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THE USE OF SPINAL ANAESTHESIA FOR RETROGRADE URETERO-RENOSCOPY DURING THE COVID-19 PANDEMIC

William J. Gallagher, Anna Longshaw, Andrew Dickinson

University Hospital Plymouth NHS Trust

Correspondence author: williamgallagher@nhs.net

Abstract

Background

The use of spinal anaesthesia (SA) for retrograde uretero-renoscopic surgery is considered to be not as effective as a general anaesthetic (GA) by urologists. However, there were significant concerns associated with GA both for the patient and the anaesthetic team at the height of the COVID-19 pandemic. Our unit was able to successfully transfer surgery to a purpose-built day facility that had extensive experience in delivering SA. This created the opportunity to assess the SA technique in uretero-renoscopy in a cohort of unselected patients.

Objective

To assess the feasibility of SA as a primary form of anaesthetic for retrograde endoluminal renal and ureteric surgery.

Results

Over 4 months, 41 ureteroscopic procedures were performed. The conversion rate to GA (for inadequate analgesia) was 9.8%. Surgical outcome data were compared with an equivalent cohort of patients' who underwent GA before the pandemic. Both groups had similar outcomes: day-case discharge rate (SA 84%, GA 86%) and surgical completion rate (SA 94%, GA 90%). However, there was a difference in post-operative readmission rate (SA 8%, GA 22%) favouring SA.

Conclusions

This observational study demonstrated that SA is a safe and effective form of anaesthesia for uretero-renoscopic surgery, delivering non-inferior outcomes to GA. This has implications for the immediate provision of care as COVID-19 continues and as an alternative anaesthetic option to suit patients post pandemic. A larger prospective observational study would be appropriate to clearly define the benefits of SA for ureteroscopy.

Keywords: *uretero-renoscopy, COVID, Anaesthesia, Spinal anaesthetic, regional anaesthetic, ureteroscopy endourology*

INTRODUCTION

Rigid and flexible ureteroscopy is a crucial part of urological practice, primarily for treating renal and ureteric stones and for the diagnosis of upper tract pathology. The standard anaesthetic approach for this procedure is a general anaesthetic (GA).[1] Spinal anaesthesia (SA) is not widely used as there are concerns about obtaining a sufficiently high analgesic block, and the anaesthetic time is limited. As a result, the surgery can be more challenging due to patient movement and inability to control respiratory rate.[2]

COVID-19 has forced a change in the delivery of surgical practice in the UK. There was a high degree of uncertainty about the risks of surgery and anaesthesia during the first peak of the pandemic.[3] Across most of the UK, all elective surgery was initially cancelled to focus on caring for acutely unwell patients with COVID-19. There was also a nationwide strategy to reduce patient admissions and exposure to COVID-19 in hospitals.

On recognising that cancellations would significantly impact patient prognosis and quality of life, alternative providers and sites were accessed by the NHS. This study outlines the experience from one such site and highlights the use of alternative anaesthetic techniques from the department's standard practice. There was a recognised risk of GA (an aerosol-generating procedure requiring ventilation) during the pandemic, both to the team undertaking the procedure and the patient if they contracted the virus.[4] The alternative provider was highly competent at SA, allowing the study of this alternative anaesthetic method for patients undergoing both ureteroscopy and flexible uretero-renoscopy. The change in practice was instigated by experience and preference of anaesthetic team at the new site rather than as a result of this study.

COVID-19 has caused a dramatic change in clinical practice across the UK. There has been a tragic death toll associated with the disease. The NHS had to rapidly adapt to the changing clinical environment. This has forced and accelerated change that might not usually occur. It is essential to capture these changes, particularly if they have potential benefits for ongoing surgery even after the pandemic has resolved.[5]

OBJECTIVES

The objectives were to assess the safety and effectiveness of SA for retrograde uretero-renoscopic surgery.

