Original Article

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Comparison between Ultrasound Guided Peritubular Infiltration and Paravertebral Block for Postoperative Pain Relief in Percutaneous Nephrolithotomy

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Abstract

Background: Percutaneous Nephrolithotomy is most advanced and preferred technique for Renal calculi but associated with pain and discomfort in postoperative period. Aim of our study is to compare analgesic efficacy of peritubular infiltration with paravertebral block under Ultrasound guidance for postoperative pain relief.

Methods: In this prospective randomised study total 60 adult patients were allocated in two equal groups (A, B). After undergoing surgery under general anaesthesia group A patients received peritubular infiltration of 15ml of 0.25% inj.bupivacaine with inj. Dexmeditomidine 1ug/kg and group B patients received 15ml of 0.25% inj.bupivacaine with inj. Dexmeditomidine 1ug/kg in Paravertebral space T11, T12, L1 under ultrasound guidance. Postoperatively hemodynamic variables, VAS, Dynamic VAS, mean time for 1st demand of analgesia and total consumption of inj.tramadol were noted in both groups.

Results: At 4, 8, 12 hrs VAS, Dynamic VAS scores were lower in group B compared to group A($p<0.005$). Hemodynamic variables were comparable between groupsand demand for first rescue analgesia time were higher in paravertebral block group compared to peritubular infiltration group and total consumption of tramadol were low in paravertebral block.

Conclusion: Paravertebral block under ultrasound guidance is an effective analgesia for PCNL in postoperative period compared to peritubular infiltration.

Keywords: Paravertebral block; Peritubular infiltration; Percutaneous nephrolithotomy.

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Introduction

Renal calculi aremost common disease encountered in day to day practice. Various treatment modalities available such as percutaneous nephrolithotomy (PCNL), percutaneous nephrostomy (PCN), extracorporeal shock wave lithotripsy (ESWL) and open surgeries.[1,2] PCNL is the most common technique for removal of renal stones > 2 cm, staghorn calculi and multiple calculi. It is preferred

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because of less invasive, less time consuming than open surgery and increased clearance rate than ESWL.[1,2]

Percutaneous nephrostomy tube usually placed at the end of procedure to facilitate drainage of pelvicalyceal system to minimise bleeding relook and removal of residual calculi.[2] This Percutaneous nephrostomy tube placement is associated with severe discomfort and pain for patients which may require additional analgesics in postoperative period.[3] If failure to provide adequate analgesia may result in impaired ventilation, inadequate mobilization and prolonged hospitalization.[4]

Various modalities of treatments tried such as Nonsteroidal anti-inflammatory drugs, opioids, local infiltration, peritubular infiltration, paravertebral block, intercostal block and epidural anaesthesia.[5-9, 11-14] In our study we compared analgesic effect of paravertebral block and peritubular infiltration under ultrasound guidance with dexmeditomidine which was not studied previously.

Methodology

The study was conducted in Melmaruvathur Adhiparasakthi institute of medical sciences and research in department of anaesthesiology after obtaining permission from institutional ethical committee. In this study 60 patients of ASA I and II, age group between 18- 60 years undergoing elective PCNL surgeries are included in this study. Patient refusalASA III & IV, Hypersensitivity to Bupivacaine and dexmedetomidine, Patients requiring more than one puncture, supracostal puncture, Coagulopathy, Excessive bleeding and procedure more than 3 hours are excluded from the study. After obtaining written informed consent, total 60 adult patients were randomly allocated to two equal groups every odd numbers allocated to Group A(n~30) and alternative patients to Group B(n~30).

In preoperative assessment general examination, systemic examinations and assessment of the airway were done. Preoperative fasting of minimum 8 hrswas ensured before surgery. All patients received premedication of tab. Alprazolam 0.25mg orally the night before surgery as per anaesthesiologist order to allay anxiety, apprehension, and for sound sleep. The patients also received tab. Ranitidine 150 mg in the previous night and the morning of operation with sip of water.

Preoperatively patients were clinically examined and procedure was explained. On entering operative room (OR) standard intraoperative monitors such as ECG, pulse oximeter (SPO2), noninvasive blood pressure (NIBP) were attached, and baseline parameter recorded. Intravenous (IV) infusion of Ringers lactate started. After intubation end-tidal carbon dioxide (EtCO2) monitor was attached.

The patients were preoxygenated with 100% oxygen for 5min. Injection fentanyl (2 µg/kg) andinj. Glycopyrrolate (0.01 mg/kg) were given intravenously 3min before induction of anesthesia. Injection propofol 2mg/kg and Injection Succinylcholine 2 mg/kg IV was used for induction and intubation. After 1 min of succinylcholine administration, laryngoscopy and intubation were performed. The trachea was intubated with a soft seal cuffed sterile polyvinyl chloride ETT with a standard cuff and an internal diameter of 7–7.5 mm for women and 8–8.5 mm for men. Tracheal intubation was performed by an experienced anesthesiologist. Anesthesia was maintained with nitrous oxide 66% and oxygen 33% and isoflurane up to 1–2 minimal alveolar concentration and inj. Atracuririum for muscle relaxation.

