

A COMPARATIVE STUDY OF CONTINUOUS PERINEURAL CATHETERS AND SINGLE SHOT PERIPHERAL NERVE BLOCKS TO PROVIDE RELIEF FROM POST-OPERATIVE PAIN

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Abstract

Background: Many practitioners consider continuous perineural catheters blocks (CPCNB) to be superior to single-shot peripheral nerve blocks (SSPNB). The present study was carried out to perform a comparative evaluation of CPCNB and SSPNB in order to investigate superiority of the CPCNB. **Materials and Methods:** 60 patients of either sex, from age group of 10 to 60 years and belonging to ASA 1 and 2 undergoing orthopedic surgeries upper limbs were enrolled for the study. They were divided in two group, continuous perineural catheters nerve block (CPCNB) and single shot peripheral nerve blocks (SSPNB) each with 30 patients. Postoperatively, subjects were given 40 ml mixture containing 20 ml of 0.5% Bupivacaine and 20 ml of 2% lidocaine. Subjects were followed up by telephone on an outpatient basis. The primary outcome was the average pain score on the day after surgery. **Result:** The mean age is group SSPNB is 43.6 years and group CPCNB is 43.2 years. The mean weight, height, BMI, pulse rate and mean arterial pressure (MAP) were reported 64.9 kg, 61.56 kg; 164.93cm, 162.74cm; 23.7, 23.1; 83, 84; 91mmHg, 87mmHg for SSPNB and CPCNB group respectively. The duration taken to complete SSPNB technique was observed significantly less than CPCNB technique whereas the VAS score was reported significantly much higher in SSPNB than in CPCNB. The rescue analgesic score was significantly more in Group SSPNB (4.53) than in CPCNB Group (0.53). **Conclusion:** Compared with SSPNB, CPCNB were associated with improved pain control, decreased need for opioid analgesics, less nausea, and greater patient satisfaction.

INTRODUCTION

CPCNB (continuous perineural catheters nerve block) has a number of benefits over single-shot peripheral nerve blocks (SSPNB).^[1,2] CPCNB may promote early hospital release and aggressive early rehabilitation by providing better pain management for many days following severe surgical operations, as well as reduce unwanted effects associated with systemic analgesic medicines.^[3,4]

In addition, CPCNB may save health-care expenditures by minimizing problems and promoting early release.^[5] While some randomized controlled trials (RCTs) have shown that CPCNB is related with better pain management, decreased opioid needs, and higher patient satisfaction when compared to SSPNB, several other investigations have found no such differences in pain control or other outcomes.^[6-8]

Although CPCNB have certain benefits than SSPNB, they also have some drawbacks. Longer peripheral nerve blocks may lead patients to hurt the insensate limb and fall as a result of a longer motor block (particularly in the lower extremities), as well as increasing the risk of nerve injury.^[9-11] CPCNB management necessitates collaboration amongst care providers, particularly if the patient is using anticoagulants. Catheter-related issues, such as dislodgment or malfunction of the catheter or infusion pump, may also arise, and catheters can be difficult to remove.^[12-14]

To explain the possible risk and advantages of CPCNBs over SSPNB, we compared the two approaches using randomized controlled trials.

MATERIALS AND METHODS

Study design

This was a single centre, prospective, randomized, non-blinded comparative study conducted in the department of Anesthesiology. Tirunelveli Medical College, Tirunelveli from the June 2015 to August 2015.

After Institutional ethical committee approval and written informed consent 60 adult patients of both sexes, within the age group of 10 to 60 years. Belonging to ASA 1 and 2 undergoing orthopedic surgeries upper limbs were recruited. They were randomized using computer generated random numbers and allocated into two groups, Groups SSPNB and CPCNB.

Inclusion Criteria

Age should be between 10 to 60 years, with ASI 1 and 2. Patients having BMI less than 30 and all cases for upper limb orthopedics surgeries.

