

# **Peritubal Infiltration of Bupivacaine Versus Bupivacaine With Clonidine For Postoperative Analgesia After Percutaneous Nephrolithotomy: A Double Blind Randomized Comparative Study**

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## **I. Introduction & Background**

Percutaneous Nephrolithotomy (PCNL) is nowadays a widely used method for the treatment of kidney stones more than 2 cm, staghorn calculi and multiple renal calculi. It remains the gold standard for the treatment of renal stones as compared to the less invasive extracorporeal shockwave lithotripsy and is achieved with lower morbidity as compared to the open surgery. PCNL is a procedure to remove complex upper tract renal calculi by the means of a nephroscope, although the skin incision for PCNL may appear small, the intensity of intra-operative and post-operative pain is significant because of the soft tissue injury. However, the procedure of Percutaneous Nephrolithotomy can cause distension of the pelvicalyceal system leading to postoperative pain that can be extremely distressful for the patient. Most of these patients have already compromised renal function, hence this surgically minimal invasive technique is done for the removal of stones through a skin hole incision between skin and kidney.

Pain is mainly experienced during the dilatation of the renal capsule and parenchyma & not during the intrarenal handling or stone disintegration at the time of PCNL. Placement of nephrostomy tube after PCNL is a standard practice which can be associated with a significant post-operative pain along the nephrostomy tube that may require implementation of many postoperative analgesic methods such as systemic opioids, non-steroidal anti-inflammatory drugs and epidural analgesia to be continued after the procedure to alleviate postoperative pain, reduce complications, hospitalization, costs and also to facilitate faster recovery.

The placement of a large bore access sheath in flank, is beneficial for two reasons-

- a) Intraoperatively - this allows good fragmentation of renal stones and their removal
- b) Postoperatively - this allows adequate drainage, hemostasis and access for possible complications.

However, there are certain recent changes in the practice of Percutaneous Nephrolithotomy include the introduction of 'mini-perc' technique and tubeless procedures as well as the use of smaller nephrostomy tubes. 'Mini-perc' (minimally invasive PCNL) technique is a less invasive alternative to standard Percutaneous Nephrolithotomy and causes minimal trauma to the tissues. But these methods may not be applicable in all the patients, and it may not be possible to avoid the use of the nephrostomy tube totally i.e. Tubeless PCNL can be performed only in selected cases.

Several studies which investigated post-operative pain after PCNL focused on traditional measures of either reduced percutaneous catheter size on postoperative pain, analgesic requirements such as the use of non-steroidal anti-inflammatory drugs and opioids or the impact of reduced duration of cutaneous drainage. These analgesics like NSAID's and opioids have their own side effects and limitations particularly in patients with potential renal failure. Skin infiltration of local anesthetic drug at the surgical site is not so effective.

### **Regional techniques offer many advantages:**

The pain is cured near the damaged tissue area when local anesthetics are instilled, which can provide analgesia without the side effects of opioids. There have been previous research reports stating that the infiltration of various local anesthetic agents from the skin to the renal capsule along the nephrostomy tube, can provide good pain relief for nearly 14 hours after surgery, while reducing the need for rescue analgesia.

Hence, there is need to study and investigate various regional anesthetic drugs that can be used to promote pain free period after PCNL surgery and with minimal or no side effects of opioids and NSAID's postoperatively.

With this aim, a comparison is done to see the efficacy of Peritubal infiltration of Bupivacaine versus Bupivacaine with Clonidine, administered under C-arm guidance for post-operative pain relief after PCNL.

Percutaneous Nephrolithotomy is considered as 'gold standard' for the management of patients with renal calculi. Placement of nephrostomy tube after PCNL is a standard practice. In PCNL surgery, pain around nephrostomy tube can be distressing. Analgesics like NSAID's and opioids have their own side-effects. Infiltration of local anaesthetic from the renal capsule to the skin along the nephrostomy tract has been reported to relieve the initial post-operative pain.

## **II. Methodology**

Patients were kept fasting for 8 hrs. as per the ASA NBM guidelines and premedicated with Tab. Ranitidine(150mg) and Tab. Alprazolam (0.25mg), on the night before surgery. After shifting the patient inside the theatre, ECG, Pulse- oximeter (SpO<sub>2</sub>), non- invasive blood pressure monitors (NIBP), Respiratory rate (RR) & temperature probe were connected. Intravenous access was established with atleast 20G intravenous cannula.

