RESEARCH

Effectiveness and Efficiency of Peripheral Nerve Blocks as Adjunct to General Anaesthesia for Open Reduction and Internal Fixation Surgery at Primary Hospital in Tangerang

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ABSTRACT

Background: Pain management is essential for postoperative patients. Effective management involves considerations such as the type of Anesthesia. It affects the total cost of spent, quality of pain control, and side effects. This study will evaluate the addition of peripheral nerve blocks (PNB) in orthopedic surgery patients.

Objective: The objective of this study is to evaluate the efficacy and efficiency of PNB as an adjunct in general anesthesia (GA). Variables to be assessed the total cost of drugs, pain score and side effects after surgery.

Methods: This study is an analytic study with a case-control approach that includes 116 patients. Secondary data were obtained through patient medical record data. Data in the form of types of anesthesia, total cost of drugs used before and 24 hours after surgery, pain scale before and during 24 hours after surgery and side effects in patients.

The samples were divided into two groups: the GA group and the GA with PNB (GA-PNB) group. The intensity of pain was evaluated by a numeric rating scale. The total cost was calculated based on the drugs administered prior to and within 24 hours after surgery. The assessment of side effects was converted into scores to the following criteria: 0 = no symptoms, 1 = one symptom, and 2 = multiple symptoms.

Result: The results showed that the total cost of drugs spent for GA-PNB group was 18.3% less than GA group. GA-PNB produces lower pain scores and lower incidence of side effects. The average pain scale in GA patients was 3.8 points and GA with PNB was 2.8 points.

Conclusion: The addition of PNB has the potential to improve patient satisfaction. Lower pain scores, lower side effects and lower costs will encourage patients to choose Primaya Hospital Pasar Kemis for their treatment.

Keywords: analgesic; cost; general anesthesia; orhopedic surgery; peripheral nerve block

INTRODUCTION

Peripheral nerve block (PNB) is a technique employed for the purposes of surgical anesthesia and non-surgical analgesia. PNB offers numerous advantages over alternative anesthesia techniques in specific patient populations and clinical scenarios. These benefits include expedited and secure pain management, enhanced patient satisfaction, decreased hospital stay duration, and reduced overall healthcare expenditures. Peripheral nerve blocks (PNBs) are employed for both perioperative and non-surgical analgesia. In certain cases, PNBs may offer several advantages over other forms of anesthesia, such as neuraxial or general anesthesia (GA), and may result in superior outcomes. The benefits of PNB over GA include superior pain control and a reduction in general anesthesia-related adverse events.[1] Additionally, PNBs reduce pain on movement within 30 minutes after block placement, the risk of acute confusional state, and probably also reduce the risk of chest infection and time to first mobilization. A modest reduction in the cost of analgesic drugs may be observed for single-injection PNB.[2]

Pain management in the setting of acute and subacute orthopedic trauma can be challenging. Due to the recent focus on the rising opioid epidemic, as well as the adverse side of effects of opioid pain medication, multimodal pain control has become the standard of care for management of orthopedic trauma, particularly during operative fixation. Opioids are commonly used for postoperative analgesia but considering the associated complications like nausea, vomiting, delirium, constipation, and respiratory depression.[3,4] Peripheral nerve injury or post-block neurological dysfunction (PBND) are uncommon but a recognized complications of PNBs.[5] Ultrasound-guided multiple nerve blockade may be an alternative to the common anesthetic procedures. It provided satisfactory intraoperative pain management and reduced early postoperative complications.[6] Pericapsular nerve group (PENG) block which anesthetizes the femoral nerve, obturator nerve, and the accessory obturator nerve while sparing the motor components. Studies have shown that the PENG block is efficient in providing postoperative analgesia in patients undergoing hip surgeries with preservation of quadriceps muscle strength.[7,8]

PNB have recently been recommended in total hip and total knee arthroplasty as they may reduce pain, morphine consumption, length of stay and complications. However, whether PNBs are associated with early discharge within an enhanced recovery protocol including multimodal analgesia is uncertain.[9] PNB generally lasts longer than local anesthesia and involves the injection of the regional anesthetic in the close vicinity of a specific nerve or bundle of nerves to block sensations of pain generated and transmitted from a specific area of the body to another. A nerve block can be useful when it is confined to a specific region of the body suitable for anesthesia.[10] PNB is a technique that provides long-term analgesia while preventing side effects of GA. For orthopedic lower limb surgery, it has been demonstrated that the use of PNB has a beneficial impact on functional recovery post-surgery.[11] This study aims to see the effect of PNB as an adjunct of GA in bone surgery patients at Primaya Hospital Pasar Kemis.

