



Surgeon Satisfaction with Flexible Ureterorenoscopy and Laser Lithotripsy: A Comparison between General Anaesthesia and Combined-Spinal Anaesthesia

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

Aim: Comparing the effect of General Anaesthesia (GA) and combined Spinal Epidural Anaesthesia (CSE) on the comfort of the surgeon and flexible Ureterorenoscopy outcomes.

Materials and Methods: Duration of study was 2 years, in a randomized prospective pattern. Sample size was 34, GA (n=17) and CSE (n=17). Analysis was on demographic, and perioperative parameters of patients.

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Results: 34 randomized patients were included with ASA I and II, no difference in demographic variable. Monitoring vital signs intraoperatively, 3 patients in CSE group had bradycardia, and hypotension which was significant when compared with GA group, bradycardia ($p=0.002$), hypotension ($p=0.001$). Additionally, 1 patient in CSE group experienced mucosal tears, but no complications observed in the GA group ($p=0.006$) statistically significant. The postoperative evaluation of surgeon comfort was statistical significance in favour of the GA group ($p=0.001$).

Conclusion: GA and CSE are equally effective and safe Anaesthesia methods for f-URS procedures. Although regional anaesthesia may be preferred by the Anaesthesiologist, to avoid polypharmacy, and airway manipulation, the surgeon's satisfaction is paramount, therefore general anaesthesia is preferred with less side effect as the CSE group showed statistical significance in bradycardia and mucosal injury and decreased surgeon comfort during surgery.

Keywords: Laser lithotripsy; general anaesthesia; combined spinal epidural anaesthesia.

LIST OF ABBREVIATIONS

GA	: General Anaesthesia
CSE	: Combined Spinal Epidural Anaesthesia
RIR	: Retrograde intrarenal surgery
F-URS	: Flexible Ureterorenoscopy
ASA	: American Society of Anaesthesiologists
SFR	: Stone-Free Rates
KUB	: Kidney-Ureter-Bladder
NCCT	: Non-Contrast Computed Tomography
NSAIDS	: Non-Steroidal Anti-Inflammatory Drugs
PCNL	: PerCutaneous NephroLithotomy

1. INTRODUCTION

Urolithiasis is a highly prevalent urological disease that significantly impacts the health and quality of life of affected individuals (Wang et al., 2017). The prevalence of the disease varies across different regions in the world, ranging from 0.1 to 14.8% in Western countries to up to 10.6% in the Asian population (Wang et al., 2017; Romero et al., 2010). Flexible ureterorenoscopy (f-URS) because of its success rates, lower complication rates, advanced technology and modern procedural equipment, (Türk et al., 2016; Oztekin et al., 2020) is very important in management of renal stones. There has been an extensive examination of factors affecting f-URS however; there is paucity of studies on the effect of Anaesthesia type (Sánchez-Martín et al., 2007; Resorlu et al., 2013). In ureterorenoscopy, anaesthetists prefer regional anaesthesia to general anaesthesia to avoid complications due to general anaesthesia (Oztekin et al., 2020) but surgeons prefer general anaesthesia due to increased risk of urethral trauma with CSE (Resorlu et al., 2012). In

general anaesthesia the anaesthetist is in charge of patient respiration, and movement therefore patients compliance is higher, with better patient control, using GA for retrograde intrarenal surgery (RIR) (Kourmpetis et al., 2018; Tangpaitoon et al., 2012). GA has the disadvantage of increase airway manipulation, aspiration of gastric contents, adverse drug events and cardiopulmonary complications (Sahan et al., 2020). On the other hand, risk of venous embolism and bleeding are lower in patients undergoing regional anaesthesia (RA) (Ballestrazzi et al., 1988). Although it has been demonstrated by Sahan et al., (2020) that Both GA and RA are equally effective and safe anaesthesia methods for f-URS procedures, RA group showed significantly increased likelihood of bradycardia and mucosal injury during surgery, and significantly decreased surgeon comfort during surgery. There are no studies reported in our environment, therefore, this study is designed to compare the effect of general anaesthesia (GA) and combined spinal epidural on f-URS, outcomes and surgeon comfort.

2. MATERIALS AND METHODS

It was a randomized prospective study over 2 years, preanaesthetic review was done, during which patient was educated on the Visual Analog Scale (VAS, where '0' score corresponds to no pain, and '10' to maximum or worst pain, informed consent was obtained. Inclusion criteria was Age 18-60 years, ASA I&II, all patients were premedicated with I.V midazolam 0.05 mg/kg. 34 patients were included in the study, 17 GA group and 17 CSE group.