The outcome measures were the failure of SA and conversion to GA, the ability to safely complete surgery, 30-day readmission rates, length of time for anaesthesia (SA vs GA), the requirement for post-operative stenting and the surgical day-case rates (Table 1).

METHOD

This was a retrospective observational study of two matched patient cohorts. The SA group compromised patients operated from April to July 2020. The GA cohort consisted of patients operated on prior to the pandemic (January–May 2019). All cases were listed on an elective basis, and so no emergency cases were included in the study. The outcomes were analysed by using the hospital records at each site. Background parameters for the patients (age, sex) and indications for procedure were recorded to demonstrate that the cohorts were similar patient groups.

STATISTICAL ANALYSIS

The overall number of patients in this study was 77 (Primary SA 41, Primary GA 36). The necessary sample size was calculated to be 76 pts, the power of the study was 80 and the alpha value was 0.05. Anaesthetic conversion rate, patient demographics, indications for surgery, stone completion rate, anaesthetic time and surgical outcomes were analysed separately for each group. Normally distributed data was analysed with an independent T-test. Fisher exact test and Pearson chi-squared test were used to compare categorical data. Results were considered significant when P value was less than 0.05.

Description of spinal anaesthetic

Patients were taken to the anaesthetic room, and initial blood pressure and heart rate measurements were recorded at baseline. The patients were seated at the operation table, and the skin surface of the back was cleaned and sterilised with 10% povidone iodine. A midline or paramedian approach for SA was utilised. Local anaesthetic was delivered to the skin. A 25-gauge spinal needle was used to find the intrathecal space via the

TABLE 1 Table comparing parameters and outcomes for ureteroc-renoscopy patients listed for either primary spinal anaesthetic or primary general anaesthetic

	Primary SA	Primary GA	*P*
Patients Listed for Surgery	41		
Conversion to GA	9.8% (n = 4)		
Total patients	**37**	**36**	0.118
Demographics			
Age (years)	55.9	57.5	0.925
Male	57% (n = 21)	53% (n = 19)	0.816
Female	43% (n = 16)	47% (n = 17)	
Indications for procedures			
Diagnostic	8% (n = 3)	17% (n = 6)	0.308
Stone treatment	92% (n = 34)	83% (n = 30)	
Position of stone			
Renal	34% (n = 9)	47% (n = 14)	0.327
Upper	20% (n = 7)	10% (n = 3)	
Distal	44% (n = 15)	33% (n = 10)	
Multiple	9% (n = 3)	10% (n = 3)	
Completed procedure	94% (n = 32)	90% (n = 27)	0.659
Anaesthetic			
Time (mean)	26 mins	17 mins	<0.001
Surgical outcome			
Day-case	84% (n = 31)	86% (n = 31)	0.781
Post-operative stent	38% (n = 14)	28% (n = 10)	0.457
Readmissions <30 days	8% (n = 3)	22% (n = 8)	0.112
Infection	5% (n = 2)	13% (n = 5)	—
Pain	3% (n = 1)	3% (n = 1)	—
Other	0% (n = 0)	6% (n = 2)	—

loss of resistance method. The preferential level of anaesthetic was at L2–L3 with L3–L4 being the alternative option. Chloroprocaine hydrochloride was the local anaesthetic with a dose of 45–60 mg. Chloroprocaine is hyperbaric, so its volume, timing and positioning will reach satisfactory levels with less spinal anaesthesia–induced hypotension compared to other local anaesthetics. Sensory and motor blocks were assessed. Temperature-sensation testing using a freezing spray was used to evaluate the level of anaesthesia. If adequate level of sensation was achieved, the operation was begun; if not, conversion to GA was applied. The anaesthetic effect lasts from 45 min to 90 min based on volume used and positioning. Supplementary anaesthesia was supplied via low dose IV propofol. If required, paracetamol +/− Ketorolac was used to provide intraoperative pain relief. After the operation, patients were transferred to the post-operative unit. The aim was to discharge them home the same day with the patient being able to walk 2–4 h post anaesthesia.