METHOD

This study is an analytic study with a case-control approach with a total sample of 116 patients. Secondary data were obtained through patient medical record data. Data in the form of types of anesthesia, total cost of drugs used before and 24 hours after surgery, pain scale before and during 24 hours after surgery, total drug costs spent, and side effects.

Dependent variables analyzed in this study consisted of the general anesthesia (GA) with or without peripheral nerve block (PNB). Independent variables in this study were postoperative pain score, which was evaluated before surgery and for 24 hours postoperatively with the numerical pain scale, total cost of drugs for 24 hours postoperatively, and side effects symptoms that occurred during 24 hours after surgery. Side effects were scored into 3 categories. Category 0 (no symptoms), category 1 (there is 1 symptom), and category 2 (there is more than 1 symptom). Symptoms that were found were nausea, vomiting, and headache. Inclusion criteria: 1. Patients undergoing open reduction internal fixation (ORIF) surgery 2. Patients under GA and GA with PNB anesthesia 3. Exclusion Criteria: 1. Patients get intensive postoperative care 2. Patients refuse to be included in the research sample.

Data collection and analysis started with obtaining permission from the management of PHPK. Patients' medical records are screened and recorded. Recorded data were patient identity, medical record number, patient diagnosis, surgery, type of anesthesia, drugs used and side effects occurred. Samples were coded to ensure the safety of patients' identity.

RESULTS

The statistical methods employed were descriptive and included statistical tests, namely One-Way ANOVA and Mann-Whitney Test. The results of the statistical tests were deemed significant if the p-value was less than 0.05.

The subjects under investigation comprised 116 patients, of whom 61 had undergone general anesthesia (GA) and 55 had received general anesthesia with a peripheral nerve block (PNB). The comparison of the sample characteristics between general anesthesia (GA) and general anesthesia with a peripheral nerve block (GA-PNB) was conducted to assess sample homogeneity, and the results are presented in the Table 1.

The subjects studied were 116 patients, consisting of 60 people consisting of male gender and 55 female gender. The age of the subjects was between 8-82 years with a mean of 43 years. Based on the type of surgery is divided into 2 categories, where the first category is only open reduction internal fixation (ORIF) and the second category is more than 1 surgery and includes ORIF. The comparison of sample characteristics between GA and GA-PNB to assess sample homogeneity is shown in the Table 2.

Table 1. Homogeneity test between variables

Variable/ Unit	Category	N	Mean	SD	P
Total Cost/ (Rupiah)	GA	61	709444.34	220954.3	0.33
	GA-PNB	55	593552.25	194722.0	
Numeric Pain Rating Scale/(1-3 : Mild, 4-6 : Moderate 7-10 : Severe)	GA	61	3.8	0.41	0.146
	GA-PNB	55	2.85	0.356	
Symptom of side effect (Numeric : 0,1 and 2)	GA	61	0.36	0.731	0.001
	GA-PNB	55	0.07	0.250	

Description: The mean total cost exhibited homogeneous variance between the groups of patients who received GA and GA-PNB, with a value of P>0.05. The mean pain scale exhibited homogeneous variance between groups of patients who received GA and GA-PNB, as indicated by a P-value exceeding 0.05. The mean side effects demonstrated unequal variances between the aforementioned groups, as evidenced by a P-value less than 0.05.

Table 2. Homogeneity test between variables

Variable/Unit	Category	N	Mean	SD	P
Age	GA	61	39	14.8	0.217
	GA-PNB	55	30.9	11.8	
Gender/Male and Female	GA	61	1.38	0.488669	0.62
	GA-PNB	55	1.6	0.494	
Type of Anesthesia	GA	61	1.25	0.436667	0.003666
	GA-PNB	55	1.37	0.489	

Description: The mean age exhibited homogeneous variance between the groups of patients who received GA and GA-PNB, with a value of P>0.05. Similarly, the mean gender demonstrated homogeneous variance between the groups of patients who received GA and GA-PNB, with a value of P>. 0.05. The mean type of surgery exhibits an unequal variance (heterogeneous) between the groups of patients who received GA and GA-PNB, with a value of P < 0.01.

Table 3. Significance test between variables

Variable	Category	N	Mean	SD	P
Total cost (Rupiah)	GA	61	709444.34	220954.4	0.003
	GA-PNB	55	593552.25	195915.3	
Numeric Pain Rating Scale (1-3 : Mild, 4-6 : Moderate, 7-10 : Severe)	GA	61	3.8	0.41	0.001
	GA-PNB	55	2.85	0.356	
Symtom of side effect	GA	61	0.36	0.731	0.004
	GA-PNB	55	0.07	0.250	

Description: Total Cost between the groups of patients who received GA and GA-PNB showed significant differences with a P value <0.05. Pain Scale between groups of patients who received GA and GA-PNB, showed significant differences, namely with a P value of <0.05. Side effects between groups of patients who received GA and GA-PNB, showed significant differences, namely with a P value <0.05.