Patients were premedicated with injection Glycopyrrolate 0.2mg and injection fentanyl 2µ/kg. Induction was done with 100% oxygen, injection midazolam 0.02mg/kg and injection Propofol 2mg/kg followed by intubation, which was facilitated by Succinylcholine 1.5 mg/kg. Injection Lidocaine (Xylocard) 1.5mg/kg was given to attenuate the stress response before intubation. Patients were intubated with the appropriate size of cuffed endotracheal tube. After confirmation of the ETT with bilateral auscultation and with end tidal Carbon dioxide monitor (ETCO<sub>2</sub>) readings, patients were then given injection Cisatracurium in the dose of 0.15mg/kg and were maintained with O<sub>2</sub> /N<sub>2</sub> O<sub>2</sub> 40% and 60% respectively and Isoflurane. After performing fluoroscopic guided retrograde urogram, ureteral catheter was placed in lithotomy position, to localize the stone and plan approach to the collecting duct.

Patient was then shifted to prone position, confirmation of bilateral equal breath sounds on auscultation was done to ensure correct position of the tube in situ and the procedure was started. Intra operatively patient was monitored in prone position for blood loss and hypothermia. Throughout the procedure, patient was maintained under anesthesia with volatile anesthetics/N<sub>2</sub>O+O<sub>2</sub>/Cisatracurium maintenance dose and the stones were removed after fragmentation by using electrohydraulic probe.

After the procedure was over, that is after insertion of nephrostomy tube and just before the extubation, a 23G spinal needle was inserted up to renal capsule under the C-arm guidance along the nephrostomy tube at 6 O'clock and 12 O'clock positions. The anesthesiologist performing the block and the investigator were blinded to the coded drug that was given. In Group A, 20 ml of 0.25% Bupivacaine and in Group B, 20 ml of 0.25% Bupivacaine with 30µg Clonidine was infiltrated along the nephrostomy tube from the renal capsule, the perinephric fat, muscles, subcutaneous tissues and the skin, while gradually withdrawing the needle upto the skin.

After performing the procedure, the patients were shifted to supine position, a catheter was placed to drain the urinary system and once the patient efforts were adequate, patients were extubated with injection Ondansetron 4mg and reversed with (Neostigmine 0.06-0.08mg/kg + Glycopyrrolate 0.08mg/kg). Then the post-operative baseline parameters were recorded and the patients were transferred to post anaesthesia care unit (PACU).

Post-operative pain assessment was made by visual analogue scale (VAS) score at rest and during deep breathing & coughing (Dynamic visual analogue scale score). The assessment was done every half an hour after extubation for 2 hours and every 2 hours for 6 hours and every 8 hours till 24 hours.

Effective analgesia was defined as VAS score ranging from 0 to 4. All the patients were given injection Tramadol hydrochloride 100 mg intravenously as rescue analgesic drug, every 8<sup>th</sup> hourly or as soon as the VAS score exceeded 4. Patients were also monitored for local anaesthesia toxicity in the postoperative period.

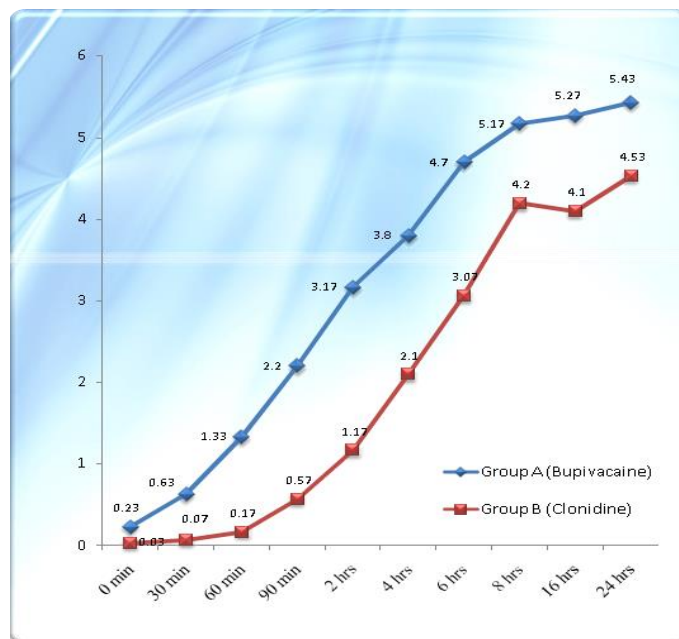
The following parameters were monitored:-