Description of general anaesthetic

The following standard technique was used for GA. Intravenous induction was performed using 2 mg/kg propofol and 1–1.5 mcg/kg fentanyl. A supraglottic airway device was used for airway management. An I-gel of 4–5 size was introduced using a standard technique. The minimum alveolar concentration of 1.0 sevoflurane with 40% oxygen air mixture was used for maintenance of anaesthesia. Patients who were unwilling or unsuitable to have SA also had a primary GA. If the SA was deemed to be ineffective, the patient was converted to GA.

RESULTS

The patient demographics were similar, which were as follows: average age (SA 55.9 years; GA 57.5 years, P = 0.925) and sex distribution (SA male 57%, female 43%; GA male 53%, female 47%, P = 0.816). (Table 1).

There were 41 cases in the SA group. There were four conversions to GA, yielding a 90% success rate of SA. There were 36 cases in the GA group (see Figure 1). Statistical significance was not established between these two groups (P = 0.118).

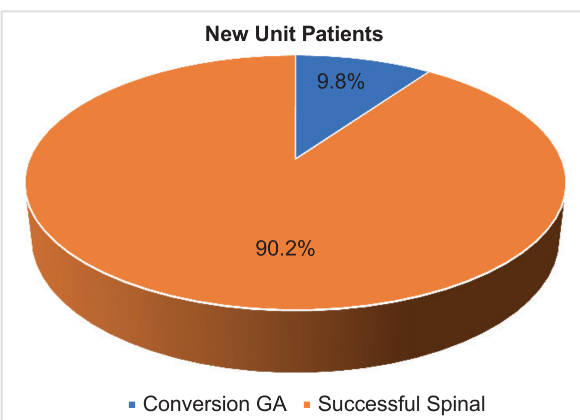

FIGURE 1 Chart showing conversion rate to GA in patients listed for primary SA.

There was a 9-min difference in anaesthetic time between the two groups (SA 26 mins, GA 17 mins). This was deemed statistically significant with P < 0.001 (Table 1 and Figure 2).

Ureteroscopy was the only option analysed for treatment of kidney or ureteric stones. The predominant indication for surgery was urinary tract stone treatment (SA 92%, GA 83%). The other indication was diagnostic ureteroscopy (SA 17%, GA 8%). See Table 1 and Figure 3 (P = 0.308).

All stones were deemed suitable for day-case procedures and were less than 1 cm (range 3–10 mm). There was a lower proportion of renal stones (Renal SA 34%, GA 47%) and a higher volume of upper or mid-ureteric stones in the SA Group (Upper or Mid-ureter: SA 20%, GA 10%; Distal Ureter: SA 44%, GA 33%). Both groups had a similar number of more challenging cases which required treatment of multiple stones (SA 9%, GA 10%). See Table 1 and Figure 4 (P = 0.327).

There were similar stone surgery completion rates (SA 94%, GA 90%), with <10% requiring further surgery to remove residual fragments (P = 0.659). See Table 1 and Figure 5.

All surgeries were performed by urology consultants with specialisation in ureteroscopy or registrars with consultant's supervision. The following surgical outcomes were measured. The successful day-case discharge rate between both groups were roughly equivalent (SA 84%, GA 86%; P = 0781). Rates of stent insertion post procedure were higher in the SA group (SA 38%, GA 28%; P = 0.457). There was a difference in post-operative complications requiring readmission within 30 days favouring SA (SA 8%, GA 22%; P = 0.112). The reasons for readmission were usually related to infection (SA 5%, GA 13%), pain (SA 3%, GA 3%) and other factors (SA 0%, GA 6%). The other factors were side effects from take-home analgesia and co-incidental chronic infection that was not related to the surgery (Table 1 and Figure 5).