DISCUSSION

This study highlights strong support by available literature for substantial improvement in postoperative opioid consumption, postoperative pain levels, patient satisfaction, and length of stay (LOS) among patients who receive a PNB as compared to those undergoing isolated general anesthesia. An observational study identified 65,271 hip fracture surgery patients; 10,030 (15.4%) received a block. With a block, the median hospital stay was 7 (interquartile range, 4 to 13) days versus 8 (interquartile range, 5 to 14) days without. Following adjustment, nerve blocks were associated with a 0.6-day decrease in LOS (95% CI, 0.5 to 0.8). This small difference was consistent with instrumental variable (1.1 days; 95% CI, 0.9 to 1.2) and propensity score (0.2 days; 95% CI, 0.2 to 0.3) analyses. Costs were lower with a nerve block (adjusted difference, -$1,421; 95% CI, -$1,579 to -$1,289 [Canadian dollars]). Receipt of nerve blocks for hip fracture surgery is associated with decreased length of stay and health system costs, although small effect sizes may not reflect clinical significance for length of stay.[13] A systematic review and meta-analysis: randomized controlled and observational studies investigating the impact of PNB. Analysis of 122 studies revealed that PNB use (compared with no use) was associated with lower ORs for (OR with 95% CIs) for numerous complications (total hip and knee arthroplasties (THA/TKA), respectively): cognitive dysfunction (OR 0.30, 95% CI 0.17 to 0.53/OR 0.52, 95% CI 0.34 to 0.80), respiratory failure (OR 0.36, 95% CI 0.17 to 0.74/OR 0.37, 95% CI 0.18 to 0.75), cardiac complications (OR 0.84, 95% CI 0.76 to 0.93/OR 0.83, 95% CI 0.79 to 0.86), surgical site infections (OR 0.55 95% CI 0.47 to 0.64/OR 0.86 95% CI 0.80 to 0.91), thromboembolism (OR 0.74, 95% CI 0.58 to 0.96/OR 0.90, 95% CI 0.84 to 0.96) and blood transfusion (OR 0.84, 95% CI 0.83 to 0.86/OR 0.91, 95% CI 0.90 to 0.92). Based on the current body of evidence, the consensus group recommends PNB use in THA/TKA for improved outcomes.[14]

In this propensity-matched study, we demonstrated that the use of PNB for ankle ORIF in the outpatient setting was associated with significantly lower visual analogue scale (VAS) pain scores and lower total narcotic usage when compared to similar patients who had no block in the outpatient setting. This effect was seen for the entire, immediate postoperative duration of anesthesia (0-8, 8-16, and 16-24 hour intervals after surgery), suggesting that PNBs provide superior pain control compared to not having a block other limitations of our review are as follows.[15] This could be due to limitation in the study populations, surgical procedures, baseline anesthetic protocols, baseline analgesic drugs, as well as in the type and concentration of local anesthetics used for the blocks. Owing to the small number of studies and much variability amongst the trials we were unable to conduct subgroup analyses for the same. Lastly, most of the trials were from one Hospital. This prohibits the generalizability of evidence obtained in this review.

CONCLUSION

Based on the results of the studies that have been conducted, there is a significant positive effect of PNB on the total cost of drugs spent, pain scale, and low side effects after surgery with P value <0.05 in all variables. General anesthesia is enough for most surgeries, but improvement can be made by tailoring patient management to the

patient's specific needs. In the case of general anesthesia (GA), post-operative pain tends to be managed with intravenous analgesic agents. Based on the World Health Organization (WHO) pain step ladder, opioid is the mainstay of pain management in severe pain. But opioid use is not without risk, the patients tend to experience side effects such as dizziness, nausea, vomiting, pruritus, constipation, or even respiratory depression. These warrants search for pain management options that will provide comparable or better analgesia with fewer side effects and PNB is one of the options available.

The addition of PNB has a very potential impact to improve patient satisfaction. Lower pain scores and lower side effects will be a strong testimony that encourages patients' relatives to seek Primaya Hospital Pasar Kemis for their orthopedics needs. Lower costs will lessen the financial burden and encourage insurance companies to promote Primaya Hospital Pasar Kemis as the hospital of choice.

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