At end of the PCNL procedure and before the extubation in Group A patients 23 G spinalneedle inserted up to renal capsule under ultra-sonographic guidance along the nephrostomy tube at 6 O'clock and 12 O'clock positions, 15 ml of 0.25% bupivacaine withInj dexmedetomidine 1µg/kg was infiltrated (7.5 ml in each tract) while gradually withdrawing the needle from renal capsule to the skin. Patients wereextubated. In post-anaesthesia care unit patients were observed for 24 hrs.

At end of surgery, Paravertebral block(PVB) was performed under ultrasound guidance at the T11, T12 and L1 levels using 0.25% bupivacaine with Injdexmedetomidine 1µg/kg at a total dose of 15 ml in group B. In ultrasound the paravertebral space was identified by between the costotransverse ligament, pleura, and transverse process. A 23-gauge spinal needle was advanced in the vertical-to-caudal direction using the in-plane technique. After the needle entered the paravertebral space, 5 mL of 0.25% bupivacainewith Inj dexmedetomidine 1µg/kg was injected in each dermatome level. The spread of the local anaesthestics was confirmed by anterior movement of the pleura in the paravertebral space. All blocks were performed by the experienced anaesthesiologist. At end of surgery, patients were reversed with injection glycopyrrolate 0.01 mg/kg and injection neostigmine 0.05 mg/kg and extubated when adequate spontaneous ventilation

was established.

During follow-up, patients were assessed for pain and side-effects by an observer blinded to the infiltration, immediately after extubation, and at 1st, 2nd, 4th, 8th, 12th, 24th hours respectively. The pain score was assessed using 0-10-point visual analogue scale (VAS) (0-no pain and 10-maximum, unbearable pain) and dynamic VAS (pain on deep breathing and coughing). When VAS score >4, the patient was administered intravenous tramadol 1.0 mg/kg slowly as a rescue analgesia, patient was reassessed and time of requirement noted. Total requirement of inj.Tramadol was also recorded.ECG (lead-II) and heart rate, SpO2, systolic BP (SBP), diastolic BP, mean BP, were recorded throughout the postoperative procedure. Side effects like nausea, vomiting, pneumothorax, hemothorax, wound site hematoma are noted.

Statistical analysis

All analyses were performed using SPSS Statistics software. Data were expressed as means with 95% confidence intervals for continuous variables. Continuous data were described as mean± SD, and categorical variables were given as numbers. (%). The chi-square test was used to compare categorical variables between the groups. Student's t-test or the Mann-Whitney U-test was used to compare continuous variables between two groups, depending on whether the statistical hypotheses were fulfilled. To evaluate changes in the measurements obtained in the time interval, a repeated measurements analysis was applied. The values are considered statistically significant when P value is < 0.05

Results

Demographic variables such as age, weight are comparable between groups and are not statistically significant. Duration of surgery are similar between groups and statistically insignificant. (Table 1)

Visual analogue score in immediate postoperative period at 0,1,2 hours between groups were almost similar and statistically insignificant with p-value 0.606, 0.506, 0.432 respectively (Table 2). At 4,8,12 hours VAS scores were lower in group B compared to group A with p-values 0.002, 0.003, 0.005 respectively and statistically significant. (Table.2) After 12 hours at 18, 24 hours VAS scores were comparable and not significant. Dynamic VAS scoring showed similar result as VAS and they were significant at 4, 8, 12 hours with p-value 0.02, 0.001,0.004 respectively (Table.2). Hemodynamic variables such as HR, MAP, SPO2 were comparable between groups (Table 3).

Mean time for first demand of analgesia were lower in group A compared to group B (480.50±33.53 vs 715.50±29.77 mins) and statistically significant (Table.4). Total consumption of tramadol in 24 hrs is also significant between group A and group B (113.67±29.82 vs 66.67±5.30 milligrams) (Table 4)

Table 1: Patient demographics.

Variables	Group	Mean	Standard deviation	p-value
Age	A	41.67	6.599	0.239
	B	43.50	5.619	
weight	A	66.50	6.781	0.132
	B	67.50	5.251	
Duration	A	128.65	25.34	0.778
	B	126.85	23.20	

Table 2: VAS and Dynamic VAS score.

Variables	Group	0HR	1 HR	2HRS	4HRS	8HRS	12HRS	18HRS	24HRS
VAS	A	1.63±	1.77±	2.20±	2.80±	5.43±	5.80±	4.27±	3.20±
		0.49	0.43	0.40	0.40	0.67	3.53	0.69	0.40
	B	1.40±	1.53±	2.00±	2.40±	3.00±	3.53±	3.80±	3.00±
		0.49	0.50	0.64	0.49	0.00	0.73	0.55	0.63
	p-value	0.606	0.506	0.433	0.002	0.003	0.005	0.077	0.433
Dynamic VAS	A	2.60±	2.43±	2.97±	3.70±	6.20±	6.00±	4.17±	3.47±
		0.49	0.50	0.61	0.70	0.76	0.00	0.64	0.62
	B	2.20±	2.13±	2.70±	3.53±	4.00±	4.40±	3.83±	3.17±
		0.55	0.50	0.615	0.50	0.00	0.72	0.64	0.37
	p-value	0.412	0.037	0.100	0.02	0.001	0.004	1.000	0.336

Table 3. Hemodynamic variables.

