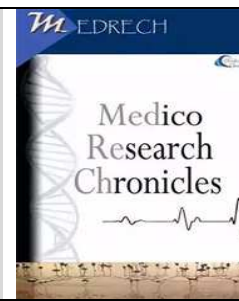




MEDICO RESEARCH CHRONICLES

ISSN NO. 2394-3971

DOI No. 10.26838/MEDRECH.2022.9.6.659

Contents available at www.medrech.com

PEROPERATIVE RENAL PAIN LOWER IN UPPER SPINAL BLOCK OF PROXIMAL (UPPER) URETERIC STONE MANAGEMENT BY URS + ICPL UNDER SPINAL ANESTHESIA

Md. Abdul Hakim Choudhury¹, Nargis Akter², Farjana Afrose³, Md. Humayun Kabir⁴, Nazrul Islam Khan⁵, Mohd. Sarwar Husain⁶, Sazeda Khatun⁷

1. Assistant Professor, Department of Anaesthesiology & ICU, National Institute of Kidney Diseases & Urology, Sher-e-Bangla Nagar, Dhaka, Bangladesh

2. Assistant Professor, Department of Anaesthesiology & ICU, National Institute of Kidney Diseases & Urology, Sher-e-Bangla Nagar, Dhaka, Bangladesh

3. Consultant (Gynae & Obs), IMO, NICVD, Dhaka, Bangladesh

4. Assistant Professor, Dept. of Anaesthesiology, Rangamati Medical College, Rangamati, Bangladesh

5. Assistant Professor, Department of Urology, National Institute of Kidney Diseases & Urology, Sher-e-Bangla Nagar, Dhaka, Bangladesh

6. Associate Professor, Department of anesthesiology, Sheikh Hasina Medical College, Tangail, Bangladesh.

7. Assistant Professor, (Gynae-Obs), Sheikh Sayera Khatun Medical College, Gopalganj, Bangladesh

ARTICLE INFO

Article History

Received: September 2022

Accepted: November 2022

Key Words: USAB, LSAB, Renal pain, Upper Ureter, URS, ICPL.

ABSTRACT

Introduction: Proximal (upper) Ureteric stone management by URS + ICPL under Spinal Anesthesia; Upper Spinal Block (USAB) reduces / lowers the Renal pain than Lower Spinal Block (LSAB). Objective: To ensure patients compliance and or to reduce renal and flank pain due to high irrigation fluid pressure and or due to rigid ureteroscopy through ureter during URS + ICPL of Upper ureteric stone operation under Spinal Anesthesia. **Material & Methods:** Randomized prospective study of 60 patients admitted in National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, Bangladesh from early January 2019 to late January 2020 with the diagnosis of proximal (upper) ureteric stone for URS + ICPL under Spinal Anesthesia. Demographic study of the patients age, sex, ASA Score having no spinal deformity. Every patient was properly informed & counselled about the whole procedures & outcomes including Spinal anesthesia (SAB) and URS +ICPL. Written informed consent was taken from all patients and their legal guardians as well. Patients with contraindications to SAB (Coagulopathy, local infection. etc.), allergies to local anesthetic sol, opioids, drugs used and significant spine, hepatic, cardiovascular, respiratory or psychiatric

ORIGINAL RESEARCH ARTICLE

Corresponding author
Dr. A. H. Choudhary*

disorders were excluded from the study. **Results:** 60 patients were randomly selected of which 30 pt's selected for Group-A and 30 pt's for Group-B. Finally, 26 patients in each Group i.e., total 52 patients were done URS+ICPL under SAB was subject for our study. 13 Patients had complained of mild to moderate pain (VAS: 0-6) of which 4 patients Group: A and 9 patients Group: B. In Group: A; 2 of 4 pt's had complained mild pain (VAS:<3) required analgesic i.e., Inj ketorolac 30mg IV & 2 pt's had complained moderate pain (VAS: >3-6) required potent analgesic i.e., Inj Pethidine 50mg IV slowly in addition to Inj ketorolac 30mg. In Group: B; 5 of 9 pt's had complained mild pain (VAS:<3) required analgesic i.e. Inj ketorolac 30mg IV & 4 pt's had complained moderate pain (VAS:>3-6) required potent analgesic i.e. Inj pethidine 50mg IV slowly in addition to IV Inj ketorolac 30mg. 8 patients had developed hypotension of which 6 in Group: A where 3 pt's had developed moderate hypotension required vasopressor (Inj Ephedrine HCl 10-30mg) with the increased IV fluid respectively & 3 pt's had developed mild hypotension hadn't got vasopressor but got increased IV fluid. And 2 pt's in Group: B had developed mild hypotension hadn't got any vasopressor but got increased IV fluid. 5 Patients had developed bradycardia (HR: >45-60 beat/min) of which 4 in Group: A & 1 in Group: B had required inj Atropine 0.3-0.6mg. 14 Patients had developed tachycardia (HR: >90 beat/min) of which 5 in Group: A & 09 in Group: B. The tachycardia was usually accompanying with the pain during procedures & little with hypotension. 3 Patients developed little anorexia without vomiting of only Group: A & neither of Group: B following moderate hypotension & bradycardia which was managed respectively. **Conclusion:** Renal pain lowers in Upper Spinal Block than that of Lower Spinal Block undergoing URS + ICPL of proximal ureteric stone management under Spinal Anesthesia.

