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ORIGINAL RESEARCH

A PECS II Block as Post Operative Analgesia After Modified Radical Mastectomy

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ABSTRACT

Background: In Indonesia, breast cancer is the most common cancers in 2018, with a mortality rate of 11%. Postoperative pain is a complication that can occur after MRM surgery. The implementation of Enhanced Recovery After Surgery (ERAS) is currently increasingly being applied to breast surgery, one of which is by reducing the use of opioids. Selection of regional anesthetic technique as an alternative used in the form of neuraxial and peripheral nerve blocks. The use of regional anesthetic techniques also reduces the side effects of opioids that are often found, namely Post Operative Nausea and Vomiting (PONV) and pruritus. Analgesic technique with pectoral nerve block (PECS block) is an effective alternative postoperative MRM pain treatment in addition to opioid analgesia.

Methods: An analytical experimental study with double-blind randomized controlled trial (RCT) design. The study population was all patients who underwent MRM surgery at Dr. Kariadi General Hospital in May 2021 - August 2021. The study sample consisted of 46 subjects that obtained using the random allocation method, and randomly divided into two groups (PECS II block and control group). Postoperative pain scores, time to first request of rescue analgesic, total dose of rescue analgesic, incidence of PONV, and pruritus within 24 hours postoperative were analyzed in both groups.

Results: Based on the results of the analysis, the mean pain scores at 4, 12 and 24 hours postoperative were significantly lower in the PECS II block group compared to the control group (p=0.001, p=0.013, and p=0.003). The mean time to first use of rescue analgesics was longer and the total dose of rescue analgesics was lower in the PECS II block group (p=0.00, p=0.00). The incidence of PONV ((69,5 %) and postoperative pruritus (17,4 %) were more common in the control group (p=0.001, p=0.346)

Conclusion: PECS II block is effective as postoperative analgesic after modified radical mastectomy.

Keywords: Morphine; MRM; PECS II; Postoperative pain.

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INTRODUCTION

Breast cancer is the most common cancer in women in both developed and developing countries. Surgery is the main choice in the treatment of breast cancer, one of which is a mastectomy. Radical mastectomy is the removal of the entire tumor with the breast tissue and overlying skin, pectoralis major and minor muscles, and level I, II, and III axillary lymph nodes. However, radical mastectomy is no longer indicated considering the high risk of morbidity without any survival benefits, so modified radical mastectomy (MRM) is now more often used. One of the complications that can occur after breast cancer surgery is postoperative pain. The onset of chronic pain after mastectomy is known as postmastectomy pain syndrome or postmastectomy pain syndrome (PMPS). Many options are available for the treatment of postoperative pain, including systemic analgesics (opioid and non-opioid) and regional analgesic techniques (neuraxial and peripheral nerves). One of the peripheral regional analgesic techniques used for postoperative pain for breast cancer, especially mastectomy surgery is pectoral nerve block (PECS block).[1]

The PECS block was first introduced in 2011 as an interfacial block that delivers local anesthetic into the plane between the pectoralis major and minor muscles to block the medial and lateral pectoralis nerves, known as the PECS II block. In 2012, Blanco described a second version of the PECS II block which is called a modified PECS block or a PECS II block. In addition to the plane between the pectoralis major and minor muscles (in the PECS II block), the PECS II block also delivers local anesthetic into the plane between the pectoralis minor and serratus anterior muscles, blocking the intercostal, intercostobrachial and the long thoracic nerve, Several studies have been conducted to evaluate the effectiveness of using PECS II blocks as analgesia to treat post-operative pain for breast cancer, especially modified radical mastectomy.[2] However, similar research has not been carried out in Indonesia, especially at the RSUP Dr. Kariadi Semarang. In this study, the researchers wanted to compare the use of PECS II blocks with a control group using morphine as an analgesic after modified radical mastectomy surgery at RSUP Dr. Kariadi Semarang.

METHODS

This study is an experimental analytical study with a randomized controlled trial (RCT) approach, providing an intervention/treatment in the form of peripheral nerve block, namely pectoral nerve block (PECS II), whose effects were analyzed on postoperative pain modified radical mastectomy, PONV, and postoperative pruritus 24 hours. The population of this study were all patients who underwent modified radical mastectomy at RSUP Dr. Kariadi in May–August 2021. The sample of this study was patients who underwent modified radical mastectomy at RSUP Dr. Kariadi in May–August 2021, and met the inclusion and exclusion criteria of the study.

