

Research Article

Percutaneous nephrolithotomy under spinal anaesthesia: a series of 100 cases

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ABSTRACT

Background: PCNL was introduced by Fern Storm and Johansson in 1976 and further developed in the following years. Till 1988 all the procedures were done under general anaesthesia (GA). This study is to determine if PCNL can be done under spinal anaesthesia with satisfaction to the patient, surgeon and anaesthesiologist and to find out if there are any complications.

Methods: PCNL was introduced by Fern Storm and Johansson in 1976 and further developed in the following years. Till 1988 all the procedures were done under general anaesthesia (GA). This study is to determine if PCNL can be done under spinal anaesthesia with satisfaction to the patient, surgeon and anaesthesiologist and to find out if there are any complications.

Results: In two patients, spinal anaesthesia failed to act. They were converted to general anaesthesia. Two patients who complained of discomfort in the prone position were reassured and given increments of Midazolam 0.5 mg. Three patients had developed bleeding. 98 patients underwent surgery under spinal anaesthesia with good patient satisfaction. There were no major complications.

Conclusions: PCNL can be done under spinal anaesthesia to the satisfaction of the patient, surgeon and anaesthesiologist.

Keywords: Percutaneous nephrolithotomy, General anesthesia, Spinal anesthesia, Complications, Patient satisfaction

INTRODUCTION

Percutaneous nephrolithotomy (PCNL) is the treatment of choice for large kidney and pelvic stones, staghorn calculus, multiple stones and those resistant to extracorporeal shockwave lithotripsy. PCNL has become a common procedure in endourology.

PCNL was introduced by Fern Storm and Johansson¹ in 1976 and further developed in the following years. Till 1988 all the procedures were done under general anaesthesia (GA) because of patient comfort and the controlled ventilation offered by GA. From 1988 various regional techniques adopted were spinal anaesthesia, epidural anaesthesia, combined spinal epidural, skin

infiltration with renal capsule block, and inter pleural block.

These techniques were tried to reduce morbidity, blood loss, post operative pain, hospital stay and cost. We chose spinal anaesthesia for the study because of its maximum predictability and success rate among the regional techniques.

This study is to determine if PCNL can be done under spinal anaesthesia with satisfaction to the patient, surgeon and anaesthesiologist and to find out if there are any complications.

METHODS

This randomized prospective descriptive study was done in our institution from February 2014 onwards in 100 patients of either sex, belonging to ASA status I and II, aged between 18 and 60 years in whom spinal anaesthesia was not contraindicated, after ethical committee approval and informed patient consent.

Patients with horseshoe kidney, single kidney, malpositioned kidney and those with body mass index greater than 35 were excluded. In the preoperative visit, the procedure was explained in detail, stressing the process of turning them prone in awake condition with their lower half of body paralysed due to spinal anaesthesia and the need for their cooperation. Also instructed on the proper use of visual analogue scale (VAS) in the post operative ward.

Routine investigations, blood grouping, cross matching and urologic workup namely BUN, creatinine, serum electrolytes, X-ray KUB, ultrasonography, non contrast or contrast CT scan were done.

All patients were premedicated with tab Ranitidine 150 mg and tab Lorazepam 1 mg the night before and in the morning, one hour before the procedure. Inj. Glycopyrrolate 0.2mg IM was given 45 minutes before the procedure. Every patient was under prophylactic antibiotic cover of Cefotaxime.

Standard intraoperative monitoring included pulse oximetry, electrocardiography, noninvasive blood pressure. After preloading with crystalloids 20 ml per kg, spinal anaesthesia was performed under aseptic conditions in lateral position at L2-L3 interspace with 25 Gauge Quincke needle with hyperbaric Bupivacaine 0.5% 4ml. Patients were placed in supine position for ten minutes and checked for sensory level of T6 dermatome with pin prick.

After stabilization of anesthesia, cystoscopy and ureteral catheter placement were done in lithotomy position. Then the patients were turned prone carefully. Since the patients were conscious and breathing spontaneously, we had placed thick pillows under pelvis and chest instead of bolsters. The knees were flexed by keeping a bolster under the ankle to encourage venous return. Both hands were placed forward with flexion at shoulder and elbow. A soft jelly pad was placed under the chin and the patients were allowed to keep their heads in neutral, left or right positions according to their choice. All patients received oxygen by bi- nasal prongs and verbal contact maintained with them through the procedure.