2022, www.medrech.com

INTRODUCTION

Most of the patients of ureteric stone (both upper & lower ureteric) management by URS + ICPL usually done under SAB due to lower consumption of drugs, fewer complications & less hospital stay i.e., for more cost effective. But some urologists believe that prevention of involuntary reflexes (coughing, sneezing, hiccup, etc.), more relaxation and less resistance of ureter can be achieved under GA during URS+ICPL by semi-rigid ureteroscope especially in upper ureteric stone operations[1]. So upper ureteric stone management by URS+ ICPL - a good practice is usually under General

anesthesia (GA) rather than regional anesthesia. Patients of ureteric stone management both upper & lower by URS + ICPL usually done under SAB due to low cost & short hospital stay, though gold standard practice is under General anesthesia (GA) which provide more satisfaction for the patients as well as surgeons. But during URS + ICPL of upper ureteric stone by semi-rigid ureter cystoscope under Spinal anesthesia(SAB) some patients complain of pain in ipsilateral renal angle, flank or in abdomen during ureteroscopy &/by high pressure of irrigation fluid which stretch the upper ureter, pelvicalicial systems or kidney

producing mild to moderate renal pain even after spinal block [2,3]. This renal pain is more in pt's of Lower Spinal Block(LSAB) because the block is lower & less dense but the pain is significantly less in Upper Spinal Block(USAB) which produces superior, upper & denser block, and that is our concerns of study. This pain during operations have to manage with intravenous analgesics according to severity of pain and usually by NSAIDs /and opioid. So upper spinal blocks(USAB) produce upper, superior & relatively denser block than lower spinal block(LSAB) and reduce the concern stretched renal pain during the whole procedure of operations that's why here need lesser analgesics [4,5,6].

MATERIAL & METHODS

Randomized prospective study of 60 patients admitted in National Institute of Kidney Diseases & Urology (NIKDU), Dhaka, Bangladesh from January 2019 to January 2020 with the diagnosis of proximal (upper) ureteric stone for URS + ICPL under spinal anesthesia. Demographic study of the patients age, sex, ASA score, having no spinal deformity and ureteric stone size: 8mm-1.5cm, with good renal functions (serum creatinine: <1.3mg/dl), well excretion on both kidneys, without any distal obstruction, having sterile urine and getting no infection. Every patient was properly informed & counselled about the whole procedures of operations (URS+ICPL) & anesthesia (SAB) and also outcomes of that operations including advantages & disadvantages of spinal anesthesia (SAB). Written informed consent was taken from all patients & their legal guardians as well. Patients with contraindications to SAB (Coagulopathy, local infection. etc.), allergies to local anesthetic sol, opioids, drugs used and significant spine, hepatic, cardiovascular, respiratory or psychiatric disorders were excluded from the study. Not only that, patients with concomitant renal stone, horse-shoe shaped kidney, ureteric stricture/growth and those patients didn't will to be involved in

