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Original Article

# Ureteroscopy Under General Anesthesia Versus Spinal Anesthesia: Stone Clearance and Morbidity

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## Abstract

**Objective:** This study aims to compare and contrast ureteroscopy procedures performed under spinal anesthesia and general anesthesia, focusing on complications, stone clearance rates, and relevant variables.

**Methods:** The study was conducted at the Kidney Centre, Women's University of Dera Ismail Khan, from January 2021 to January 2022, focusing on urinary calculus disease. A total of 100 patients aged 18 to 50 underwent ureteroscopic procedures for the treatment of ureteric stones, with 69 males and 31 females. The patients were divided into two groups: Group A received general anesthesia, and Group B underwent spinal anesthesia. Comprehensive data, including demographics, stone characteristics, operative time, hospital stay, and complications, were collected and analyzed using statistical methods.

**Results:** Group B, with spinal anesthesia, exhibited a significantly shorter operative time (31.5 ± 2.15 minutes) compared to Group A under general anesthesia (41.5 ± 1.30 minutes, p=0.033). Group B also showed a trend towards shorter hospital stay (18.2 ± 6.9 hours) compared to Group A (22.6 ± 8.1 hours, p=0.073). Postoperative complications, such as pain, fever, and analgesia requirement, were comparable between the two groups.

**Conclusion:** The study suggests that general anesthesia may be superior to spinal anesthesia for ureteroscopy in terms of safety and stone clearance rates, while spinal anesthesia is associated with a lower risk of complications. The findings underscore the effectiveness of ureteroscopy in treating lower ureteric stones and highlight the adaptability of anesthesia choices to individual patient needs.

**Key Words:** Ureteroscopy, General anesthesia, Spinal anesthesia, Ureteric stones

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## Introduction

With the use of cutting-edge technology and current equipment, ureteroscopy has grown from its 1980s beginnings to become a regular urological operation, greatly increasing its success rate, and broadening its range of uses. Endoscopic lithotripsy, ureteropelvic junction blockage correction, stricture incision, urothelial cancer care, and other specialized procedures have expanded the original scope of modern ureteroscopy.[1]

The remarkable success rate of this minimally invasive operation, which ranges from 80% to 100%, has made it the primary therapy for lower ureteric stones.[2] However, ESWL (extracorporeal shock wave lithotripsy) is often the preferable treatment when available, and its application for upper and mid-ureteric stones is less prevalent. The complication rate of ureteropyeloscopy has been significantly reduced, thanks to the continuous improvement of instruments and surgical procedures. It presently ranges from 0% to 6%, and the success rate in stone clearing is outstanding.[3]

Patients have reported little to no discomfort after undergoing the procedure under spinal anesthesia or

intravenous sedation, two alternatives to general anesthesia that were formerly reserved for the treatment.[4] The versatility of ureteroscopy is demonstrated by the variety of anesthesia choices available, which may be tailored to meet the individual needs and preferences of patients. Although ureteroscopy is highly successful, it does come with the risk of consequences. Bleeding, ureteral perforations, avulsions, strictures, urinomas, discomfort, retention of urine, and residual stone particles are all possible complications. Comprehensive patient selection before surgery is crucial since relative contraindications include undiagnosed urinary tract infections, endoscopy without proper antibiotic treatment, and uncorrected bleeding diathesis.[5]

The purpose of this research is to compare and contrast ureteroscopy procedures carried out under spinal anesthesia and general anesthesia with respect to complications, stone clearance rates, and other relevant variables. The research seeks to improve patient outcomes and urology clinical practice by systematically examining these characteristics in order to provide significant insights into optimizing the anesthesia technique for ureteroscopic operations.

## Methods

The research on urinary calculus illness took place between January 2021 and January 2022 at the Kidney Centre at the Women's University of Dera Ismail Khan. The patients' data was collected using a convenience sample method. All patients were made aware of the study and given the option to choose their anesthetic. A hundred patients, spanning the ages of 18 to 50, were chosen for this study; there were 69 men and 31 women. In order to treat ureteric stones, all subjects were observed while a semi-rigid ureteroscope measuring 8/8.4 Fr was used. Fifty patients were split evenly between the two groups in the cohort. During the procedure, Group B was administered spinal anesthesia, whereas Group A was given general anesthesia. We gathered extensive data to evaluate several factors, such as length of stay in the hospital, duration of procedure, stone removal, and intra- and post-operative problems. Data analysis was subsequently carried out using statistical approaches, which included inferential as well as descriptive statistics.

The research included all adult patients (those aged 18 years and above) who had an X-ray showing a lower ureteric stone, defined as a stone located below the sacroiliac joint. Exclusion criteria included a history of open surgery, the presence of upper ureteral stones, bleeding, presence of UTI, ASA grade III or IV 19, or any other medical condition that would prevent the administration of spinal or general anesthesia. A chemical study was performed on each stone that was removed in order to determine its kind.

