarding complications in P-URS/D-URS are established, particularly sepsis which is seen in around 4.3% patients who undergo elective URS [18]. We also observed that patients who had ES and had to wait for Ureteroscopy had stent symptoms, which varied among patients, depending on severity of symptoms as well as duration they had to wait for definitive procedure. This was not a major issue with patients who underwent P-URS as they did have their stents removed within 1–2 weeks.

Patients who underwent ES, had to visit hospital at least two more times, firstly for managing stone and secondly again for removal of stent, if re-inserted during definitive procedure. Quality wise, patient had to have three procedures required for stone management. This implies more expenses involved for hospitals and more days of work loss for the patient. On the other hand, patients who had a P-URS, received definitive treatment during index admission only and would return to hospital if they had stent inserted during P-URS. A similar study had revealed that patients undergoing ureteric stenting take significantly longer to become stone free, leading to increased hospital re-admissions, potentially increased morbidity and inevitably greater cost implications. In the study, patients became stone free significant-

ly quicker who underwent primary ureteroscopy as compared to ES (2.5 days vs 61.9 days) [19].

We also observed that using stent with string after P-URS or D-URS helps to reduce cost as patient does not need any further cystoscopy to remove stent as well as Quality of life (QoL) as patient can remove it on his own without need to return to hospital. A recent systemic review has suggested that stents with extraction strings are easy for patient self-removal and can reduce the stent dwell time for patients, thus reducing the duration of morbidity and physical and financial burden [20].

The study has many limitations, it is retrospective, the number of patients is small. The comparison is between two different scenarios, one being performed in emergency (ES) and other electively (PURS). However, these results changed management of stones in our trust. After audit recommendations, all acute ureteric stones for which surgery is indicated are being offered PURS in emergency theatre. In view of COVID, further change incorporated included that if surgeon decided to have stent insertion after procedure, usually threaded stents are to be placed so that patient does not need to come back to hospital for any additional procedure. We are now collecting data prospectively and comparing ES with PURS performed in emergency setting only.

CONCLUSIONS

We conclude that all patients presenting with acute urolithiasis should be offered P-URS in emergency setting if hospital has facilities and staff availability (doctors and trained urological nurses). The procedure is safe and is very effective in terms of improving quality for patients as well as bringing down the expenses.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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