randomization were also excluded from the study. 30 patients randomly selected for Group: A; who were undergone Upper Spinal Block (USAB) i.e., at the level of L1-2 intervertebral space where the drugs (blocking agents) may spread & block up to T4-T7 spinal segments. And 30 patients selected for Group; who were undergone Lower Spinal Block (LSAB) i.e., at level of L3-4 intervertebral space where the drugs (blocking agents) may spread & block up to T7-T10 spinal segment. Both group of spinal blocks, every patient had got 3ml/15mg of 0.5% Bupivacaine heavy (0.5% Bupivacaine Hcl+8% Dextrose) with 0.5ml/25microgram Inj Fentanyl (0.005% Fentanyl citrate) for that two level of subaracnoid space. For every patient before getting Spinal anesthesia, 400-500ml of isotonic fluid (Hartman's sol) had been infused through wide bore cannula (18G) with IV anti emetic Inj. Ondansetron 8mg, anti ulcerant Inj. Omeprazole 40mg & IV Antibiotics respectively given slowly. For irrigations Normal saline (0.9% NaCl) had been used with the height of 60-70cm. Continuous monitoring of patient's vital parameters like NIBP, HR, SPO2 and especially pain by VAS Score (VAS:0-no pain, VAS:<3-mild pain, VAS:3-6-moderate pain, VAS:>6- severe pain). Following urethrocystoscopy guide wire was passed through the ureteric orifice to the renal pelvis under visual monitoring of 46cm 10Fr storze ureteroscope was advanced next to the guide wire, as soon as the stone was seen, the pneumatic probe was pushed towards the stone. After fixing the stone, the pneumatic source was on & the stone fragmentation was started along with the irrigation fluid for well visual monitoring of fragmentation and clearances of fragmented minute stones through the irrigation fluid. More or less every patient's had required to give forced pressure through irrigation fluid for good fragmentation, clearing/ carrying of the drusts or fragments from upper ureter to urinary bladder. In those times some patients had complained of pain in renal angle or flank

or even in abdomen during upper ureteroscopy and stone fragmentation used to mainly by forced irrigation fluid pressure. Then pressure gave stretch over the upper ureter, pelvicalical system & kidney and produced the renal pain. This renal pain was recorded by Visual Analog System i.e., VAS: 0-10. In mild pain (VAS :< 3), inj. Ketorolac HCl (30mg) IV had been given & in moderate pain (VAS :> 3-6) inj. Pethidine HCl (50mg) IV slowly had been given in addition to inj ketorolac. Oxygen therapy (3-5L/min) had been provided to the all patients irrespective of developed renal pain, hypotension, bradycardia, tachycardia, respiratory distress and so on.

RESULTS

60 patients randomly selected of which 30 pt's selected for Group-A and 30 pt's for Group-B. Demographic study of the patients- Age: 18-70 yr mean 44.27 ± 11.15 , Sex: male; 42 & female: 18; mean 45.3 ± 32.5 , ASA Score: <3; mean 3.68 ± 0.63 having no spinal deformity. In this study 8 patients (4 of each group) were excluded from the study, because their stone had been pushed back to the renal pelvis. Out of 8 pt's, 3 patients were done mini PCNL in same sitting (2 of group: A & 1 of Group: B) and 5 patients were kept push back with DJ stent in ureter in situ for further sitting PCNL or RIRS (2 of Group: A & 3 of Group: B). Finally, 26 patients in each group i.e., Group: A;26 & Group: B;26 and total 52 patients were done URS + ICPL under SAB. 13 Patients had complained of mild to moderate pain (VAS: 0-6) of which 4 patients in Group: A and 9 patients in Group: B. In Group: A; 2 of 4 pt's had complained mild pain (VAS:<3) required analgesic i.e., Inj ketorolac 30mg IV & 2 pt's had complained moderate pain (VAS: >3-6) required potent analgesic i.e., Inj

Pethidine 50mg IV slowly in addition to Inj ketorolac. In Group; 5 of 9 pt's had complained mild pain (VAS:<3) required analgesic Inj ketorolac 30mg IV & 4 pt's had complained moderate pain (VAS:>3-6) required potent analgesic i.e., Inj pethidine 50mg IV slowly in addition to Inj ketorolac. 8 patients had developed hypotension of which 6 in Group: A where 3 pt's had developed moderate hypotension required vasopressor (Inj Ephedrine HCl) with increased IV fluid & 3 pt's had developed mild hypotension hadn't got vasopressor but managed with increased IV fluid. And 2 pt's in Group: B had developed mild hypotension hadn't got any vasopressor but managed only with increased IV fluid. 5 Patients had developed bradycardia (HR: >45-60 beat/min) of which 4 in Group: A & 1 in Group: B required inj Atropine 0.3-0.6mg IV. 14 Patients had developed tachycardia (HR: >90 beat/min) of which 5 in Group: A & 09 in Group: B. The tachycardia was usually accompanied with the renal pain & stress during the procedures & little with hypotension. 3 patients had developed little anorexia without vomiting of only Group: A & neither of Group: B following moderate hypotension & bradycardia. In this study i.e., URS+ICPL under SA, hypotension & bradycardia (which is usually occur suddenly alike conventional SA) was minimum or less. As because patients underwent URS+ICPL had been positioned into lithotomy for cystoscopy immediately following after spinal anesthesia given. Sympathetic block for SAB here, had made shorten of peripheral out pooling of blood due to immediate raised of lower limbs (lithotomy position for cystoscopy) & made a good compensation of venus return to trunk quickly.