The inclusion criteria for this study included: (1) patients aged 18-59 years; (2) the patient met ASA criteria 1 and 2; (3) patients who will undergo modified radical mastectomy surgery; (4) the patient was able to communicate verbally, and can use the NRS; (5) the patient agreed to participate in the study and was willing to sign the consent form; (6) there was no local infection at the site of administration of PECS II block; (7) the patient has no coagulation disorders; and (8) there were no contraindications and a history of allergies with PECS II block action and drugs in this study. The exclusion criteria included: (1) the patient refused to participate in the study; (2) there was an allergy or contraindication to the drug in the study; and (3) the patient underwent a change in the type of surgery.

Sampling will be carried out using the random allocation method, namely the method of selecting samples randomly using a sample randomization website, samples are taken that meet the inclusion and exclusion criteria for a certain period of time until the minimum number of samples is met. Based on the sample calculation formula, the minimum sample size for each group is 21 people. Taking into account the possibility of dropping out, a sample reserve of 10% is prepared for each group (21x10% = 2.1), so that the minimum total sample size for each group is 23 people (Total = 46 people).

The procedures for this study include the first, namely providing an explanation to the patient regarding the objectives, procedures and benefits of the study. Patients were asked if they were willing to participate in this study. Willingness to participate in the research was documented by signing a consent

form. Research subjects were selected according to the inclusion and exclusion criteria. Data on age, sex, height, weight were taken from medical records. Research subjects were randomly divided into two groups using a website application, namely the PECS II block group and the control group, but patients were not told which group they would be in (double-blind). The patient was prepared for general anesthesia. The patient was placed on a cuff, saturation probe and lead electrocardiography (ECG) for hemodynamic monitoring. The patient was premedicated with midazolam 0, 05 mg/kg body weight intravenously before the induction of anaesthesia. Anesthesia was induced with propofol (2 mg/kgBW), rocuronium (0.6 mg/kgBW), and fentanyl (2 mcg/kgBW). After falling asleep, endotracheal intubation was performed. After falling asleep, endotracheal intubation was performed.

Group 1 was performed with PECS II Block using 0.25% isobaric bupivacaine as much as 30 cc before the surgical incision with the help of ultrasound. PECS II block was performed using ultrasound, the ultrasound probe was placed above the mid clavicle, after identification of rib II, the probe was moved inferiorly laterally until rib iv was identified. then identify the pleura, the central anterior muscle, the pectoralis minor, and the pectoralis major. Using a 100 mm block needle, the needle is inserted parallel to the ultrasound probe directed towards the ribs iv. The tip of the needle is placed between the hundred anterior and pectoralis minor muscles, 0.9% NaCl 2 cc is inserted to identify the needle, if the needle is in the right position, aspirate, there is no blood then added isobaric bupivacaine 0.25 % 20 cc. Next, the needle is pulled up to the subcutis and the tip is repositioned between the pectoralis major and minor muscles, inserted 0.9% NaCl 2 cc for needle identification, if the needle position is correct, aspirate, there is no blood and then insert isobaric bupivacaine 0.25 % 10 cc , and the needle is withdrawn. Group 2 received the analgesic morphine 0.1 mg/KgBW iv before the surgical incision. Maintenance of anesthesia using oxygen fraction 50% and sevoflurane 1 MAC (2 volume %). Administered analgesic paracetamol 1000 mg intravenously, ketorolac 30 mg intravenously. Each group will be given rescue analgesics during surgery if on hemodynamic monitoring there is pain

marked by MAP or HR increases > 20%, then 50 mcg of intravenous fentanyl will be given.

The patient was extubated after showing a response to verbal commands, then transferred to the recovery room. The patient was given postoperative analgesia with 1000 mg oral paracetamol and 400 mg oral ibuprofen every 8 hours. If the patient still feels pain, relief analgesics will be given via PCA morphine. In the recovery room, all patients were monitored, PCA morphine as a rescue analgesic. The PCA pump was filled with 0.5 mg/mL morphine and set to deliver a 1 mg bolus on demand with a lockout period of 10 minutes without a continuous basal infusion dose setting and a lockout of 1 hour. The total administration of morphine was adjusted to give a dose of 6 mg/hour. The first time of morphine administration was determined based on the first request of PCA morphine and the amount of morphine injected during the first 24 hours was recorded. Postoperative groups 1 and 2 were measured for pain intensity by Numeric Rating Score (NRS) at 4, 8, 12 and 24 hours by an anesthetic resident observer who had been trained, where the observer did not know that this patient was in group 1 or group 2 (double-blind). The presence or absence of PONV and pruritus within 24 hours postoperatively. Patients who experience nausea and vomiting are given metoclopramide 10 mg. Patients with pruritus were given an antihistamine, namely diphenhydramine 10 mg. If side effects occur, an antidote will be given. Opioids are given naloxone while bupivacaine will be given a lipid emulsion. All data was collected and recorded for statistical analysis.