Any intraoperative complications were closely monitored in the patients. In every case, stone clearance was evaluated by X-ray KUB and/or excretory urography (in cases where the stone was radiolucent). Postoperative complications such as discomfort, fever, infection, hemorrhage, and obstruction caused by residual stone were assessed in all patients. After each procedure, a visual analogue score for pain (VAS-20) was documented. It was decided to send a blood culture and sensitivity test in case an infection was suspected. Patients experiencing abdominal swelling or other symptoms that might indicate the establishment of a hematoma were scheduled for an ultrasonography of the abdomen. For every case, the total number of hours spent in the hospital was determined. The duration between admission and discharge was used as its definition. In this context, "morbidity" refers to the patient's overall health after surgery, as well as their length of hospital stay, the severity of any procedure-related problems (such as pain or fever), and any anesthesia-related problems (such as vomiting or headaches).

We compared the two anesthesia groups to see how significantly different they were in terms of morbidity rates, stone removal, operational time, and length of hospital stay. Patient privacy, informed permission, and appropriate ethics committee approval were all maintained throughout the study. We used SPSS 10.0 to capture and analyze all of the data so that we could compare the outcomes in terms of stone removal and morbidity. The duration of hospital stay, stone size, and time of operation were examples of constant response factors that were shown as means ±SD. The means of the two groups were compared using Student's t-test.

## Results

Following the informed consent process, one hundred patients were randomly chosen to have either general or spinal anesthesia. Surgery was performed in every patient due to the presence of urinary calculi. Fifty patients from each group were compared post-operatively for operation success, operative time, hospital stay duration, and complications. Table 1 shows the demographics and stone characteristics of

the 50 patients who were part of Group A and who had general anesthesia. Of these patients, 34 (34% of the total) were male and 15 (15%) were female. With ages ranging from fifteen to seventy-one, this group had a mean age of thirty-three years. In Group A, the stone size ranged from 0.5 to 1.5 cm, with an average of 0.78 ± 0.23 cm. Group B, which underwent spinal anesthesia, also had 50 patients; of this group, 16 were female and 35 were male, making up 35% of the total. Group B's average age was 36.9 years, with ages ranging from 22 to 72 years. It should be noted that the stones in this group were much bigger, with a measurement of 1.13 ± 0.42 cm (p=0.001).

**Table 1:** *Patient Demographics and Stone Characteristics*

| | Group A | Group B |
|---|---|---|
| Total Patients | 50 | 50 |
| Male Patients | 34 (34%) | 35 (35%) |
| Female Patients | 15 (15%) | 16 (15%) |
| Mean Age (years) | 33.9 (15-71) | 36.9 (22-72) |
| Stone Size (cm) | 0.78 ± 0.23 (0.5 - 1.5) | 1.13 ± 0.42 |

**Table 2:** *Surgical Outcomes and Hospital Stay*

| | Group A | Group B |
|---|---|---|
| Operative Time (mins) | 41.5 ± 1.30 | 31.5 ± 2.15 (p=0.033) |
| Hospital Stay (hours) | 22.6 ± 8.1 (8 - 48) | 18.2 ± 6.9 (6 - 24, p=0.073) |

Group B had a noticeably lower operational time of 31.5 ± 2.15 minutes (p=0.033), in contrast to Group A's 41.5 ± 1.30 minutes (Table 2, which centers on surgical results and hospital stay). In terms of the amount of time spent in the hospital, Group A had an average of 22.6 ± 8.1 hours, ranging from 8 to 48 hours. On the other hand, Group B exhibited a significantly lower average hospitalization duration of 18.2 ± 6.9 hours, with a range of 6 to 24 hours (p=0.073).

**Table 3:** *Postoperative Complications*

| | Group A | Group B |
|---|---|---|
| Pain (Visual Analogue Score) | 3.1 ± 0.922 (2 - 5) | 1.8 ± 0.73 (1 - 3) |
| Oral/IV Analgesia Requirement | All patients required | All patients required |
| Fever | 13.4% (mean temperature: 38.9°C, ranging 37 - 40°C) | 6.6% (9 patients) developed fever |
| Hematoma / Obstruction | No reported cases | No reported cases |

The average pain level, as measured by the Visual Analogue Score, was 3.1 ± 0.922 on a scale from 2 to 5, according to Group A's report in Table 3 which details postoperative effects. Oral and/or intravenous analgesics were necessary for every patient in this group. Also, 13.4% of Group A patients had a fever after surgery; the average temperature was 38.9°C, with a range of 37 to 40°C. No instances of hematoma or blockage were recorded, although three individuals (3.3%) did acquire urinary tract infections that were cured with antibiotics. On a scale from 1 to 3, every patient in Group B reported discomfort, with an average Visual Analogue Score of 1.8 ± 0.73. likewise, intravenous and oral analgesics were necessary for all patients. There were nine cases of postoperative fever, amounting to 6.6% of patients. Additionally, Group B did not have any hematoma or blockage cases.