Table-1: General characteristics of the study subjects (n=52)

General characteristics	Group-A (n=26)	Group-B (n=26)	P value
Age (year)	46.27 ± 11.15	49.76 ± 13.42	0.1791
Sex (Male: Female)	22:10	20:8	0.5352
Stone size (mm)	8.92 ± 1.20	8.41 ± 1.28	0.511
Stone laterality (Right: Left)	16:10	12:14	0.5112

ASA Score:<3	2.02 ± 0.63	5.34 ± 0.68	<0.001 ^s
--------------	-------------	-------------	---------------------

Table-2: Indication of subject's patients (N=52)

Indication	Group A (n=26)	Group B (n=26)	Total
PCNL	2 (3.8)	1 (1.9)	03 (5.7)
Push Bank DJ stent	2 (3.8)	3 (3.8)	05 (9.6)
URS+ICPL	26 (50)	26 (50)	52 (100.0)
Pain	4 (7.6)	9 (17.3)	13 (25.0)
Hypotension			
Mild	03 (5.7)	02 (3.8)	05 (9.6)
Moderate	03 (5.7)	00 (0.0)	03 (5.7)
Bradycardia (HR;<45-60 beat/min)	4 (7.6)	1 (1.9)	05 (9.6)
Tachycardia(HR>90beat/min)	5 (9.6)	9 (17.3)	14 (26.9)
Anorexia	03 (5.7)	00 (0.0)	03 (5.7)

Table-3: Vas score of subject's patients (N=13)

VAS	Group A (n=26)	Group B (n=26)	Total
VAS:<3) Mild	02 (3.8)	05 (9.6)	07 (13.4)
(VAS:>3-6) Moderate	02 (3.8)	04 (7.6)	06 (11.5)

Table-4: Pain management of both group (N=13)

Pain	Group-A (n=26)	Group-B (n=26)	Total
Mild Pain (07)	02 (3.8)	05 (9.6)	07 (13.4)
Moderate Pain (6)	02 (3.8)	04 (7.6)	06(11.5)

DISCUSSION

URS is a reliable and easy procedure commonly used to treat ureter stones under SA and most popular & reliable techniques. Stone disease in the urinary system has a high prevalence that varies depending on climate, geography, ethnic background, diet, and genetic factors. Ureteral stones are observed in 20% of urinary system stones [5]. Patients with urinary system stones have a 50% chance of relapsing within ten years of their first diagnosis [6,7]. Important factors that determine the spontaneous passage of ureteral stones are stone size and location. The probability of spontaneous passage is higher in patients with a stone size of ≤ 5 mm, whereas this probability is substantially lower in patients with a stone size of ≥ 10 mm. The probability of spontaneous passage of proximal ureteral stones is low compared with stones in other regions of the ureter, being 48% for

proximally located ureteral stones and 79% for distally located ureteral stones [4]. During URS + ICPL of upper ureteric stone by semirigid ureterocystoscope under spinal anesthesia (SAB) some patients complain pain in ipsilateral renal angle, flank or in abdomen during ureteroscopy &/ by high pressure of irrigation fluid that stretch the upper ureter, pelvicalical systems or kidney producing mild to moderate renal pain even after spinal block. This pain has to manage with intravenous analgesic according to severity of pain usually by NSAIDs /and opioid. Ureteral stents (DJ) have been conventionally placed to reduce the colicky pain and ureteral edema following ureteroscopic removal of stones, to prevent or reduce the occurrence of ureteral Stricture [5]. However, recognized complications have been associated with the use of stents with reports in the literature of a 10% to 85% incidence of stent related symptoms and morbidity [6].

