

Comparison of infiltration analgesia and pectoral nerve block in the pain management after mastectomy for breast cancer

Meme kanseri nedeniyle, mastektomi sonrası ağrının kontrolünde infiltrasyon analjeziye pektoral sinir bloğunun karşılaştırılması

Güldeniz Argun, İdil Kaya, Süheyla Ünver

Department Of Anesthesiology And Reanimation, Medical Science University, Dr. A Y Oncology Training And Research Hospital

Dergiye Ulaşma Tarihi 30.07.2019; Dergiye Kabul Tarihi: 05.08.2019 Doi: 10.5505/aot.2019.26928

ÖZET

GİRİŞ ve AMAÇ: Bu çalışmamızda onkolojik nedenli mastektomi sonrası ağrı tedavisi için uygulanmış infiltrasyon analjezi ve pektoral sinir bloğu yöntemlerini, ağrı skorları, total analjezik tüketimi ve post anestezi bakım ünitesinden taburculuk süresine etkisi yönünden birbirlerine üstünlüklerini karşılaştırmayı amaçladık. **YÖNTEM ve GEREÇLER:** Etik kurul izni ve hasta onamları alındıktan, meme kanseri nedeniyle mastektomi uygulanmış, 18-80 yaş arası 60 hasta çalışmaya alındı. Postoperatif analjezi amacıyla pektoral sinir bloğu uygulanmış hastalar Grup I, infiltrasyon analjezi uygulanmış hastalar ise Grup II olarak iki gruba ayrıldı. Bütün hastalara intraoperatif tenoxicam 20 mg uygulandı. Hastaların operasyon sonrası ağrıları Visual Analog Scala (VAS) ile 1, 6, 12 ve 24. saatlerde değerlendirildi. VAS değeri 3 üzeri olan hastalara tramadol 1mg/kg ve gerekirse morfin (0.5-1 mg) uygulandı. Postoperatif ilk 24 saatte tükettikleri toplam analjezik miktarları, post anestezi bakım ünitesinde kalış süreleri, bulantı-kusma ve diğer yan etki oranları kaydedildi, sonuçlar istatistiksel olarak değerlendirildi.

BULGULAR: Demografik özellikler iki grupta benzerdi. Postoperatif VAS ortalamaları pektoral sinir bloğu grubunda 1, 6, 12 ve 24. saatlerde infiltrasyon analjezi grubuna göre anlamlı olarak düşük bulundu. Hastaların yirmi dört saatte tükettikleri total analjezik miktarı, bulantı-kusma, diğer yan etki oranları ve post anestezi bakım ünitesinde kalış süresi pektoral sinir bloğu grubunda anlamlı olarak düşüktü.

TARTIŞMA ve SONUÇ: Çalışmamızda onkolojik meme cerrahisi sonrası ağrı yönetiminde, pektoral sinir bloğu yöntemi infiltrasyon analjezi yöntemine göre üstün bulundu. Sonuç olarak, meme kanseri nedenli mastektomi sonrası, pektoral sinir bloğunu etkili bir ağrı yönetimi ve post anestezi bakım ünitesinden erken taburculuk sağladığı için tavsiye ediyoruz.

Anahtar Kelimeler: Onkolojik meme cerrahisi, postoperatif ağrı tedavisi, infiltrasyon analjezi, pektoral sinir bloğu, opioid tüketimi

ABSTRACT

INTRODUCTION: In this study, we aimed to compare the superiority of infiltration analgesia and pectoral nerve block methods on pain scores, total opioid consumption and discharge time from post anesthesia care unit (PACU) of patients after oncologic mastectomy.

METHODS: After approval of the ethics committee and patient consent, sixty patients who underwent mastectomy for breast cancer between 18-80 years of age were included in the study. Patients were divided into two groups, who underwent pectoral nerve block for postoperative analgesia as Group I and infiltration analgesia as Group II. Intraoperative tenoxicam of 20 mg was applied to all patients. Postoperative pain was evaluated with Visual Analog Scala (VAS) at the 1st, 6th, 12th and 24th hours. Patients with a VAS of more than 3 were given tramadol 1 mg/kg and morphine (0.5-1 mg) if necessary. In the first 24 hours postoperatively, total analgesic consumption, discharge time from PACU, rates of nausea, vomiting and other side effects of patients were recorded and results were evaluated statistically.