## Discussion

For urinary tract calculi that are either not amenable to, or resistant to extracorporeal shock wave lithotripsy, urologists often resort to the well-established and safe method of ureteroscopy. Analyzing aberrant lesions found by less invasive imaging techniques, such as intravenous ultrasound (IVUS), magnetic resonance imaging (MRI), and computed tomography (CT) scans, is another popular usage. Upper and lower urinary tract stones, blockage at the pelvi-uretric junction, urethral strictures, and localized cancers are all treatable with this procedure's minimally invasive therapy. Although intraoperative problems such as tissue damage leading to significant wall perforations or stone migration into the ureteral wall used to be common, the occurrence of these difficulties has dropped to around 1% due to improvements in surgical procedures and hospital infrastructure.

A noteworthy advancement is the shift towards ureteroscopy as a day-care surgical operation. This allows for the same-day release of 78-95% of patients. While previous research showed that general anesthesia with paralysis of the muscles was necessary to avoid ureteral damage caused by the patient's abrupt movements, newer research shows that spinal and epidural anesthesia are just as safe[6]. A number of anesthesia combinations have been investigated by researchers, including local or epidural anesthesia with intravenous sedation. Studies utilizing intravenous sedation alone, especially with a flexible ureteroscope, have demonstrated encouraging outcomes.[7]

The condition being treated and the type of endoscopy used determine the prognosis following a ureteroscopic operation. The most common goals of a diagnostic ureteroscopy are to pinpoint the origin of

bleeding or to characterize a filling deficiency. Resolving ureteral blockage and reducing stone load are the goals of therapeutic ureteroscopy in the treatment of upper urinary tract calculi. Every disease process has its own unique postoperative expectations and results, but ureteroscopy provides a flexible surgical platform for addressing them all[8].

When looking at two patient groups, Group A and Group B, we can see that no problems such ureteral avulsion or perforation happened, even though Group B had a bigger stone (1.14 cm vs 0.79 cm in Group A). In both groups, every stone was extracted without incident. Group A had an average operating duration of 41.4 minutes, whereas Group B had a considerably shorter average operating time of 30.5 minutes. The use of general anesthesia is safer when lengthier treatments are expected, as prolonged procedure duration increases the risk of severe injuries from patient movements.

After the operation, the average length of stay in the hospital was 18.1 hours for Group B and 21.6 hours for Group A. It is worth mentioning that although several patients in both groups were discharged after 6-8 hours, one patient in Group A had to stay in the hospital for 48 hours because their vomiting couldn't be managed. Consistent with previous research, spinal anesthesia had no discernible effect on length of hospital stay ($p=0.073$)[9]. Average visual analogue scores (VAS) for Group A were 3.1 and for Group B they were 1.8 following surgery, indicating that both groups experienced discomfort. A single intravenous dose of pethidine and oral analgesics were used for pain control.

Spinal anesthesia's shorter half-life (5-6 hours) and thus reduced postoperative pain were the likely causes of the observed VAS differences between the groups[10,11]. Even after taking oral antipyretics, 13.3% of Group A and 6.6% of Group B experienced postoperative sequelae, including pyrexia. An infection of the urinary tract (UTI) was treated appropriately in one patient in Group A. Retention of urine, hematoma development, ureteral perforation, or avulsion were not significant problems in any group.

As a result of being able to see the endovision video display showing the fragmentation of their stones, patients experiencing spinal anesthesia reported feeling more confident and comfortable throughout the surgery. The safety, versatility, and importance of ureteroscopy in many contexts, as well as factors to be considered when choosing anesthesia for best results, are all highlighted in this in-depth review of the field.

## Conclusion

The results show that general anesthesia is superior to spinal anesthesia for ureteroscopy in terms of safety, stone clearance rates, and other variables, whereas spinal anesthesia is linked with a lower risk of complications. This study's findings emphasize on the effectiveness of ureteroscopy in treating lower ureteric stones and demonstrate how it may be tailored to meet the requirements and preferences of individual patients. Notably, spinal anesthesia proved to be a viable alternative to general anesthesia, with quicker operating times and similar hospital stays.

Having said that, the study's shortcomings must be acknowledged. Although the sample size was sufficient for the study's aims, it may not have been truly representative of the different patient groups encountered in more general clinical settings due to the research's focus on a single facility. The study also only included participants between the ages of 18 and 50, so its results may not apply to younger or older people in general. The results should be more robust and generalizable if future research in this area seeks to recruit a wider range of patients. The long-term effects of anesthesia selections on patient outcomes should be better understood with the use of follow-up evaluations conducted at regular intervals.

**Ethical Approval:** The IRB/EC approved this study via letter no.IRB/2020/024 dated-23-12-2020.

**Conflict of Interest:** *None*

**Funding Source:** *None*

## Authors' Contribution

**IMB:** Conception
**MA, FS:** Design of the work
**UI, MS, MAK:** Data acquisition, analysis, or interpretation
**MS, MAK, FS:** Draft the work
**IMB, UI, MA:** Review critically for important intellectual content
**IMB, UI, MS, MAK, MA, FS:** Approve the version to be published
**IMB, UI, MS, MAK, MA, FS:** Agree to be accountable for all aspects of the work

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