DISCUSSION

The natural history of COVID-19 has still not been properly established, and it looks like the disease will be with us at least for the foreseeable future.[5] The risks of GA during the pandemic both for the patient and the team undertaking the procedure are well recognised. While there will always remain a proportion of the population who are unvaccinated, SA provides a safer alternative to GA in this environment.[6]

There have previously been concerns regarding SA and uretero-renoscopy. These relate to the anaesthetic failing to achieve a sufficiently high spinal block and the practical challenges during surgery of controlling respiratory movement and cough reflex. Nevertheless, SA has been widely adopted for percutaneous nephrolithotomy, and there are several international papers showing the advantages for uretero-renoscopy.[8–10] There are notable benefits to SA with lower risk of aspiration pneumonia, deep vein thrombosis and cardiopulmonary complications.[11] These are particularly relevant for urology patients who often have significant co-morbidities.

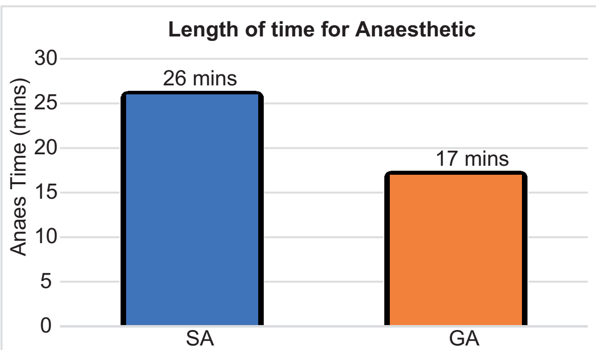

FIGURE 2 Graph comparing length of time for anaesthesia in SA and GA patients.

The primary outcome was to establish the safety and effectiveness of SA in uretero-renoscopy. There was a risk that the trial of SA would be a failure and that patients would not tolerate it. However, the conversion rate to GA was relatively modest at 9% (n = 4) (see Figure 1). There were two conversions due to technical or anatomical reasons and two for inadequate analgesia. The rates of conversion are similar to the figures published in the literature.[8–10]

There is a practical concern that SA takes longer than GA, which was reflected in our study with SA taking on average 9 mins longer to administer than GA (SA 26 mins, GA 17 mins) (see Figure 2). This did not impact on the number of achievable cases in a session (6–8/day). This was due to the time limit for SA (45–90 mins), ensuring that surgery does not stretch beyond this window. Furthermore, the

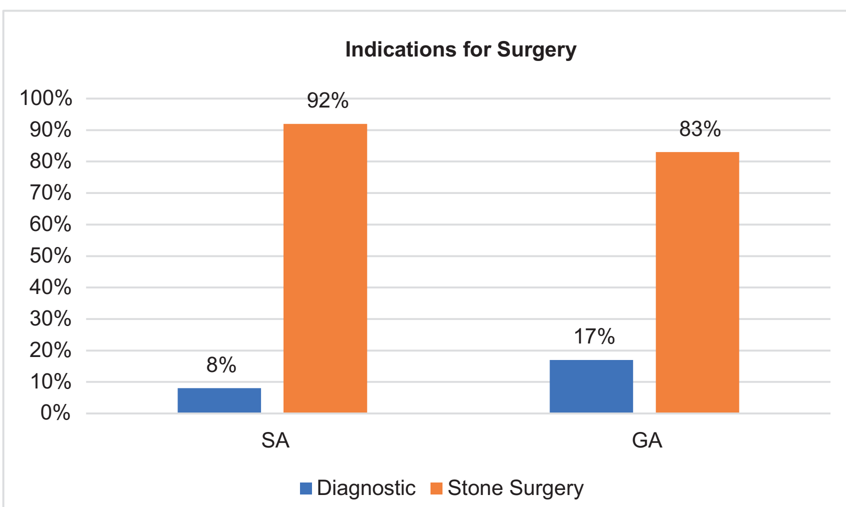

FIGURE 3 Graph comparing indications for uretero-renoscopy in SA and GA patients.

