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Original Article

Comparison of General versus Spinal Anesthesia in Patients undergoing Percutaneous Nephrolithotomy: A Prospective Randomized Study

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Abstract

Background

Percutaneous Nephrolithotomy, widely used procedure by urologists for removing renal stones nowadays. Generally, it is preferred in general anesthesia but here in our study we have compared it with spinal anesthesia to know its safety and efficacy.

Material and Methods

Sixty patients of either sex, aged between 20-60 years, ASA – Grade I and II, with stones size larger than 15 mm posted for Percutaneous Nephrolithotomy were randomly selected. Patient was divided in two groups 30 each, Spinal Anesthesia (S) and General Anesthesia (G). Patient's stones sizes, numbers & location, Anesthesia duration, Surgical duration, Recovery duration, Blood loss and Blood transfusion, Analgesic demand, post-operative Nausea & Vomiting, Patient satisfaction, Hospital stays and Heart Rate and Mean arterial pressure between two groups were compared.

Results

There was no significant difference in terms of mean age, weight, stones sizes, numbers and its location. The p value for Anesthesia duration and surgical duration were 0.144 and 0.22 which was insignificant. Recovery duration (p-value 0.007), Blood loss (p-value 0.004) were significantly lesser in spinal anesthesia group. There was no significant difference in nausea and vomiting, patient satisfaction when compared between two groups. But Analgesic demand, Blood Transfusion and Hospital stays significantly found to be decreased in spinal anesthesia groups ($p < 0.05$). The mean of MAP showed no significant difference except in 10 and 20 minutes.

Conclusion

Spinal anesthesia tends to be as effective as general anesthesia for PCNL and beneficial in terms of recovery duration, blood loss, analgesic demands, hospital stays, hence decrease the cost of patient.

Key Words: *General anesthesia, Percutaneous Nephrolithotomy, Renal stones, Spinal anesthesia*

Introduction

Percutaneous nephrolithomy (PCNL) is one of the most popular techniques to remove the renal stones in today's world. Its

popularity is increasing day by day due to its less hospital stay, less scar marks, less post operative pain, fast ambulatory. Surgical Stages for PCNL are classified as

Renal access, Tract dilatation, Nephroscopy & Stone disintegration and Nephrostomy tube insertion [1]. General anesthesia during PCNL enables control of ventilation and also subjected to comfort of patients [2]. Therefore, choice of anesthesia mostly chosen by anesthesiologists is general anesthesia [3]. But, Anesthetics complications and patient's costs seems to be higher with general anesthesia when compared with spinal anesthesia [4].

Hence, some of the previous studies shown that PCNL with spinal anesthesia have better outcomes in comparison with general anesthesia [5]. Neuraxial block like spinal, epidural has advantage over general anesthesia in many urogenital surgeries including PCNL and is a choice of anesthesia in patients who are at high risk for surgery under general anesthesia [6]. In this study, comparison between spinal & general anesthesia has been done in PCNL, its surgical outcomes and complications to know which one has better outcome.

Material and Methods

The study was conducted at Nobel Medical College Teaching Hospital Pvt. Ltd, Biratnagar, Nepal, during the period of 15th April 2015- 15th April 2016.

This Randomized, prospective clinical study was conducted on 60 adults, ASA- Grade I & II patients, aged between 20 to 60 years of either sex, stones larger than 15 mm posted for PCNL in Urology Operation Theatre. After approval, informed consent taken, patients were randomly divided into two groups of 30 each.

Group G- General Anesthesia group

Group S- Spinal Anesthesia group

Exclusion criteria for this study were any contraindication for spinal anesthesia, ASA – Grade III or above, any congenital anomalies of kidneys like Ectopic or horse shoe kidneys, coagulation disorders.

Pre-Anesthetic evaluation was done after taking proper history with systemic

examination and relevant investigations were advised. Beside Routine preoperative investigation complete blood count (CBC), Renal function test, Coagulations profiles and routine urine examination was done in all patients. X-ray KUB and Intravenous pyelography was done to locate the position of stone and its size.

Anesthetic Management

On arrival in the operation theatre IV line was secured and all the baseline monitors like NIBP, ECG & SPO2 were attached and recorded. In Group G patient's premedication were done with glycopyrolate 0.1 mg & midazolam 0.04mg/kg. After premedication Inj fentanyl 1mcg/kg was given in this group patient. Pre-oxygenation was done for 3 minutes and induction was done with Inj propofol 2.5mg/kg & Inj. Atracurium 0.5mg/kg. Then the patient was intubated with appropriate endotracheal tube and fixed the tube. Maintenance was done with Isoflurane & Atracurium with oxygen. Patient was made prone after stabilization of anesthesia and cystoscopy and urethral catheterization was done on lithotomy position. HR, SPO2, SBP, DBP, MAP were recorded through-out the surgery and noted in every 10 minutes. Patient was reversed with Neostigmine & Glycopyrolate and transferred to PACU for monitoring.