RESULTS

A total of 49 patients were sampled in this study, 3 patients were excluded due to changes in the type of surgery so that the final total sample was 46 respondents who underwent modified radical mastectomy (MRM) surgery at Dr. Kariadi in May 2021-August 2021, and met the inclusion and exclusion criteria set by the researcher. This randomized controlled trial (RCT) randomly divided patients into two groups, namely the PECS II block group (n=23) who received the PECS II block intervention using 30cc bupivacaine 0.25%, and the control group (n=23) who received IV morphine 0.1 mg/kg body weight. The average age of respondents in the control group and the

PECS II block group was 47.61 ± 8.98 years and 49.69 ± 7.55 years. The average duration of operation of respondents in the control group and the PECS II block group was 121.96 ± 7, 65 minutes and 123.69 ± 11.4 minutes. Based on the results of the Mann-Whitney test, there was no significant difference in age and duration of surgery between the two groups. The Mann-Whitney test was performed because of the abnormal distribution of age and duration of surgery data based on the Shapiro-Wilk normality test. In addition, there was no difference in weight, height, and BMI between the two groups based on the unpaired T-test.

Pain intensity in both groups was assessed by Numeric Rating Score (NRS) at 4, 8, 12 and 24 hours postoperatively. To determine the difference between the administration of PECS II blocks and control of postoperative pain, a non-parametric comparative test was used, namely the Mann-Whitney test, because the data distribution was not normal based on the Shapiro-Wilk normality test. Based on the results of the analysis, the mean postoperative pain scores of 4, 12 and 24 hours were lower in the PECS II block group compared to the control group (mean±SD: 2.65 ± 0.49 vs 3.22 ± 0.52; 1, 91 ± 0.6 vs 2.35 ± 0.49, 1.56 ± 0.51 vs 2.13 ± 0.62). From the statistical test results at the 95% confidence interval, p = 0.001, p = 0.013, and p = 0.003 which means that there is a significant difference between the pain scores of respondents in the PECS II block group and the control group at 4, 12, and 24 hours postoperative MRM. The average 8-hour postoperative pain score was also lower in the PECS II block group, but based on the results of statistical tests, there was no significant difference (p = 0.116).

Both groups received postoperative rescue analgesics according to the NRS assessment, using a PCA filled with 0.5 mg/mL morphine, then the total dose and time of first use of rescue analgesic were recorded. To determine the difference between the administration of PECS II blocks and control over the use of postoperative rescue analgesics, a non-parametric comparative test was used, namely the Mann-Whitney test, because of the abnormal distribution of data based on the Shapiro-Wilk normality test. Based on the results of the analysis, the average time to first use of rescue analgesics in the PECS II block group was longer than

the control group (Mean ± SD: 163.04 ± 20.38 vs. 100.87 ± 10.07). From the results of statistical tests on the 95% confidence interval, the p value = 0.00, which means that there is a significant difference between the time of first use of rescue analgesics in the PECS II block group and the control group. The mean total rescue analgesic dose in the PECS II block group was found to be lower than the control group (Mean±SD: 2.91 ± 1.12 vs. 8.52 ± 2.35). From the statistical test results obtained p value = 0.00, which means that there is a significant difference between the total dose of rescue analgesics in the PECS II block group and the control group.

The incidence of nausea and vomiting (PONV) and pruritus in both groups was assessed within 24 hours postoperatively. To determine the difference between administration of PECS II block and control on the incidence of PONV and postoperative pruritus, a comparative test was used, namely the Chi-Square test and Fisher's Exact, because the variables are categorical data. Based on the results of the analysis, it was found that more respondents in the control group experienced postoperative nausea and vomiting (69.5%). From the statistical test results at 95% confidence interval, p value = 0.001, which means that there is a significant difference between the incidence of postoperative nausea and vomiting in the PECS II block group and the control group. In addition, there were more respondents in the control group who experienced postoperative pruritus (17.4%), but from the statistical test results obtained, p = 0.346, which means that there is no significant difference between the incidence of postoperative pruritus in the PECS II block group and the control group.