Stone size and duration of operation and hospitalization were not significantly different in 52 patients who underwent URS for upper ureteric stones under spinal anesthesia in this study. Upper Spinal Block (USAB) produce upper, superior & denser block and reduce the ureteric & renal pelvical pain more effectively during the procedure than Lower Spinal Block (LSAB). 60 Patients randomly selected for this study of which 30 pt's selected for Group-A and 30 pt's for Group-B. Demographic study of the patients- Age: 18-70yr mean 44.27 ± 11.15 , Sex: male; 42 & female: 18; mean 45.3 ± 32.5 , ASA Score :<3; mean 3.68 ± 0.63 having no spinal deformity. Motor and sensory block achieved by spinal anesthesia provided sufficient anesthesia during the operation. During URS+ICPL under SA, hypotension & bradycardia (which is usually occur suddenly alike of conventional SA) was minimum or less. Because patients underwent URS+ICPL had been positioned into lithotomy for cystoscopy immediate after spinal anesthesia given. Sympathetic block for SA here, had made shorten of peripheral outpooling of blood due to immediate raised of lower limbs (lithotomy for cystoscopy) & made a good compensation of venous return to trunk. No significant complication developed in any of that patient. Maghsoudi et al compared the lithotripsy methods used for treating ureteral stones. They found that the incidence of urethral stones was higher in males [5]. The incidence of ureteral stones in the present study was also found to be high in male patient. A study reported that general anesthesia providing muscle paralysis is usually preferred in URS procedures to avoid ureteral injuries due to movement & reflexes (caugh, hiccup etc) of the patients [6]. Finally 26 patients in each Group i.e., total 52 patients were done URS + ICPL under SAB. 13 Patients had complained of mild to moderate pain (VAS: 0-6) of which 4 patients Group:A and 9 patients Group: B. In Group: A; 2 of 4 pt's had complained mild pain (VAS:<3)

required analgesic i.e., Inj ketorolac 30mg IV & 2 pt's had complained moderate pain (VAS: >3-6) required potent analgesic i.e., Inj Pethidine 50mg IV slowly in addition to Inj ketorolac. In Group: B; 5 of 9 pt's had complained mild pain (VAS:<3) required analgesic Inj ketorolac 30mg IV & 4 pt's had complained moderate pain (VAS:>3-6) required potent analgesic i.e., Inj pethidine 50mg IV slowly in addition to Inj ketorolac. 8 patients had developed hypotension of which 6 in Group: A where 3 pt's had developed moderate hypotension required vasopressor (Inj Ephedrine HCl) with increased amount of isotonic IV fluid & 3 pt's had developed mild hypotension hadn't got vasopressor but managed with increased IV fluid. Another study showed that the URS+ICPL easily & frequently done under epidural procedure successfully [7]. Some other studies also reported that epidural anesthesia with intravenous sedation i.e., combined with regional anesthesia & GA anesthesia were safe anesthesia methods for URS procedures [8, 9, 10]. In the present study, on postoperative day 1, the mean VAS scores for flank pain in Group-A and Group-B was not significantly different. Irritative voiding symptoms at 1 week postoperatively was similar for both groups. Similar finding was seen by Moon et al [4] and Chauhan et al [11] A study compared general and spinal anesthesia for URS procedures according to the duration of operation and hospitalization and complications. It found that spinal anesthesia decreased the duration of operation and hospitalization, and did not cause additional risk like general anesthesia. Further, it increased patient satisfaction and minimized postoperative pain, thus serving as a safe method [12]. In this study, 8 patients had developed hypotension of which 6 in Group: A where 3 pt's had developed moderate hypotension required vasopressor (Inj Ephedrine HCl) with increased IV fluid & 3 pt's had developed mild hypotension hadn't got

vasopressor but increased IV fluid. And 2 pt's in Group: B had developed mild hypotension hadn't got any vasopressor but increased IV fluid.

5 patients had developed bradycardia (HR: >45-60 beat/min of which 4 in Group: A & 1 in Group: B required inj Atropine 0.3-0.6mg. 14 Patients had developed tachycardia (HR:>90 beat/min) of which 5 in Group: A & 09 in Group: B. The tachycardia was usually accompanied with the pain during procedures & little with hypotension. 3 patients developed little anorexia without vomiting of only Group: A & neither of Group: B probably due to hypotension & bradycardia. Although there are several studies regarding the reliability, applicability, and tolerability of URS+ICPL performed owing to distal ureteral stones under SA, local anesthesia, or sedation, studies directly comparing the applied anesthesia types for the endoscopic treatment of the proximal ureteral stones is lacking [13,14] Spinal anesthesia has some disadvantages such as bradycardia, hypotension (owing to sympathetic blockage), which can be cured with appropriate treatment; headache, which can require a little longer hospitalization. There is a common belief that possible negative effects of USAB are widely observed during and after the treatment of proximal ureteral stones. Pre operative hydration with isotonic fluid i.e., inf Hartmann sol & lithotomy position combat the hypotension & bradycardia of our patients. In our study, nausea was observed in one patient as a side effect of SA during the operation, and the patient was treated with metoclopramide, which was administered intravenously. Closely monitoring of pt's vital with abrupt management of adverse helped the study smoother & easier without any significant morbidity or complications.