Exclusion Criteria

Patients with an Infection close to the insertion site and a coagulation problem. Subjects with a known allergy to local anesthetics, hepatic or renal insufficiency, aberrant shoulder architecture, pre-existing neurological deficiency of the operated upper limb, and past nerve block surgery at the location of nerve block. Patients who refused to participate, as well as those who were pregnant or breastfeeding, were excluded from the research.

Sample Size: 60 patients, 30 patients in group SSPNB and 30 patients in Group CPCNB.

Pre-operative Evaluation: All enrolled patients were examined for age, gender, body mass index (BMI) (Kg/m²), and height (cm). Additionally, the medical histories of each patient were assessed for past anesthesia, surgery, severe medical conditions, medicines, and known allergies.

Laboratory investigations: Haemoglobin (%), Blood Sugar and Urea, serum creatinine, urine analysis, chest X-ray and ECG, bleeding time and clotting time, screening for HIV, HBsAg were recorded during the study.

Procedure for Single shot peripheral nerve block (SSPNB)

Supraclavicular: The patient is supine with his arms at his sides and his head twisted to the other side. Determine the interscalene groove and indicate the clavicle's midway. With rigorous aspectic precautions, the interscalene groove between scalene medius and scalene anterior is discovered. First, the finger is inserted behind the posterior border of the sternocleidomastoid muscle, which is identified as the first groove. The finger is then rolled out laterally and the second groove, the interscalene groove, is palpated. The midpoint of the clavicle is determined, and about 2 centimeters above that position, the subclavian artery is

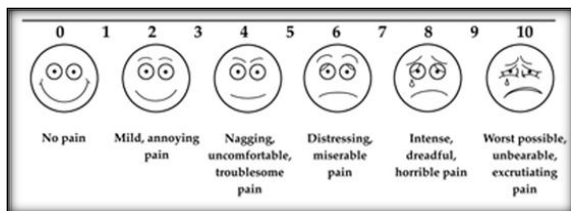
palpated. A skin wheal is raised just cephalo posterior to the artery, then a 22 G 5 cm needle attached to a 20 ml syringe is inserted parallel to the head and neck, caudally, medially, and posteriorly, until paraesthesia can be elicited; after confirmation with negative blood aspiration, 40 ml of a mixture containing 20 ml of 0.5% Bupivacaine and 20 ml of 2% lidocaine given. All patients' HR, MAP, and SPO₂ are routinely monitored intra-operatively and postoperatively, followed by VAS monitoring. At 1h, 2h, 6h, 12h, 24h, and 48h, the number of breakthrough pain and rescue analgesia are recorded. If opioid-related adverse effects are also documented. Which were administered at regular intervals postoperatively and also for pain relief via pinprick sensation on dermatomes C4 to T2.

Procedure of continuous perineural catheter nerve Block (CPCNB)

Interscalene single shot block is done in the operating room independent of the actual location of the surgery. Adequate space, equipment, and monitoring are required to enable time-efficient care for patients having nerve block operations. Supplies, drugs, and other equipment for the nerve block operation must be easily accessible in the room and prepared at the bedside; this is one of the most important aspects of effective nerve block implementation. Negative consequences and complications of peripheral nerve are uncommon. If they do develop, prompt and astute creativity is required to avoid major complications. All of the medications were properly stored in a drawer that was easily accessible. Throughout the surgery, I was given emergency medicines such atropine, adrenaline, and propofol. A short acting barbiturate e.g. thiopental may be used instead of propofol, although this needs dilution of the medicine at the time when its fast delivery is of almost crucial. For each patient, an i/v catheter with an 18-gauge needle is inserted, supplementary oxygen is administered, and ECG monitoring is initiated prior to the use of low intensity current nerve stimulation and gradual nerve progression. With little patient pain, an interscalene brachial plexus block was performed. Most patients were given 1-3 mg of midazolam to make them cooperative during nerve localization after needle advancement as stated below. 30 ml of 0.25 percent bupivacaine was injected, and a contiplex d catheter was used. With need over technique and tip of the catheter passed beyond 3 cms the needle tip and then. Tunnelling was made to prevent slippage of catheter. At the site of exist of the catheter. Tuoh's needle is inserted and style removed, catheter passed retrogradely and then removed at the point of exists and catheter fixed at the neck. In addition to recording the total time of the procedure, a catheter is linked to a portable infusion pump in the PACU with an infusion regimen of 0.125 percent bupivacaine 5ml/hr with a 60-minute lockout period, and the following is observed. VAS score at 1h, 2h, 6h, 12h, 24h, and 24h after surgery. With VAS anxiety ranging from zero to ten. Score 1