In theatre simple random sampling was done, a coin was flipped, heads GA and tails CSE. Baseline vitals checked those for CSE were placed in sitting position, back cleaned and

scrubbed aseptically with chlohexidine and spirit, combined spinal epidural pack (18G Tuohy needle and 27G intrathecal needle) was used. Using the posterior superior iliac crest L3-4. L4-5 located, 15mg of 0.5% heavy bupivacaine given. Epidural catheter inserted 5cm inside, motor block assessed using modified Bromage scale; 0, no motor block; 1, hip blocked; 2, hip and knee blocked; 3, hip, knee and ankle blocked. If block not adequate anaesthesia is converted to GA.

For GA, induction was with 1mg/kg fentanyl. 2mg/kg propofol, intubation was facilitated with 1-2mg/kg suxamethonium. Maintenance with 60% oxygen at 4l/min and 40% air, for hypnosis 0.8%-3% isoflurane, analgesia 1gr paracetamol, muscle relaxation pancuronium, 0.1mg/kg, reversal was with IV atropine (0.01mg/ kg) and neostigmine (0.02mg/kg), with adequate spontaneous ventilation patient was extubated and transferred to the PACU. Patients with a Modified Aldrete score of 9 were transferred to the in-patient clinic from the PACU. The length of stay in PACU was recorded. The postoperative pain was assessed using VAS. VAS scores were recorded at 1, 3, 6, 12 and 24 hours. After surgery, In the first 24 hours, if the VAS score was more than 6 points, the patient was given suppository diclofenac and 1gr of iv paracetamol. patient satisfaction was scored from 1 to 5 (1-very bad, 2-bad, 3-moderate, 4-good, 5-very good).

3. SURGERY

Patient in lithotomy position, optical visualisation of the ureter was done using a 9.5 French semi rigid URS, an 11/13Fr uretral access was then placed, 5/8.5Fr flexible ureteroscope (Flex X2, Storz, Tuttlinger, Germany), was used to visualise the intrarenal collecting system and holmium laser with a 272µm fibre was used for laser lithotripsy. Fragments were removed from the collecting system using the Nitinol basket. Depending on outcome of surgery a uretral double J stent was inserted and removed after 2 weeks. First day post operation, kidney-ureter-bladder (KUB) radiography was obtained to check the location of the double j stent and residual stones. Re-evaluation with non-contrast computed tomography (NCCT) was done after the first postoperative month. Success was considered as residues of <2mm or absence of any stone fragments. The parameters affecting the comfort of the surgeon such as efficiency, comfort of being sure about the safety of the patient, difficulty of laser focusing during surgery

were assessed by the surgeon, scoring between 1 (very poor) and 10 (very good).

4. STATISTICAL ANALYSIS

All data was collected by the investigator and filled in a pro forma. All data were handled in confidence and analysed with Statistical Package for Social Sciences (SPSS) version 20 for Windows. Tables and figures were used to present the result, and expressed as median (inter-quartile range), proportion (number of patients), and mean \pm standard deviation. Chi square test was used for test of significance between non-parametric variables such as pre-existing pathologies and adverse effect incidences, and student t test for parametric data. When the variables are skewed and/or the number of cases is small the non-parametric Chy-square test was used. A p value < 0.05 was considered significant.

5. RESULTS

A total of 34 patients were included in the study (17 in GA group and 17 RA group), no difference was detected between the two groups. In terms of age, sex, ASA score, stone size, location and operation side as listed in Table 1.

The mean operation time for GA group was longer but was not statistically significant (320.5 ± 65.4 , 302.5 ± 6.72 , $p=0.834$) GA and CSE groups respectively. The fluoroscopy time was 246.3 ± 70.4 (min) in GA group and 254.7 ± 7.8 (min), $p=0.77$, there was no statistical difference. The mean duration of hospital stay was similar between the two groups $p=0.01$. At one-month postoperative visit, stone clearance was noted 15 of 17 in GA group and 13 of 17 in CSE group. Intraoperative monitoring of vital signs revealed 3 patients in CSE group had bradycardia, and this was statistically significant ($p=0.002$), 1 had hypotension also significant ($p=0.001$). Two patients in CSE group had mucosal tear ($p=0.006$), but no complications were observed in the GA group Table 2.