Renal puncture was done under fluoroscopic control, track dilatation done to accept 30F Amplatz sheath. Lithotripsy was done by air lithotripter and or 100 W Holmium laser. Stones were removed by forceps under 24 F nephroscope, which was connected by the camera to

TV monitor. In all cases double J stents and 20F nephrostomy tubes were placed. Duration of the procedure, volume of irrigation fluid used were noted. It was very difficult to measure the blood loss, as the effluent fluid goes a bucket kept under the table. In bleeding patients haemoglobin level was checked in the post operative ward to determine the need for blood transfusion.

After surgery, they were shifted to step I postoperative unit till the spinal effect had worn off and then to step II, where they were kept for the day and observed for pain, nausea, vomiting, bleeding, bradycardia, hypotension, headache, shivering, backpain and temperature. In the step I, routine analgesia in the form of Inj Tramadol 50 mg im was given. Inj Butorphanol 1 mg IV was given as rescue analgesia. Pain assessment was done using VAS asking the patients to rate pain on a 11 point scale which has 0 for no pain and 10 for worst pain possible at hourly interval. Rescue analgesia was given to patients of score more than four. An ultrasound or Xray KUB was done next day for residual stones. A stone larger than four mms is considered as a residual stone. If there were no stones or stones less than four mms were found, it was taken as a successful PCNL. Residual stones were managed after 6 weeks when patients came for double J stent removal.

Surgeon's satisfaction score was recorded on a four point scale. 0= poor 1=satisfactory 2=good 3= excellent. The patients were followed up for any other complications till discharge.

Statistical analysis was done by Students t-test. Values were represented as mean standard deviation.

RESULTS

In two patients, spinal anaesthesia failed to act. They were converted to general anaesthesia. Demographic characteristics are shown in Table 1.

Table 1: Demographic data.

Gender	Gender	Male 76% Female 24%
Mean age	Mean age	36.7 ± 5.2
Mean body mass index	Mean body mass index	25.2 ± 3.4
Stone size	Stone size	32.3 ± 8.6

In 91 patients renal system was accessed through a sub costal approach. The sites of stones are shown in Table 2. The intraoperative complications are shown in Table 4. Bradycardia defined as value lower than 20% of the preoperative value or below 60 per minute, was treated with Inj Atropine 0.6 mg and hypotension defined as value lower than 20% of the pre operative value with increments of Mephenteramine 6 mg. Four patients who developed severe hypotension. (Systolic blood pressure

below 80 mm Hg) Were given 500ml of Hydroxy ethyl starch, increments of Mephenteramine and surgery allowed to continue. The patients who developed shivering were given a dose of Piperacillin 4.5 gms iv diluted in 100 ml of normal saline. Air conditioner was switched off and one more layer of clothing put on the hands.

Table 2: Location of the stone.

Upper calyx	9
Middle calyx	32
Lower calyx	15
Pelvis	11
Staghorn	15
More than one location	8

Table 3: Puncture site.

Subcostal	91
Intercostal	7

Table 4: Intraoperative complications.

Failed spinal	2
Nausea and vomiting	3
Bradycardia	5
Hypotension	8
Severe hypotension on prone position pain during procedure	4
Shivering during procedure	4
Discomfort in lying prone	2
Bleeding	4

Two patients who complained of discomfort in the prone position were reassured and given increments of Midazolam 0.5 mg. Three patients had developed bleeding. But none were given blood transfusion in the theatre.

One patient who had intercostal approach on the left, developed chest pain in the post operative ward was diagnosed as pneumothorax, and treated by putting a chest drain.

We had five patients who developed bleeding intraoperatively. They were given Tranexamic acid 500 mg iv, crystalloids and plasma expanders. Two of them responded and bleeding stopped. Three of them needed blood transfusion in the post op ward.

The mean operating time was 85+6 minutes. 82 patients were completely stone free. Eight were found to have stones less than four mms. So a total of 90 patients were stone free. In eight patients residual stones found and were managed by flexiureterscope when they came for stent removal six weeks later.

DISCUSSION

First report of PCNL under regional anaesthesia was reported in 1988, where 112 patients were operated². They were given epidural anaesthesia with 88% haemodynamic and respiratory parameter satisfaction. The largest prospective study under spinal anaesthesia was a series of 387 patients spread over 9 years by Babak Borzouei³ et al and concluded that spinal anaesthesia is a feasible, safe and well tolerated method particularly for elderly patients with cardiac and pulmonary comorbidities.

Upper calyceal stones are associated with pleural puncture, haemothorax, pneumothorax especially on the left side, which is at a higher level than right side. Our series had nine patients in which one patient had pneumothorax which was diagnosed in the post operative ward. Babak Borzouei's series had 16 (4.1%) patients who had upper calyceal stones which were uneventful.