indicated NO discomfort, while 10 indicated severe suffering. Break through pain using Rescue analgesia, as Rescue analgesia is also documented. The patient was subsequently moved to orthopedic post-operative care 48 hours after receiving 50 mg i/m of diclofenac sodium or 50 g i/v of fentanyl. After 48 hours, the catheter is removed and the patient is transferred to the orthopedic post-operative ward.

VAS score, breakthrough pain, and rescue analgesia evaluation performed as described for supraclavicular. Using a visual analog scale (pain scale), patients often report their current pain level over the last 48 hours.



Respondents independently fill out the pain visual analog scale. At that moment, the responder is instructed to draw a line perpendicular to the VAS line to depict their pain severity. After the patient has indicated the 10 cm line with a ruler, the score is

obtained by measuring the distance between "No Pain" and "Severe Pain."

The score ranges from 0 to 10. A higher score implies more intense discomfort. On the basis of the distribution of pain VAS scores in postoperative patients, the following pain VAS cut points have been recommended:

- No pain (0 – 1)
- Mild pain (2 – 4)
- Moderate pain (5 – 7)
- Severe pain (8 – 10)

Statistical Analysis: All the gathered information on the chosen instances was documented in a master chart. SPSS software and Sigma Stat 3.5 version were used to do computer-assisted data analysis (2012). Using this program, the percentage, mean, standard deviation, and 'p' value were determined using One-way ANOVA and the Chi-square test, and a P value < 0.05 was considered significant.

RESULTS

The maximum patients were in age group of 41 to 60 years in both group followed by age group of 21 to 40 years and minimum in age group of more than 60 years. The mean age is group SSPNB is 43.6 and group CPCNB is 43.2, and p value is >0.005 so not significant and hence comparable [Table 1].

Table 1: Age distribution among all patients

Age Group (Years)	SSPNB Group (N=30)	CPCNB Group (N=30)
<20	2	3
21 to 40	10	11
41 to 60	16	13
>60	2	3

The number of males in group SSPNB group and CPCNB group are 21, and 24 respectively whereas female is both groups are 9 and 6 respectively. The effect was non-significant (p value >0.005) so both groups are comparable.

The mean weight of all patients were recorded and it was found that the mean weight in group SSPNB is 64.9 kg and CPCNB group is 61.56 kg. The effect of mean weight in both groups was statistically insignificant (p value >0.005).

The mean height of all 60 patients were studied and it was reported that the mean height in SSPNB groups is 164.93 cm and in CPCNB group is 162.74 cm. The effect was statistically insignificant (p value >0.005) so both groups are comparable.

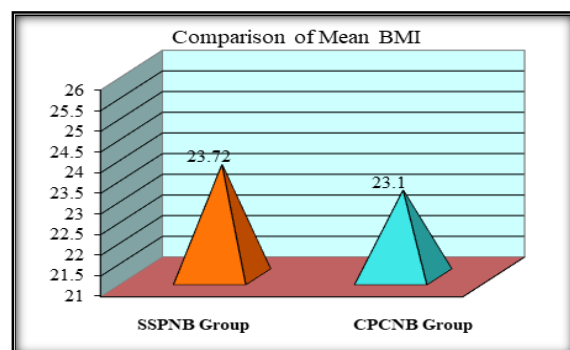


Figure 1: The mean BMI of patients recorded in study

The mean BMI in SSPNB group was reported to be 23.7 and 23.1 was reported in CPCNB group. The both groups were comparable and also satisfy the inclusion criteria with p-value >0.005 [Figure 1].