In Group S, Patients were placed in sitting position and under aseptic technique Inj. 0.5% Bupivacaine (hyperbaric) was given in L3-L4 intervertebral space using 25 G quincke spinal needle. After placing the patient on supine position, the head end of table in tilted down for few minutes until the desired level being obtained. Then cystoscopy and urethral catheterization was done by urologist in lithotomy position and patient made prone. HR, SPO2, SBP, DBP, MAP were monitored through-out the surgery, every two minutes for the first 10 minutes and then every 5 minutes for another 20 minutes and noted in every 10

minutes intervals. Patient was shifted to PACU after the procedure for monitoring. PCNL was done in both groups with fluoroscopy control to locate the stone and nephrostomy tube was placed in case of residual stones.

Besides this, in both groups, Anesthesia duration, Surgery duration, Recovery duration, Blood Loss, Analgesic demand & Blood transfusion if needed was recorded. Visual Analogue Scale was used for Pain severity and analgesic demand fulfilled accordingly.

Analgesic demand was fulfilled by Inj. Paracetamol 1gm & Inj. Morphine.

In postoperative period the following parameters was assessed viz. Nausea & Vomiting, Analgesic requirement, blood transfusion if required and later at the time of discharge from hospital patient's satisfaction & hospital stays noted.

Patient was shifted to ward in 2nd postoperative day and discharged after removal of nephrostomy tube.

Data analysis in this study was done with SPSS with data analyzed by chi-square test and student's t test and data taken as mean ± SD. p-value < 0.05 was considered significant.

Results

Out of 60 patients of ASA grade I between 20-60 years of age, of either sex posted for PCNL, randomly divided into two groups – Group G and Group S.

Table 1: Comparison of Patient's Characteristics:
We noted that there were no significant differences between two groups in terms of age, sex and weight. The demographic data are shown in Table 1.

PARAMETERS	Group G	Group S	P-value
Mean Age (years)	34.87 ± 9.95	38.03 ± 12.11	0.27
Male	16 (53.3%)	12(40%)	0.3
Female	14 (46.7%)	18(60%)	-

Weight (kg)		55.90 ± 7.12	52.20 ± 7.12	0.07
ASA	I	30	30	-
	II	0	0	-

Table 2: Comparison of stone sizes & Locations:
On comparing the Stone & its location as shown in the Table 2 regarding the numbers of stones and stones location, there was no significant when comparing between the two groups.

	Variables				
	Mean Stone size (mm)	Numbers of stones	Location of Stones		
			Pelvic stone	Calyceal stone	Staghorn stones
Group G	26.3 ± 6.6	3.4 ± 3.6	21	6	3
Group S	27.6 ± 5.8	3.8 ± 3.1	23	5	2
P-value	0.243	0.302	0.74	0.422	0.233

Table 3: Comparison of Anesthesia & Surgery duration, Recovery duration, Blood loss
In Table 3: Comparing the Anesthesia & Surgery duration & Recovery duration between two groups, general anesthesia groups had a more time required in terms of recovery of patients when compared with the spinal anesthesia groups and was statistically significant. Blood loss in case of general anesthesia groups was more than in spinal anesthesia groups and thus statistically significant. There were no significant differences in between the group for Anesthesia and Surgery duration.

Variables	Group G	Group S	P-value
Anesthesia Duration	78 ± 10	72 ± 8	0.144
Surgery Duration	70 ± 12	62 ± 14	0.122
Recovery Duration	85 ± 10	74 ± 10	0.007
Blood Loss	13	3	0.004

Table 4: Comparison of Post-Operative Outcomes
Table 4: In terms of Post operative outcomes, Analgesia demand was seen more in general

anesthesia group when compared with the spinal anesthesia group and statistically significant. Analgesic demand was fulfilled by Injection Paracetamol 1 gm & Injection Morphine.

Nausea & vomiting was seen in 2 patients among general anesthesia groups where as 1 patients had Nausea & Vomiting in spinal anesthesia groups. There was no significant difference in terms of Patient's satisfaction where compared in both groups.

Blood transfusion was done in 13 patients from general anesthesia groups and 3 patients in spinal anesthesia groups and was statistically significant.

Hospital stays was more in case of general anesthesia groups when compared with the spinal anesthesia groups and thus significant.

Variables	Group G	Group S	P- value
Analgesic demand (Post operative)	14.6 ± 2.4	8.2 ± 1.2	0.0001
Nausea & Vomiting	2	1	0.55
Patient Satisfaction	24	26	0.615
Blood Transfusion	13	3	0.004

Table 5: Intraoperative Mean Heart Rate compared between two groups

The Mean Heart rate comparison is shown in Table 5. When compared with the baseline, in both the groups there were significant difference in mean heart rate in 10 min, 20 min, 30 min, 40 min while there after were no significant difference between two groups.