RESULTS: Demographic characteristics were similar in two groups. Postoperative VAS scores were significantly lower in the pectoral nerve block group at the 1st, 6th, 12th and 24th hours compared to the infiltration analgesia group. The total analgesic consumption, nausea- vomiting rate, and discharge time from PACU were significantly lower in the pectoral nerve block group.

DISCUSSION AND CONCLUSION: In our study, pectoral nerve block method was found superior to infiltration analgesia method on postoperative pain management in oncologic breast surgery. In conclusion, we recommend the pectoral nerve block to supply effective pain management and early discharge time from PACU after mastectomy for breast cancer.

Keywords: Oncologic breast surgery, postoperative pain management, infiltration analgesia, pectoral nerve block, opioid consumption

INTRODUCTION

After surgical procedures and anesthesia, patients are required to recovery painlessly and early return to normal life. Nonsteroidal anti-inflammatory drugs, opioids, additives, paravertebral blocks, thoracic epidural anesthesia, peripheral nerve blocks are used for the treatment of postoperative pain in breast operations.

According to the Enhanced Recovery After Surgery (ERAS) protocols, regional anaesthesia methods, especially peripheral nerve blocks, are gaining importance in the prevention of the pain and early recovery (1). The opioids used in the treatment of post-operative pain prevent early recovery of the patients and cause side effects such as nausea and vomiting. All this prolongs the patient's stay in intensive care and leads to an increase in cost (2). Infiltration analgesia is a method applied by surgeons to treat postoperative pain after breast operations. Pectoral nerve blocks are applied by anesthesiologists for postoperative analgesia and are easy to apply (3). The use of ultrasound (US) in peripheral nerve blocks for the last 10 years has led to the discovery of new blocks while increasing the success rate in blocks (4,5). In 2011, Rafael Blanco blocked the medial and lateral pectoral nerves of the brachial plexus between the pectoralis major and minor muscles, and introduced a new modality to analgesia methods after breast surgery (Pectoral Block I) (6). Pectoral Block II, which will be effective in axillary interventions, has been developed. Ultrasound-guided Pectoral Block I and II (PEC I and II) are alternative methods to thoracic epidural and paravertebral blocks for the prevention of pain after breast surgery (6,7). Application of PEC blocks is easier than paravertebral and thoracic epidural blocks since they do not cause sympathetic blockage and do not cause unwanted hemodynamic changes. While infiltration analgesia method can only cause a sensory block, PEC I and II blocks make both sensory and motor blocks (6).

In our study, we aimed to compare the effects of infiltration analgesia and pectoral nerve block methods on pain scores, total opioid consumption, side effects and discharge time

from the post anesthesia care unit (PACU) in patients after mastectomy for breast cancer.

MATERIAL - METHOD

In this prospective observational study was included ASA (American Society of Anesthesiologists) physical status class II-III, 60 female patients between 18-80 years of age who underwent mastectomy for breast cancer. After the ethics committee approval (2018-06 /79) and written informed consent taken, patients were included in the study as of 15/06/2018. The study was ended when the desired number of patients was reached in both groups. Patients under the age of 18 years, patients with anticoagulants, coagulation disorder, neurological disorders, psychiatric disorders, local anesthetic hypersensitivity and pregnant women were not included in the study. All patients were given 1-2 mg of midazolam as premedication. Anesthesia induction was achieved with fentanyl 1-2 mcg / kg, propofol 1.5-2 mg / kg, atracurium 0.5 mg / kg. Desflurane, oxygen, air mixture and remifentanyl infusion were used for the maintenance of anesthesia. All patients were routinely treated with 20 mg of intraoperative tenoxicam. After mastectomy performed by the surgical team, 20 ml of 0.25% bupivacaine was infiltrated onto the pectoralis major muscle and the operation area without skin closure. The anesthesia team applied pectoral block 1 (PEC 1) and pectoral block 2 (PEC 2) with the help of high frequency linear ultrasound (Esaote, My Lab Five) probe after skin closure in patients without infiltration analgesia. Pectoral nerve block 1 (PEC 1) was performed at the second rib level between the fascias of the pectoralis major and minor muscles. Pectoral nerve block 2 (PEC 2) was applied at the 4th rib level between the fascias of the pectoralis minor and serratus muscles.