Post operative VAS scores for GA group were in 1hr (2.4 ± 0.294 , 2.1 ± 0.183 , $p=0.475$), 3hr (2.1 ± 0.183 , 2.2 ± 0.223 , $p=0.852$), 6hrs (2.2 ± 0.246 , 2.1 ± 0.215 , $p=0.309$), 12hrs (1.0 ± 0.293 , 1.4 ± 0.283 , $p=0.212$), 24hrs (1.4 ± 0.224 , 1.5 ± 0.211 , $p=0.218$) GA and CSE Respectively.

Three patients in the GA group required postoperative analgesia, 2 was given tramadol

and 1 NSAIDS (diclofenac) this was not significant, tramadol $p=0.059$ and NSAIDS $p=0.012$. No nausea and vomiting observed during the follow-up visit in both groups. No itching or respiratory depression was observed in

any patient. Patient satisfaction assessed 24hrs postoperatively, showed similar results in both groups. Postoperative surgeon comfort assessed was statistically significant favouring the GA group ($p=0.001$).

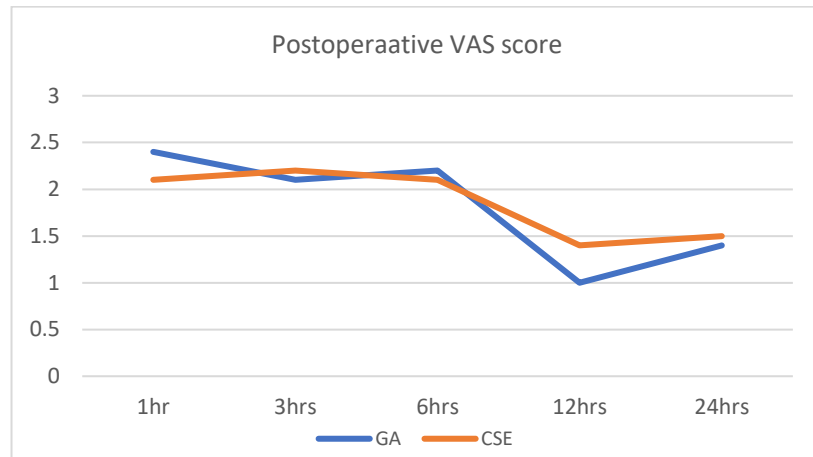


Fig. 1. shows the mean of postoperative visual analogue score

Table 1. Depicts the preoperative patient's demographic data of both groups

Parameter	GA n(17)	CSE n(17)	P-value
Gender (M/F)	15/2	12/5	
Age (years)	42.3±6.7	42.2±6.5	0.998
ASA	1.5±0.5	1.4±0.5	0.789
Stone size (mm)	18.8±5.0	16.7±2.0	0.097
Stone location			
Renal pelvis	12 (63%)	7 (37%)	
Multiple	3 (16%)	5 (26%)	
Lower pole	1 (5%)	5 (26%)	
Middle	1 (5%)		
Operation side (R/L)	9/7	11/6	0.783

Mean, SD-Standard deviation, %-Percentage, Chy-square, ASA-American Society of Anaesthesiology, R/L Right/Left

Table 2. Comparison of perioperative parameters and outcomes

Parameter	Groups		P-Value
	(N)17	N(17)	
Operation Time (min)	320.5±65.4	302.5±6.72	0.834
Fluoroscopy (min)	246.3±70.4	254.7±57.9	0.770
Hospital Stay (hrs)	64.4±10.0	64.2±10.1	0.01
Perioperative Outcomes			
Tachycardia	0	0	
Bradycardia	0	3(15.8%)	0.002*
Hypertension	0	0	
Hypotension	0	1(5.3%)	0.001*
Perioperative Complications			
Haemorrhage	0	0	
Mucosal tear	0	2 (10.5%)	0.006*
Perforation	0	0	
Stone free status	15 (78.9%)	13 (68%)	

Statistically significant<0.05, Median, Standard deviation, %-Percentage

Table 3. Shows the postoperative parameters and outcomes of both groups

	Group		
	GA	CSE	P-VALUE
Tramadol requirement first 24 hours	2 (10.5%)	1 (5.9%)	0.059
NSAID requirement first 24 hours	1(5.9%)	1(5.9%)	0.012
Nausea-vomiting first 24 hours	0	0	
Itching first 24 hours	0	0	
Respiratory depression first 24 hours	0	0	
Patient satisfaction after 24 hours	4.5±0.51	4.4±0.6 2	0.343
Surgeon comfort	7.8±10.5	5.1±0.80	0.001*

*Statistically significant<0.05, Mean, Standard deviation, %-Percentage, VAS –visual analog scale

6. DISCUSSION

General anaesthesia and combined spinal epidural are safe methods of anaesthesia for F-URS but general anaesthesia showed increased significance in surgeon satisfaction. Traditionally F-URS procedures are performed under GA (Resorlu et al., 2012; Kourmpetis et al., 2018) the reason is unclear, but may be due to the fact that patient under CSE is thought to have larger tidal volume resulting in greater diaphragm and renal movement, thus causing inability to reach stones, which is not well tolerated by surgeons during stone fragmentation (Tangpaitoon et al., 2012).