The purpose of doing PCNL under spinal anaesthesia is to reduce the complications of general anaesthesia. This becomes more significant in elderly patients and in those with significant comorbidities. But the problem with spinal anaesthesia is that if a suitable level cannot be achieved, then the procedures have to be abandoned or converted to GA with possible complications. If the anaesthesia wears off intraoperatively or the surgery gets prolonged, maintaining the patient becomes a problem because of the prone position.

Sadrolla Mehrabi et al in a study mention giving hypnotic and narcotic drugs like Ketamine for the patients who complained of pain intra operatively. We do not consider it a safe practice, because of the prone position. These are reports of inducing general anaesthesia in prone position and using LMA for airway control. But that needs experience and expertise.

Many studies had reported frequency of blood transfusion in the post op ward as 6.3% - 15.5% under regional anaesthesia. Since sympathetic tone is reduced in spinal, blood pools in the large vein, and hence the bleeding is less. We had five patients developing bleeding and three of them needed transfusion in the post op ward.

Table 5: Post operative complications.

Bradycardia & Hypotension	4
Pain	5
Headache	0
Fever	1
Nausea	2
Vomiting	2
Shivering	2

The study by Akash Gupta et al shows a postoperative complications like nausea 43%, vomiting 23%, shivering

26%.⁴ But our study shows these complication very less which are described in Table 5.

Watanabe N et al had reported a catastrophic event of sudden cardiac arrest in patient who was undergoing the procedure under epidural anaesthesia.⁵ We never had such problems.

Farhad Mehrabi et al had reported headache in the postoperative ward at 3.8% in a study of 160 patients. But we had no patients with headache in our study.⁶

Our intraoperative complication rate is about 15% which slightly higher than the study of Babak Borzouei⁷. But except for bleeding and sudden drop of blood pressure on positioning in prone, all were minor without clinical significance. Four patients who developed hypotension were treated promptly with plasma expanders, atropine and mepheteramine. G. Moraseghi et al also reports six patients who underwent PCNL under spinal, had severe hypotension while turning them prone.⁸

The number of patients who had complained of pain and assessed by VAS score was eight. Their VAS score was more than four and had received rescue analgesic. This correlates well with the studies which were done under regional techniques by other workers.⁹⁻¹⁰ The spinal anaesthesia lasts for about three to four hours. Since injection Tramadol was given in the step I, there is a smooth transition from analgesia of spinal anaesthesia to that of the injected Tramadol. Because of less pain, early ambulation is possible and this, together with early oral hydration helps in cutting down hospital stay which was proved by many studies.

Under regional anaesthesia, bleeding during surgery which needed blood transfusions varied from 6.3-15.5% in different studies.^{11,12} Our study had five patients who developed bleeding in the operation theatre or step I post op. bleeding under regional techniques are less than that of general anaesthesia, because of reduced sympathetic tone.

Pulmonary complications in different reports vary between 4.13-9.4%. There is no difference between the type of anaesthesia on the development of atelectasis. We had two patients who developed atelectasis and become better with antibiotics, chest physiotherapy and breathing exercises.

Stone free patients varies greatly between 53-97% in different studies. The type of anaesthesia has no bearing on complete removal of the stones. We had a success rate of 89%. Success depends on many variable factors like experience and skill of the surgeons, hardness, position, number, size of the stones, bleeding reducing visibility, dialation of renal system, availability of laser etc.

The intra operative shivering can be multifactorial. We had five patients in our study. Large amounts of irrigation

fluids can induce hypothermia and hence shivering. Another factor is the bacteraemia produced by the manipulation of stones and the urinary system.

Surgeons had rated the satisfaction level as two and three meaning good to excellent, based on reduced complications, reduced bleeding, and early recovery. All patients expressed satisfaction. Two patients, who complained of discomfort in the prone position, later relegated it to be a minor complication, as they were happy with the overall experience. We anaesthesiologists were satisfied because we had avoided complications of general anaesthesia and provided a smooth post operative period. There is considerable saving of time in the theatre also. The time from the completion of surgery to the recovery of anaesthesia is the time saved.

Limitations to our study are many. We had only one hundred patients in the study which is less. All the patients were of ASA I and II, and hence less chance of developing complications than ASA III, IV group. The study was limited to a single centre. No control group was used. Our surgical team had three experienced surgeons. So time taken for surgery was relatively less and hence less chance of complications due to the procedure and patients prone position. We had 100 W Holmium laser and it was very easy to powder the stone fragments, which were not accessible to the forceps. That is one of the reasons for our high success rate.

CONCLUSIONS

PCNL can be done under spinal anesthesia to the satisfaction of the patient, surgeon and anesthesiologist.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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