1. VITAL SIGNS- Heart Rate (HR), Mean Arterial Pressure (MAP), Respiratory Rate (RR).
2. A) VAS SCORE – noted at the time intervals of 30 minutes till 2hrs; 0 minute..., 30 minutes..., 60 minutes..., 90 minutes..., 2hrs..., then every 2 hourly intervals; at 4hrs..., 6 hrs..., 8 hrs..., then 8 hourly intervals; at 16 hrs..., 24 hrs...
3. B) DVAS SCORE – Assessment of Dynamic VAS score during deep breathing and coughing at the time intervals of 30 minutes till 2hrs; 0 minute..., 30 minutes..., 60 minutes..., 90 minutes..., 2hrs..., then every 2 hourly intervals; at 4hrs..., 6 hrs..., 8 hrs..., then 8 hourly intervals; at 16 hrs..., 24 hrs...

## **III. Results**

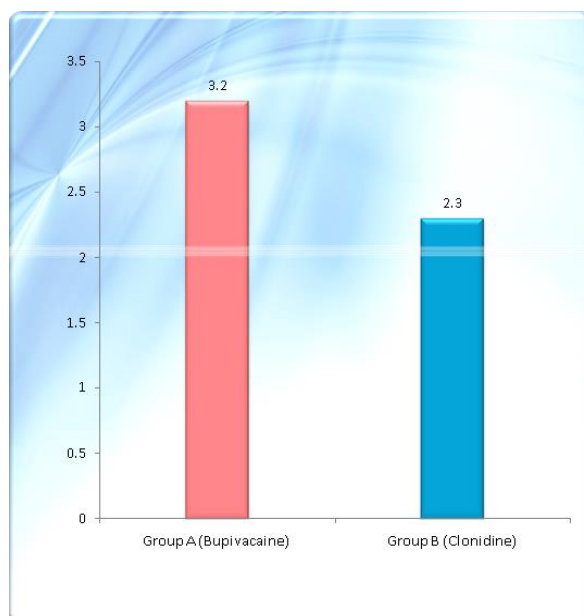
It was found that the mean VAS score were lesser in Group B & also the mean time for demand of first rescue analgesia was longer in Clonidine group.

During the course of the study, it was found that effective analgesia at all these time intervals, due to the Local anaesthetic drug infiltration with drugs in group B, was p value less than 0.05 which is highly significant (i.e. **Mean VAS score** at rest and DVAS score is statistically significant with p value = <0.001). This shows that there is a significant pain relief with Clonidine when added as an adjunct as compared to Bupivacaine alone.



**Fig. 1 Graphical representation of comparison of Mean VAS Score distribution in both the groups**

The mean number of **Total Rescue Analgesic doses** were also lesser in Clonidine group, for 24hrs postoperatively. In group A, the mean time for first rescue analgesia demand was 6.00 +/-1.232 hrs, while in group B it was 8.30 +/- 2.184 hrs. There was a highly statistical significant difference between the two groups (p=<0.001) and hence the Clonidine prolonged the mean time of demand for rescue analgesia when compared to Bupivacaine. The duration of complete analgesia was prolonged when Clonidine was added as adjuvant in Group B, as compared to plain Bupivacaine in group A, postoperatively



**Fig. 2 Graphical representation of comparison of Mean Total No. of Doses required in both the groups**

#### IV. Conclusion

To conclude, in our comparison study, both peritubal infiltration with Local Anaesthetic Bupivacaine

alone and on addition of adjuvant Clonidine along with Bupivacaine can provide a safe postoperative analgesia in terms of haemodynamic stability. But the duration of effective analgesia was prolonged when Bupivacaine was infiltrated along with Clonidine and also the need for rescue analgesia was less when Clonidine was used as adjuvant with Bupivacaine.

**KEYWORDS:** Bupivacaine; Clonidine; Post-operative analgesia; Peritubal Infiltration; Percutaneous Nephrolithotomy

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