Blocks were performed with 0.25% bupivacaine with 10 milliliters per block by using 22 gauge 50 mm insulated needle (Stimuplex D.B. Braun Medical).

After extubation the patients were taken to the post anesthesia care unit. Postoperative pain was evaluated with VAS (Visual Analog Scala). The patients were asked to number the severity

of their pain from 1 to 10. The absence of pain was evaluated as VAS 0 and the most severe pain was evaluated as VAS 10. In the pain treatment, tramadol 1-2 mg/kg intravenous were administered to patients whose VAS score was greater than 3. If tramadol treatment was insufficient, morphine treatment (0.5-1 mg intravenously) was performed. Researchers performed the study with 60 patients. The thirty patients who underwent infiltration analgesia by the surgical team and 30 patients who were applied pectoral nerve block by the anesthetist were included in this study. The researchers did not interfere with these analgesia methods applied to patients. They chose the patients who have applied infiltration analgesia and PEC block. The study was terminated when both analgesia methods were applied to 30 patients. Patients' postoperative pain was evaluated with Visual Analog Scale (VAS) at 1st, 6th, 12th and 24th hours. The first analgesic requirement time was recorded. Total opioid amount of the patients consumed and the side effects (nausea, vomiting, pruritus, sedation, urinary retention) in the first 24 hours postoperatively and discharge time from post anesthesia care unit were determined. The difference between the group with infiltration analgesia and the group with pectoral nerve block was evaluated.

Statistical Analysis: To determine the number of patients to be included in our study, G Fa Power (G * Power Ver.3.0.10, Franz Faul, University Kiel, Germany, <http://www.psyc.uni-pkg.de>) program was used. A total of at least 50 patients with at least 25 patients in each group had to be included in the study, with a 90% test power and 95% safety limit. We planned to include 60 patients in each group with 30 patients. "Statistical package for the social science (SPSS Inc., Chicago, IL, USA) version 16.0" has been used for statistical analyses. The Kolmogorov Smirnov test was used to determine if the groups were normal distribution. Demographic data and analgesic methods were compared between groups with Student's t test.

Chi-square test was performed for ASA, nausea and vomiting and other side effects (pruritus, sedation, urine retention). Mann Whitney-U Test were used to determine the difference between VAS values and the amount of analgesics consumed. A value of $p < 0.05$ was considered as significant difference.

RESULTS

Demographic characteristics were similar in two groups (Table 1). Postoperative VAS averages were significantly lower in the pectoral nerve block group at the 1st, 6th, 12th and 24th hours compared to the infiltration analgesia group (1.2, 2.6, 2.5, 2.3 / 5.5, 5.1, 3.2, 4.3, $p < 0.05$) (Table 1). The first analgesic requirement time was the 1st hour in the infiltration analgesia group, whereas in the pectoral nerve group only 2 patients required analgesic at the 8th and 10th hours. The amount of analgesic consumed in 24 hours (tramadol and morphine) was significantly lower in Group I (mean tramadol, 0.13/ 1.5 mg/kg, $p = 0.007$ and morphine, 0.0/ 0.005 mg/kg, $p = 0.01$). Postoperative nausea and vomiting rates were lower in Group I (3% / 10%, $p < 0.05$). The other side effects of opioids were not observed in two groups. Post anesthesia care unit stay was significantly lower in the pectoral nerve block group (Group I) (62/167 min, $p = 0.012$, Table 2).

Table -1: General characteristics of patients.

GROUPS	Group I (n=30)	Group II (n=30)	p
Ages (years)	50.1±11.3	51± 9.7	0.854
Weight (kg)	73.6± 9.5	72.1±9.8	0.607
Gender (male/ female)	0/30	0/30	0.500
ASA II/III	17/13	14/16	0.860
Anesthesia duration (minute)	124±8.5	120±9.6	0.640

Group I: pectoral nerve block, Group II: Infiltration analgesia, * : $p < 0.05$, statistically signification.