DISCUSSION

Postoperative acute pain is one of the complications that can occur after breast cancer surgery. An observational study conducted by Habib showed that 68% of women complained of moderate to severe pain in the first 72 hours after breast cancer surgery, and 57% experienced persistent pain. Another study showed that of 196 women who underwent a partial and complete mastectomy, 60% experienced severe acute postoperative pain, with the incidence of postoperative pain increasing with the complexity of the surgery. There are many options available for the treatment of postoperative pain, including systemic

analgesics (opioid and non-opioid) and regional analgesic techniques (neuroaxial and peripheral nerves). [3]

The PECS block has been successfully performed both as a single regional analgesic technique and in combination with other analgesics. Most studies have focused on single injection of PECS blocks, but some investigators have reported successful use of PECS blocks by continuous infusion.43 Although there are no studies regarding fixed-dose PECS II blocks, it is possible that relatively large volumes are required to achieve an adequate clinical effect. Most studies with PECS II block used doses with a volume of 10 ml between the pectoralis muscle and 20 ml in the superficial serratus anterior muscle. The type and concentration of local anesthetic used also varies, with the most common choices being bupivacaine 0.25% (or levobupivacaine) and ropivacaine 0.5%.53 In this study a PECS block with bupivacaine 0 was used.[4]

In this study, the average pain score at 4, 12, and 24 hours postoperatively was lower in the group receiving PECS II block than the control group, and based on the results of statistical tests, there were significant differences. These results are in line with those of Joshi, who showed that MRM postoperative pain scores assessed using the VAS were found to be significantly lower in the group receiving modified PECS block with 30 ml 0.375% levobupivacaine, compared to paravertebral block, at 6 hours (mean ± SD: 0.80 ± 0.48 vs. 1.97 ± 0.77) and 12 hours postoperatively (mean ± SD: 1.43 ± 0.73 vs. 2.57 ± 0.77).[5]In this study, pain scores in the PECS II block group were lower during the 24-hour postoperative period, which could be due to the multimodal analgesic approach used, namely in addition to using IV tramadol as a rescue analgesic, patients were also given paracetamol regularly in both groups. In this study, a similar approach was used, namely by giving oral paracetamol 1000 mg and oral ibuprofen 400 mg every 8 hours in both groups. Several other studies showed that the pain scale in the group receiving PECS II block was lower, especially in the early postoperative hours (<6 hours). A study conducted by Hamed (2020) showed that the MRM postoperative pain scale was significantly lower in the group receiving PECS II block with 20 ml of 0.25% bupivacaine.[6]

The results of a meta-analysis in Zhao's study showed that initial MRM (0–6 hours) postoperative pain was significantly reduced in patients receiving PECS blocks compared to the group receiving general anesthesia alone, but this difference gradually disappeared, especially over the period of treatment. (24 hours after surgery) Another meta-analysis showed that compared to paravertebral blocks, PECS II blocks significantly reduced pain scales at 1 and 6 hours postoperatively, but there was no difference in pain scores at 12 and 24 hours postoperatively. Based on the results of the aforementioned studies, PECS blocks provide an adequate initial analgesic effect, but this effect begins to diminish, especially after 4-6 hours postoperatively. This could be due to the possibility that the effectiveness of a single-dose PECS block began to decrease after the initial postoperative period but was still superior to the control group. In this study, the finding of lower pain scores during the first 24 hours postoperatively could be due to the previously described multimodal analgesic approach and the different types and doses of local anesthetics and rescue analgesics used in each study. [7]

In this study, there were differences in NRS values from the two groups where the PECS II group had a lower NRS value than the control, but both were still on a mild pain scale with an NRS value (1-3), this was due to the measurement of the pain scale after the patient received rescue analgesia with PCA morphine, as a result the NRS values obtained will be lower in both groups. Postoperative pain can also be affected by several factors beyond the use of analgesics. Based on the results of a study that analyzed the factors that influence acute postoperative mastectomy pain, it was found that younger age, bilateral mastectomy surgery, preoperative pain, anxiety and depression were associated with more severe acute postoperative pain. PECS II block not only causes motor blockade, but also block sensory nerves thereby effectively controlling pain and reducing the need for postoperative rescue analgesics. Postoperative acute pain is an important variable that can be a risk for further complications, namely chronic pain, which will be more difficult to overcome and will result in a decrease in a person's quality of life. The onset of chronic pain after mastectomy is known as postmastectomy pain syndrome

(PMPS). PMPS is estimated to affect almost 25%-60% of patients undergoing mastectomy, so acute postoperative pain must be managed appropriately to reduce the risk of chronic postoperative pain complications.