Variables	Group	0HR	1 HR	2HRS	4HRS	8HRS	12HRS	24HRS
HR (min)	A	91.20±	90.63±	88.93±	87.93±	90.20±	90.00±	83.13±
		2.82	2.26	3.22	2.49	4.14	3.43	4.45
	B	89.53±	89.20±	86.97±	86.57±	86.97±	84.67±	85.03±
		2.96	2.325	3.67	3.720	3.21	4.72	3.31
	p-value	0.921	0.076	0.383	0.036	0.186	0.086	0.09
MAP (mm hg)	A	92.13±	91.13±	90.97±	89.20±	88.10±	87.87±	87.03±
		2.12	1.88	1.92	2.51	3.54	3.14	3.24
	B	90.90±	89.90±	87.60±	87.80±	88.20±	87.10±	86.07±
		2.28	2.13	2.44	2.73	1.91	2.80	2.49
	p-value	0.613	0.202	0.083	0.903	0.085	0.746	1.910
SPO2 (%)	A	99.53±	99.40±	99.43±	99.37±	99.33±	99.47±	99.23±
		0.57	0.56	0.56	0.61	0.54	0.50	0.56
	B	99.37±	99.40±	99.40±	99.50±	99.37±	99.47±	99.40±
		0.61	0.49	0.49	0.57	0.55	0.50	0.49
	p-value	0.116	1.012	0.205	0.788	0.753	1.000	0.105

Table 4: Comparison of analgesic efficacy between groups.

Parameters	Group A	Group B	p value
Mean time for first demand of analgesia (mins)	480.50±33.53	715.50±29.77	0.003
Total consumption of tramadol in 24 hrs (mgs)	113.67±29.82	66.67±5.30	0.004

Discussion

Various surgeries like Percutaneous nephrolithotomy, Percutaneous nephrostomy and open surgeries involving removal of renal calculi are associated with pain invariably.[1,2] This pain can hamper post-operative respiration and devastating effects in postoperative period.[4] Various modalities of treatment were tried with variable success. In our study we compared analgesic effect of paravertebral block and peritubular infiltration under ultrasound guidance with dexmeditomidine for percutaneous nephrolithtomy.

The results of our present study showed that paravertebral block was more effective than peritubular infiltration in reducing postoperative pain. VAS score and DVAS score were lower in both group in initial postoperative period but duration of analgesia was prolonged in paravertebral block group compared to peritubular infiltration group. Geetha P Parikh et al as studied analgesic efficacy of peritubular infiltration of 0.25% bupivacaine in percutaneous nephrolithotomy also observed better low VAS score in immediate postoperative period compared to control group similar to our study.[15] Yayik AM et al as studied ultrasound –guided low thoracic paravertebral block versus peritubular infiltration and Zehra Hatipoglu et al comparatively studied ultrasound- guided paravertebral block versus intravenous tramadol for postoperative pain in percutaneous nephrolithotomy inboth these studies found that paravertebral block has better postoperative VAS and DVAS scores and longer duration of analgesia than other techniques.[16,17]

Paravertebral block preferred using ultrasound guidance to avoid inadvertent complication such as pleural puncture, intrathecal injection, intravenous placement, block failure and pneumothorax.[18] In our study no complication was encountered in any patients during ultrasound guided paravertebral block.

Paravertebral block being a regional anaesthesia technique, have less effects on hemodynamic variables. In our study there was no significant changes in HR, MAP, in postoperative period between groups. Zehra Hatipoglu et al andBaidya DM et al in both these studies no change in hemodynamic variablesin postoperative period following paravertebral block and control group

similar to our study.[17,19]

In our study demand for first rescue analgesiatime were lower in paravertebral block group compared to peritubular infiltration group and total consumption of tramadol were low in paravertebral block. Yayik et alstudied ultrasound –guided low thoracic paravertebral block versus peritubular infiltration in their study also showed that first demand of rescue analgesia time and fentanyl consumption both are lower in paravertebral block compared to control group.[20]

In recent years regional anaesthesia techniques were used increasingly in postoperative period under ultrasound guidance because they are simple, safe and give good analgesia without any side effects. We tried paravertebral block and peritubular infiltration for percutaneous nephrolithotomy surgeries. In both techniques better pain relief in postoperative period was observed but longer duration was observed in patients receiving paravertebral block under ultrasound guidance seems to be an advantage.[21]

Conclusion

Hence paravertebral block under ultrasound guidance with increased duration, minimal adverse effects, reduction in consumption of rescue analgesia make it suitable technique of choice for postoperative analgesia in percutaneous nephrolithotomy. Peritubular infiltration may be a simple alternative technique.

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Conflicts of interest: Nil

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