The mean pulse rate of all participating patients among both groups were also recorded. The mean pulse rate of SSPNB group was recorded 83 whereas in CPCNB group it was found 84. The effect was insignificant (p <0.005) and hence both groups were comparable.

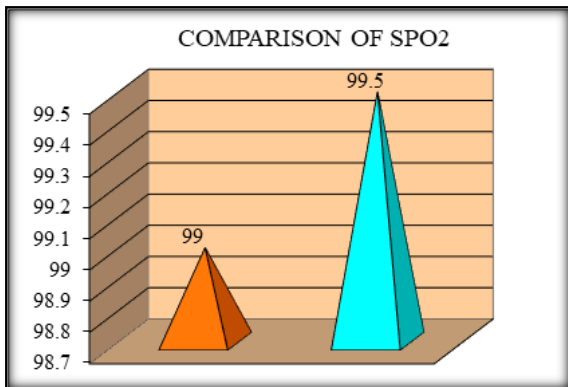


Figure 2: Observation of SpO2 value among both groups

The mean arterial pressure (MAP) between two groups were noted and it was found that in group SSPNB it was slightly higher 91 whereas in Group CPCNB it was 87. The p value <0.005 , found to be significance but this significance is demographic profile is not taken into account, so both groups were comparable as MAP is whole number as group CPCNB mean MAP is also within normal limits. The mean SPO2 of two group was observed 99 for SSPNB and 99.5 for CPCNB. The p value was 0.019 but this profile is not much significant, because SPO2 is 99 and 99.5 SPO2 is measured as whole number and SPO2 within 95-100 is normal, so both groups are comparable though statistical significance is reported [Figure 2].