LIMITATIONS

The study was conducted in a single hospital with a small size of sample, so it may not represent the whole community

CONCLUSION

Renal pain lower in Upper Spinal Block than that of Lower Spinal Block undergoing URS + ICPL of Proximal (upper) Ureteric Stone management under Spinal Anesthesia.

Conflict of Interest: None.

Ethical approval: The study was approved by the institutional ethical committee.

REFERENCES:

1. Reis Santos JM. Ureterscopy from the recent past to the near future. *Urolithiasis*. 2018; 46: 31-37.
2. Coll DM, Varanelli MJ, Smith RC. Relationship of spontaneous passage of ureteral calculi to stone size and location as revealed by unenhanced helical CT. *AJR Am J Roentgenol*. 2002; 178: 101-103.
3. Türk C, Neisius A, Petrik A, Seitz C, Thomas K. Guidelines on urolithiasis. European Association of Urology, Arnhem 2018. Available at <http://www.uroweb.org/gls/pdf>.
4. Moon, K.T., Cho, H.J., Cho, J.M., Kang, J.Y., Yoo, T.K., Moon, H.S. and Lee, S.W., 2011. Comparison of an indwelling period following ureteroscopic removal of stones between Double-J stents and open-ended catheters: a Prospective, pilot, randomized, multicenter study. *Korean journal of urology*, 52(10), pp.698-702.
5. Netto, N.R., Ikonomidis, J. and Zillo, C., 2001. Routine ureteral stenting after ureteroscopy for ureteral lithiasis: is it really necessary?. *The Journal of urology*, 166(4), pp.1252-1254
6. Harmon WJ, Sershon PD, Blute ML, Patterson DE, Sequra JW. Ureterscopy: current practice and long-term complications. *J Urol* 1997; 157: 28-32.
7. Maghsoudi R, Amjadi M, Norizadeh D, Hassanzadeh H. Treatment of ureteral stones: A prospective randomized controlled trial on comparison of Ho:YAG laser and pneumatic

- lithotripsy. *Indian J Urol* 2008; 24(3): 352–354. doi: 10.4103/0970-1591.39549.
8. NettoJunior NR, ClaroJde A, Esteves SC, Andrade EF. Ureteroscopies tone removal in the distalureter. Whychange? *J Urol* 1997; 157: 2081-3.
 8. Wills TE, Burns JR. Ureteroscopy: an outpatient procedure? *J Urol* 1994; 151: 1185-1187.
 9. Rittenberg MH, Ellis DJ, Bagely DH. Ureteroscopy under local anaesthesia. *Urology* 1987; 30: 475-478.
 10. Vogelli A, Mellin HE, Hopf B, Ackermann R. Ureteroscopy under local anaesthesia with and without intravenous analgesia. *Br J Urol* 1993; 72: 161-164
 11. Chauhan, V.S., Bansal, R. and Ahuja, M., 2015. Comparison of efficacy and tolerance of short-duration open-ended ureteral catheter drainage and tamsulosin administration to indwelling double J stents following reterosopic removal of stones. *Hong Kong Med J*, 21(2), pp.124-30.
 12. alçinkaya F, Topaloğlu H, Ozmen E, Unal S. Is general anesthesia necessary for URS in women? *Int Urol Nephrol*. 1996;28:153–156.
 13. Large T, Heiman J, Ross A, Anderson B, Krambeck A. Initial experience with narcotic-free ureteroscopy: a feasibility analysis. *J Endourol*. 2018;32:907–911.
 14. Hosking DH, Smith WE, McCole SE. A comparison of extracorporeal shock wave lithotripsy and ureteroscopy under intravenous sedation for the management of distal ureteric calculi. *Can J Urol*. 2003;10:1780–1784.