Mean Heart rate	Group S	Group G	P value
Baseline	76.73 ± 15.74	79.80 ± 10.67	0.3
10 min	85.20 ± 15.24	95.23 ± 11.44	0.006
20 min	82.30 ± 13.92	90.83 ± 11.76	0.01
30 min	78.23 ± 12.17	85.20 ± 9.97	0.01
40 min	74.87 ± 13.45	83.87 ± 12.35	0.009
50 min	74.07 ± 13.37	75.87 ± 9.09	0.54

Table 6: Intraoperative mean MAP (mean arterial pressure) compared between two groups

The mean of Mean arterial pressure (MAP) measured during intra-operative period compared between two groups are shown in Table 6. There were no significant differences between the groups except in 10 and 20 minutes.

Mean MAP	Group S	Group G	P value
Baseline	92.70 ± 10.27	95.13 ± 11.04	0.38
10 min	90.23 ± 16.86	98.53 ± 17.29	0.06
20 min	79.93 ± 13.80	88.67 ± 14.31	0.01
30 min	76.13 ± 14.16	83.50 ± 15.19	0.057
40 min	76.53 ± 12.56	79.17 ± 14.11	0.44
50 min	85.87 ± 11.46	82.33 ± 15.89	0.32
60 min	84.27 ± 10.22	81.14 ± 13.14	0.26

Discussion

Anesthesia in PCNL plays an important role in determining the patient's quick recovery and thus hospital stay. In our study we have found that Spinal anesthesia in PCNL has more advantage as compared with general anesthesia in terms of hemodynamically stability, analgesic demand, recovery duration, Blood loss and Hospital stay.

S. Sraban Routray et al [7] who compared the surgical outcome and complications between spinal and general anesthesia undergoing PCNL and found that spinal anesthesia maintains better hemodynamic and haemostatic state, avoids general anesthetics complications, decreases the need of analgesics and duration of surgery. G. Movasseghi et al [8] compared Spinal with general anesthesia during percutaneous lithotomy and concluded that spinal is as effective and safe as GA and also under SA requirement of analgesics was less and showed hemodynamically stability during surgery and recovery period. This is same with our results where the need of analgesia was less in spinal group and also recovery time was less and hemodynamic stability was more in spinal groups.

B. Borzouei et al [9] found that spinal anesthesia is feasible, safe and well tolerated in management of patient with

renal stones, which also is our finding with spinal anesthesia group.

Kuzgunbay B, et al [10] studied 82 patients undergoing PCNL and compared general anesthesia with Spinal anesthesia and found no significant differences in two groups in terms of age, location of stone, operative time and hospital stays, which was also insignificant in our study except hospital stays in spinal anesthesia was less than in general anesthesia group.

Andreoni C, et al [11] studied impact of single dose of spinal analgesia on postoperative pain and recovery following PCNL, and found significant decrease in postoperative parenteral pain medication requirement and early ambulation and also found the decrease incidence of PONV, which was similar to our findings where spinal anesthesia group needed less amount of analgesic demand when compared with the general anesthesia groups.

Sung soo kim et al [12] studied and compared two groups and reported that post operative fever rates and hospital stays were greater in the general anesthesia group in compared with Spinal anesthesia group and this was common finding in our study where general anesthesia group required more hospital stay than spinal anesthesia group.

Mehrabi et al [13] studied 160 patients posted for PCNL in prone position and concluded that spinal anesthesia was an good alternative technique compared with general anesthesia and was similar in our findings.

Singh et al [14] studied and compared PCNL under general anesthesia and CSEA and found that CSEA was as effective and safe, and also found that the requirement of analgesia within first 24 hours was lesser in CSEA group with shorter hospital stays. Though our study was with spinal anesthesia but single shot Spinal anesthesia showed a similar beneficial

effect when compared with general anesthesia group.

Tangpaitoon T et al [15] studied and compared Spinal with Regional anesthesia undergoing PCNL in 50 patients and found that regional anesthesia was associated with greater patient satisfaction, lesser post-operative pain and lesser adverse effects.

Karacalar et al [16] compared spinal epidural block with general anesthesia and found that more patient satisfaction, less postoperative pain and lesser requirement of analgesia in spinal epidural group. Incidence of Vomiting, hypotension and bradycardia, there were no significant difference between two groups. Here the comparison was with epidural block and our study was with spinal anesthesia, despite this they showed more or less similar to our findings.

Therefore, on the basis of above studies and the results of above findings spinal anesthesia seems to be superior when compared with general anesthesia for performing the PCNL. In our study as the location of stones, sizes were more or less similar, duration of anesthesia and surgery were not significant in both groups. But, overall findings like less analgesics demand, faster recovery and less blood loss, patient's satisfaction and less hospital stays in spinal groups and hemodynamically stability with less blood transfusion showed spinal anesthesia as superior or equally beneficial in performing a PCNL.

Conclusion

Thus, we can conclude that Spinal Anesthesia during PCNL is more acceptable and stable in terms of hemodynamic stability, less blood loss, reduced analgesic demand, faster recovery which in turn improved the patient's quality of life with less hospital stay. Therefore, spinal anesthesia can be preferable choice for an anesthesiologists & urologists thereby

decreasing the complications of general anesthesia.

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