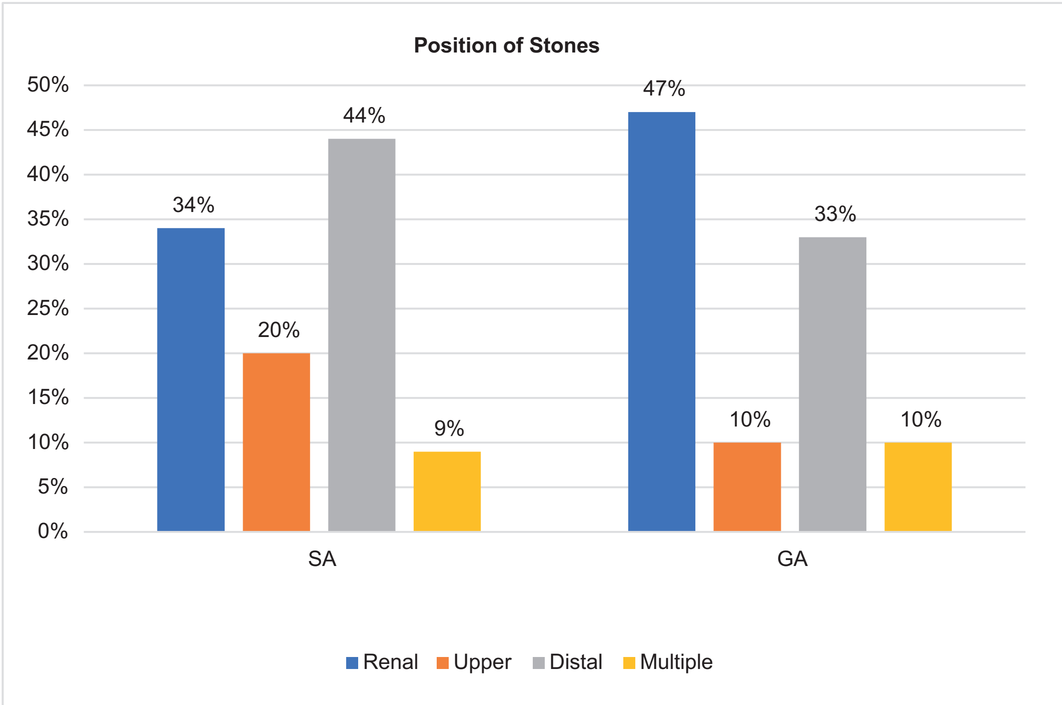

FIGURE 4 Graph comparing positions of stones in SA and GA patients.