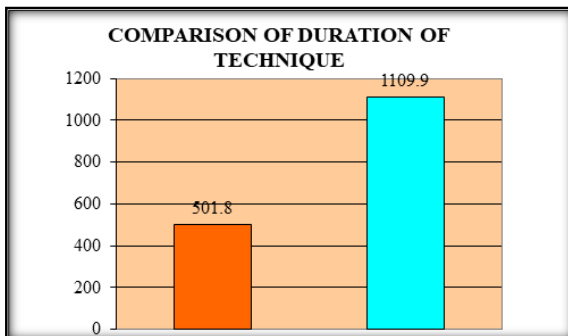


Figure 3: Time duration required for both techniques

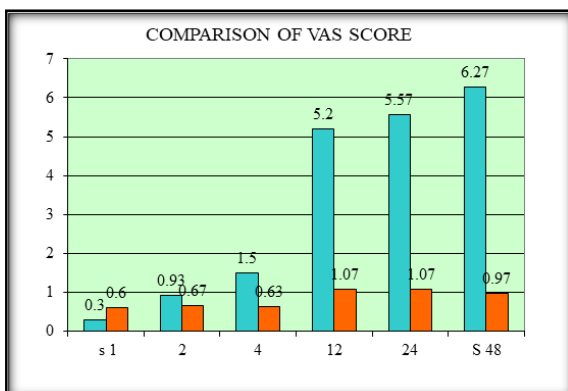


Figure 4: Comparison of VAS score among both groups

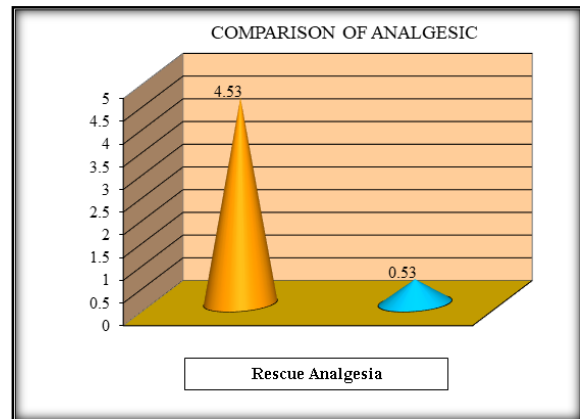


Figure 5: Observation of rescue analgesia among groups

The duration of time taken for both technique was also recorded during the study and it was observed that SSPNB technique took 501.8 second whereas CPCNB technique was completed in 1109.9 seconds. The effect was statistically significant ($p < 0.005$) [Figure 3].

VAS Score was taken for 1st hour, 2nd hour, 6th hour, 12th hour, 24th hour, 48th hour of both groups and it was found that VAS score of Group SSPNB was significantly higher ($p < 0.005$) than CPCNB group [Figure 4].

The rescue analgesic score was reported to be 4.53 in Group SSPNB and 0.53 in Group CPCNB. The effect was statistically significant among the groups ($p < 0.005$) [Figure 5].

DISCUSSION

In present study maximum patients were observed in age group of 41 to 60 years in both SSPNB and CPCNB group and mean age was reported to be 43.6 years for SS group and 43.2 years for SS groups. Similar finding was also reported by Mriano et al. in their study.^[15]

The mean weight of patients in group SSPNB was reported 64.9 kg and 61.56 kg in group CPCNB. Whereas the mean height of patients in SS groups was 164.93 cms and 162.74cms in CS group. The men weight and height in both group patients was found to be almost similar. These findings in present study are in accordance with earlier reported studies.^[16]

The mean BMI in both SSPNB and CPCNB group patients was reported to be 23.7 and 23.1 respectively. Similarly mean pulse rate was reported 83 for SS group patients and 84 for patients of CPCNB group patients. Dhir et al., reported similar findings in their study where both SSPNB and CPCNB group patients were observed with comparable mean BMI and pulse rate.^[17]

The mean MAP were observed 91 for SSPNB group and 87 for CPCNB group whereas SpO2 value was reported 95 to 100 in both groups (99 for SSPNB group and 99.5 for CPCNB group). These findings

in present study are in accordance to earlier reported studies.^[18]

In present study SSPNB procedure took total duration of 510 seconds whereas CPCNB was reported with significantly higher total duration of 1109 seconds. It is a well-known fact that SSPNB takes less time than CPCNB. The findings in our study are in confirmation to earlier reported studies.^[19]

The VAS score of SSPNB group patients was observed significantly higher than the CPCNB group patients. SSPNB group patients experienced more pain especially at 12, 24 and 48 hours than CPCNB group patients. In CPCNB a sustained analgesia is provided that is beyond duration of SSPNB analgesia hence CPCNB supposed to provide less pain thereby less VAS score. The findings in present study are in line to the outcome of various previous studies.^[20]

In present study SSPNB group patients were observed with higher rescue analgesia score in comparison to CPCNB group patients thereby requiring more post-operative analgesia to reduced pain after surgery. Fredrickson et al. also reported similar findings in their studies where patients of SSPNB group observed with more rescue analgesia during post-operative surgery of shoulder.^[16]

Limitations of Present Study

The Limitations of this study is that the complications of the continuous peripheral catheter like catheter displacement, infection haematoma is not considered as this is out of the scope of this study. Our institutions do many single shot peripheral blocks approximately 20 per weeks, our orthopedics theatre run late evenings, so complications are rare, as we are experienced no pneumothorax in our cases.

CONCLUSION

In present investigation, patient undergoing upper limb orthopedics surgery the post-operative pain relief is better in CPCNB peripheral nerve block procedure. The incidence of Break through pain, requirement of rescue analgesia, and opiod related side effects were also reported less with CPCNB procedure.

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