DISCUSSION

In our study, we found that PEC block application is superior to infiltration analgesia method for pain management in mastectomy. Infiltration analgesia, which is one of the methods to prevent pain after breast cancer surgery, is mostly applied by the surgical team. Easy to apply, is a method of providing effective analgesia in costs and side effects and in various surgical procedures. Local anesthetic toxicity, wound infection, migration of the catheter, bacterial contamination of the catheter, the escape of the given local anesthetic from the drains are undesirable effects of infiltration analgesia (8).

In their study, Marhofer et al. showed that displacement rates in various peripheral nerve catheters could be detected by ultrasound and that drug distribution could be confirmed (9). In the meta-analysis of randomized controlled trials performed by Tam et al., the effects of wound infiltration with ropivacaine and bupivacaine on postoperative pain control and drug consumption were investigated after radical mastectomy. The methods of wound infiltration were found to be effective independently of the local anesthetic type but were effective to prevent pain until the 2nd hour. There was no difference in postoperative analgesic consumption between two groups (10). In our study, the first analgesic requirement time in the group undergoing infiltration analgesia was the 1st hour after the VAS score was over 5. In the pectoral nerve block group, VAS scores were below 3 in the first 24 hours and total analgesic consumption was significantly lower in this group.

Table 2: VAS averages of the groups, the amount of opioid consumed in 24 hours, postoperative intensive care unit stay and rates of nausea and vomiting

	Group I (n=30)	Group II (n=30)	p
VAS average at 1 st hour	1.2±0.01	5.8±1.0	*p=0.02, p<0.05
VAS average at 6 th hour	2.6±0.2	5.1±0.8	*p=0.036, p<0.05
VAS average at 12 th hour	2.5±0.1	3.2±0.4	*p=0.04, p<0.05
VAS average at 24 th hour	2.3±0.1	4.3±0.67	*p=0.03, p<0.05
Amount of opioid consumed in 24 hours (tramadol/morphine) mg/kg	0.13±0.05 /0	1.5±0.1/0 .005±0.008	*p=0.007, p<0.05 *p=0.01, p<0,05
Post anesthesia care unit stay (minute) median	62 (30-90)	167 (100-180)	*p=0.012, p<0.05
Rates of nausea and vomiting (n, %)	3, (10%)	18, (30%)	*p<0.05

Other side effects (pruritus, urine retention, sedation)	0, (0%)	0, (0%)	p>0.05
--	---------	---------	--------

Group I: pectoral nerve block, Group II: Infiltration anaesthesia, * :p<0.05, statistically signification.

Paravertebral block and infiltration analgesia were used for postoperative pain management in women who underwent mastectomy and axillary dissection. In a prospective randomized study, infiltration analgesia was performed on the pectoralis major muscle and placed in the axillary dissection site, followed by continuous infusion of local anesthetics from the combined catheters. Postoperative morphine consumption and satisfaction rates were similar in both groups. While VAS scores were lower in the paravertebral block group in the first 4-hour postoperative period, VAS scores were significantly lower in the patients who underwent infiltration analgesia at the 12th and 24th hours (11). In our study, infiltration analgesia and PEC block were applied as a single dose and no catheter was used. Postoperative VAS scores and morphine consumption were significantly lower in the pectoral nerve block group than the infiltration analgesia group.

PEC I and II blocks in breast cancer surgery, opioid, nonsteroidal anti-inflammatory drugs, paravertebral blocks in a multi-centered meta-analysis showing that alternative, peripheral nerve catheterization method can be used for long-term pain treatment, but the catheter displacement, catheter-related neurological deficit, catheter infections can be encountered (12, 13). Morau et al. reported that in the postoperative pain control with peripheral nerve catheters, infusion pumps may be insufficient to provide the required volume due to technical difficulties (14). It is stated that these side effects are not encountered in single dose peripheral nerve block and the duration of block can be prolonged with additional drugs (15). In this study, the efficacy of the bupivacaine-based PEC block was over 12 hours, with the added drug being prolonged to 17 hours. In our study, PEC block with single dose bupivacaine was observed to be effective up to 24 hours and total

opioid consumption of the patients was significantly decreased in this group.