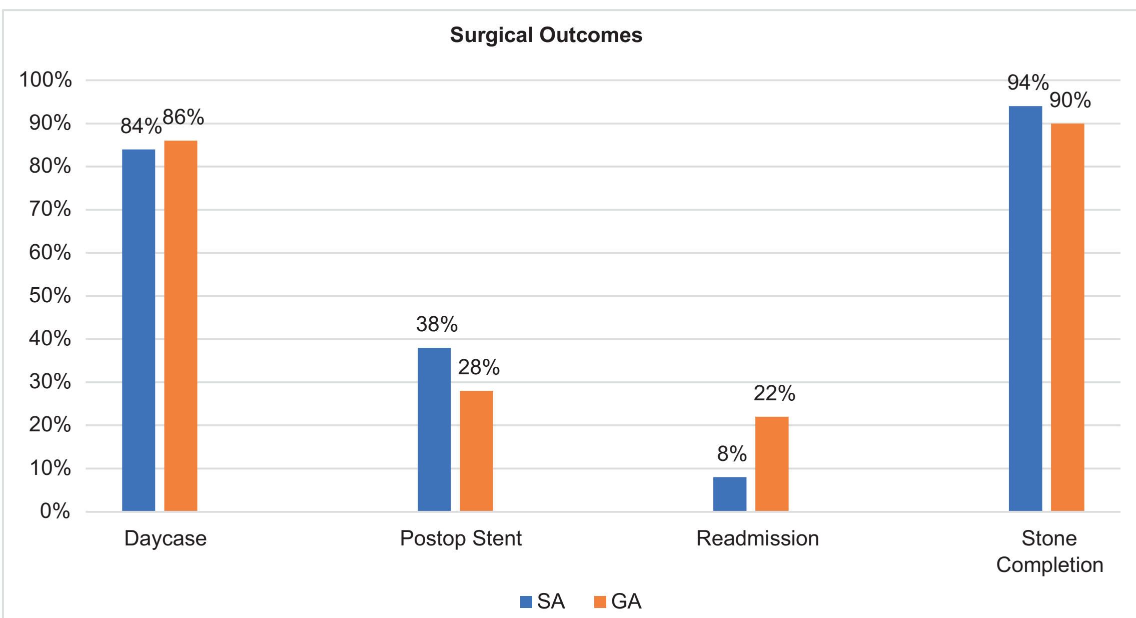

FIGURE 5 Graph comparing surgical outcomes in SA and GA patients.

service was delivered in a dedicated day-case unit that had removed many of the inefficiencies between cases that are prevalent within large hospitals.

In relation to surgical outcomes, SA did not appear inferior. We did not record the operative comfort of surgery, though this has been assessed in other studies.[8] Stone completion rate was determined by the surgeon at the time of surgery. If the surgeon felt there were significant residual fragments, the patient was re-listed for further procedure. Though this is a notoriously subjective assessment for stone completion rate, the figures were similar between the two groups (SA 94%, GA 90%) (see Figure 5). There was little difference in day-case discharge rate (SA 84%, GA 86%). There was an increased rate of post-operative stenting in the SA group (SA 38%, GA 28%). This is likely related to the more cautious surgical practice adopted during the pandemic with stents being deployed (usually on string) to reduce the risk of readmission due to infection. This appears to have yielded a significant benefit with >50% fewer readmissions in the SA group (SA 8%, GA 22%). The reasons for readmission were predominantly related to the risk of infection (SA 5%, GA 13%) and pain (SA 3%, GA 3%). This might also be due to a reluctance of patients to attend hospital unless strictly necessary during the pandemic (Table 1).

Extra corporal shockwave lithotripsy was not offered at the Trust as there was no fixed site lithotripter, and the travelling lithotripsy service was suspended during the pandemic. This obviously does not involve any type of anaesthetic and therefore would be the safest treatment modality in appropriate patients. This has been recognised by the National Institute for Clinical Excellence who now recommend extracorporeal shock wave lithotripsy as first-line treatment for the majority of renal or ureteric stones that are suitable for intervention.[12]

This was an opportune study brought about by a forced change in practise due to COVID-19. There are numerous flaws that we have not tried to disguise and are probably self-evident to the educated reader. This was not a controlled randomised trial of two different anaesthetic modalities. If this was a prospective paper, the study would be designed more elegantly with the opportunity to gather detailed information about the patients, their urological pathology, the intraoperative anaesthetic risks and the surgical challenges.

There are numerous confounding factors that could influence the data. The operations were conducted under very different clinical circumstances, in different hospitals and with different surgical teams. The types of cases that were prioritised during the pandemic were not the same; for example, fewer patients were listed with renal stones. The surgical practise was changed; for example, post-operative stents were deployed more commonly. Patient behaviour would have been influenced by the pandemic, with patients less likely to return to hospital. It is therefore difficult to make robust conclusions about the data.

CONCLUSION

This is the first study of its type in the UK. We are not claiming that it definitively demonstrates the superiority of SA against GA. It is a fortuitous development in practise that was forced upon us by COVID-19 which allowed our unit to continue treating our patients.[13]

The data shows that patients did not come to harm from this change of practise. It provides a practical template of how SA can be integrated into practice for uretero-renoscopy in most healthcare units. We hope that it will stimulate further research in this area as it offers the possibility of offering SA as a routine form of anaesthetic for uretero-renoscopy in the future.

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