Both GA and CSE have their advantages and disadvantages, in terms of surgeon's comfort, surgery success, patient comfort and complication rates. GA has the advantage of the anaesthetics being in control of the patients breathing and tidal volume, but patients with CSE, have less anaesthesia cost, no airway manipulation and its complications, fewer drugs usage, reduced risk of thromboembolic events, shorter operative time and less post operative pain (Sahan et al., 2020). CSE is also advantageous in patients with high risk of complications using general anaesthesia.

Some studies (Zeng et al., 2015; Kuzgunbay et al., 2009) report lower VAS for post operative pain in percutaneous nephrolithotomy (PCNL) procedures with spinal and epidural anaesthesia compared to GA, but in F-URS, pain assessed at different times post operatively was not significantly different in both groups (Singh et al., 2011). This similar to the results in the study and may be attributed to the minimally invasive nature of the F-URS procedure; which is associated with no post operative pain.

F-URS aims at complete stone clearance, managing nephrolithiasis with lesser morbidity, by using less invasive treatment. In the index

study complete stone clearance was achieved in 78.9% for GA group and 68% in CSE, higher in the GA but not statistically significant (0.342). This similar to Zeng et al., (2015) 65 patients had F-URS under GA (n=34) and RA (n=31). Similar to our results, their stone clearance rates were 70.6% in GA and 67.7% in RA group, not significantly different, also Sahan et al., (2020) with complete stone clearance achieved in 77% of patients in GA group and 86.7% of patients in RA group. No significant difference was detected among groups in terms of stone clearance (P=0.215).

The complications noted in this study was seen more in the CSE group, this may be attributed to the inadequate stabilization of respiratory muscle by CSE and thereby causing increased movement, with difficulty in laser focusing during stone fragmentation. But drug requirement was required in the GA group compared to the CSE group, although not statistically significant.

Mucosal tear was noticed in 2 patients in the CSE group (10.5%, p= 0.006), incidence of bradycardia and hypotension was higher in the CSE group. This is similar to Sahan et al., (2020) but for hypotension which was not noticed. In contrast to Zeng et al., (2015) their was no significance between the two groups, in operative complications, and mucosal injury. They also found bradycardia but was not statistically significant.

Patient satisfaction was similar in both groups which is similar to Sahan et al., (2020) this in contrast to Karacalar et al., (2009), that found an increase in patient satisfaction in the CSE group.

Inasmuch as GA and CSE have their drawbacks, most of the disadvantages of CSE can be eliminated by the use GA for F-URS, which can positively affect parameters such as efficiency

and laser focusing, thus improving the comfort of the surgeon. In the index study it was noticed that the surgeons were more satisfied with the GA compared to CSE ($p=0.001$). This is similar to the study by Sahan et al., (2020) which was the only study assessing surgeon satisfaction in F-URS. Another important point is the fact that the results obtained with CSE were not worse than that for the GA group. The overall success rate of anaesthesia was 100%, with nobody in the CSE needing conversion to GA. Owing to the fact that F-URS procedures are safe with very low morbidity rate, we will advise that under similar clinical and economic conditions F-URS can be performed under CSE in any patient if general health status allows.

The index study was the first to assess, anaesthesia type in f-URS cases in terms of success, complications and surgeon comfort in our environment. However, it has some limitations. Small sample size, most of the included studies were from China therefore limits the generalization of the study. The study would have been better generalised if it was a multicentre study.

7. CONCLUSION

GA and CSE are equally effective and safe Anaesthesia methods for f-URS procedures. Although regional anaesthesia may be preferred by the Anaesthesiologist, to avoid polypharmacy, and airway manipulation, the surgeon's satisfaction is paramount for a favourable outcome, therefore general anaesthesia is preferred with less side effect as the CSE group showed statistical significance in bradycardia and mucosal injury and decreased surgeon comfort during surgery.

ETHICAL APPROVAL

Ethical approval was obtained from the ethical committee of the University of Port Harcourt Teaching Hospital. All patients recruited for this study gave written consent before their data was collected.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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