Both groups in this study received postoperative rescue analgesics according to the NRS assessment, using a PCA filled with 0.5 mg/mL morphine. Based on the results of the study, it was found that the average time for the first time to use rescue analgesics was longer and the total dose of rescue analgesics was lower in the PECS II block group compared to the control group, and based on the results of statistical tests, there were significant differences. The reduced use of rescue opioids after PECS II block may have contributed to the lower incidence of PONV and pruritus in these patients. These results are in line with studies conducted by Bashandy, who showed that the total number of rescue analgesic doses after MRM with PCA morphine, significantly lower in the PECS block group than the control group receiving only general anesthesia. The time to first receiving PECS II was significantly longer in the morphine group than in the control group (170 minutes vs. 130 minutes). Another similar study showed that the time to first receiving rescue analgesics with intravenous tramadol was significantly longer in the group receiving the PECS block than in the control group. The total tramadol dose was also found to be lower in the PECS block group. Another study using tramadol as a rescue analgesic also found a lower total dose of tramadol in the PECS block group than in the paravertebral block group. Research conducted by Hamed showed that the first time to receive rescue analgesics with pethidine 0.5 mg/kg intramuscularly was longer and the total dose within 24 hours was lower in the group receiving PECS block than in the paravertebral block group. In a meta-analysis study found different results. Based on the results of 3 studies, there was lower 24-hour postoperative opioid use in the PECS II group compared to the paravertebral block group, but there was no significant difference after the meta-analysis. The results of the meta-analysis on the time factor for the first time postoperative opioid use also found results that were not significant. Different results can be caused by many factors,[6]

This study used PCA with morphine as a postoperative rescue

analgesic. PCA with opioids remains the most common technique for postoperative pain management, but its effectiveness is less than optimal due to its frequent side effects. Postoperative nausea and vomiting (PONV) and pruritus are among the side effects associated with opioids.[8,9]Based on the results of this study, there were more respondents in the control group who experienced postoperative nausea and vomiting (69.5%), and based on the results of statistical tests, there were significant differences. In addition, there were more respondents in the control group who experienced the incidence of postoperative pruritus (17.4%), but from the results of statistical tests there was no significant difference. A similar study showed that the PONV score in the PECS block group was significantly lower than in the control group. The study assessed the incidence of PONV using a 5-point scale (0 = indicating no nausea or vomiting and 4 indicating vomiting more than once).[10]Another study, which also assessed PONV scores using a 5-point scale, showed that PONV scores were lower in the PECS group than in the control group (0.8 ± 0.9 vs. 1.8 ± 1.22).[9] Kumar's study showed that there were 3 patients in the control group who experienced nausea and vomiting, but none of the patients experienced nausea and vomiting in the PECS II block group. In a meta-analysis study found different results. Based on the results of a meta-analysis of several studies, there was no significant difference in the incidence of PONV in both the PECS II block group compared to the control group and the paravertebral block group.[11] Another study showed that there was no incidence of postoperative pruritus in either the treatment or control groups.[8] In this study, the morphine group showed a higher incidence of PONV and pruritus than the PECS II group. The use of rescue analgesics in the form of PCA morphine was higher in the morphine group (mean + SD: 8.52 + 2.35) mg compared to the PECS II group (mean + SD: 2.91 + 8.52) mg. The use of large doses of opioids can stimulate opioid receptors in the chemoreceptor trigger zone in the brain, thereby stimulating PONV. in health facilities. In addition, there are several risks associated with the use of regional anesthetics, namely systemic toxicity of local anesthetics from intravascular injection or perivascular absorption.[12]

The weakness of this study is the assessment of the NRS score which is less relevant to assess the pain scale because it is assessed after the use of analgesic rescue so that it will reduce pain in both groups. In addition, there are differences in the educational status of the research respondents so that there can be bias when assessing the pain scale because it is subjective. Assessment of the incidence of PONV and postoperative pruritus is also less relevant because the control group received more opioids than the PECS II block group. In this study, an assessment of the side effects that arise due to the use of opioids, namely PONV and pruritus, was carried out to assess the side effects that arise due to peripheral nerve block action with PECS II such as hematoma In the puncture site, nerve injuries such as tingling or pain at the puncture site have not been studied in this study.

CONCLUSION

There was a significant difference in NRS values in patients using PECS II blocks which were lower than controls, both groups showed a mild pain scale with NRS values 1-3, a longer postoperative rescue analgesic administration time and a smaller total rescue analgesic dose in patients receiving PECS II compared to controls who underwent MRM and the use of PECS II blocks compared to the control group in the incidence of Post Operative Nausea and Vomiting (PONV) 24 hours postoperatively. There was a difference but not statistically significant in the use of PECS II blocks compared to the control group with the incidence of pruritus 24 hours postoperatively. Thus, it can be concluded that PECS II block is effective as an analgesic postoperatively modified radical mastectomy.

CONFLICT OF INTEREST

The Authors declare that have no conflich of interest

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