CONCLUSION

In our study, we found the pectoral nerve block method which is applied for the treatment of pain after oncologic breast operations is superior to infiltration analgesia method in terms of pain scores, total opioid consumption, their side effects and discharge time from post anesthesia care unit. In conclusion, we recommend the pectoral nerve block for effective pain management and discharge time after oncologic mastectomy.

Sources of support (grants, drugs, equipment, etc.): None

Conflict of interest statement: None

This paper represents honest academic work. No other papers have been submitted or published that might represent redundant publication.

REFERENCES

1. Chelly JE, Greger J, Al Samsam T Et al. Reduction of operating and recovery room times and overnight hospital stays with interscalene blocks as sole anesthetic technique for rotator cuff surgery. *Minerva Anesthesiol* 2001; 67:613-9.
2. Büttner B, Mansur A, Hinz J, et al. Combination of general anesthesia and peripheral nerve block with low dose ropivacaine reduces postoperative pain for several days after outpatient arthroscopy: A randomized controlled clinical trial. *Medicine (Baltimore)*.2017. Feb;96(6): e6046.
3. Blanco R, Fajardo M, Parras Maldonado T. Rev Ultrasound description of Pec II (modified Pec I): a novel approach to breast surgery. *Esp Anesthesiol Reanim*. 2012 Nov;59(9):470-5.
4. Gürkan Y, Kuş A, Aksu C, et al. Changing trends and regional anesthesia practices in Turkey. *Agri* 2014; 26: 131-7.
5. Chin KJ, McDonnell JG, Carvalho B, et al. Essentials of Our Current Understanding: Abdominal Wall Blocks. *Reg Anesth Pain Med* 2017; 42: 133-83.
6. Blanco R. The 'pecc block': A novel technique for providing analgesia after breast surgery. *Anaesthesia*. 2011; 66:847-8.
7. Blanco R, Fajardo M, Parras Maldonado T. Ultrasound description of Pec II (modified Pec I): A novel approach to breast surgery. *Rev Esp Anesthesiol Reanim*. 2012;59:470-5.
8. Scott N B. Wound infiltration for a surgery. *Anaesthesia*, 2010; 65 (1): 67-75.
9. Marhofer D, Marhofer P, Triffterer L, et al. Dislocation rates of perineural catheters: A volunteer study. *Br J Anaesth*. 2013; 111:800-6.
10. Tam KW, Chen SY, Huang TW, et al. Effect of wound infiltration with ropivacaine or bupivacaine analgesia in breast cancer surgery: A meta-analysis of randomized controlled trials. *Int J Surg*. 2015 Oct; 22:79-85.
11. Tatiana Sidiropoulou, Oreste Buonomo, Eleonora Fabbi, et al. A Prospective Comparison of Continuous Wound Infiltration with Ropivacaine Versus Single-Injection Paravertebral Block After Modified Radical Mastectomy. *Anesth Analg* 2008(3); Vol. 106, 997-1001.
12. Capdevila X, Pirat P, Bringuier S, et al. Continuous peripheral nerve blocks in hospital wards after orthopedic surgery: A multicenter prospective analysis of the quality of postoperative analgesia and complications in 1416 patients. *Anesthesiology*. 2005; 103:1035-45.
13. Volk T, Engelhardt L, Spies C, et al. Incidence of infection from catheter procedures for regional: First results from the network of DGAI and BDA. *Anaesthesist*. 2009; 58:1107-12.
14. Morau D, Lopez S, Biboulet P, et al. Comparison of continuous 3-in-1 and fascia Iliaca compartment blocks for postoperative analgesia: Feasibility, catheter migration, distribution of sensory block, and analgesic efficacy. *Reg Anesth Pain Med* 2003; 28:309-14.
15. Manzoor S, Taneja R, Sood, Puri A, et al. Comparative study to assess the quality of analgesia of bupivacaine and bupivacaine with dexmedetomidine in ultrasound-guided pectoral nerve block type I and II in breast surgeries. *Journal of Anesthesiology Clinical Pharmacology* 2018 Apr-Jun;34(2):227-231.