ANTICANCER RESEARCH *40*: 2231-2238 (2020)
doi:10.21873/anticanres.14185

Ultrasound-guided Interfascial Plane Blocks for Non-anesthesiologists in Breast Cancer Surgery: Functional Outcomes and Benefits

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Abstract. *Aim: Acute post-operative pain following modified radical mastectomy (MRM) in patients with breast cancer is challenging for anesthesiologists. This study aimed to prospectively compare the quality outcome of interfascial plane blocks performed with ultrasound guidance, and evaluate the consequences of sharing tasks with the breast surgeon. Patients and Methods: The study involved 255 patients scheduled for unilateral MRM, who were divided into two groups: Pecs group: General anesthesia plus ultrasound-guided modified pectoral nerves blocks type I and II, including serratus and parasternal infiltration according to surgical requirements; and Control group: general anesthesia only. Quality was evaluated based on perioperative opioid consumption, reported pain intensity, rescue analgesic requirement, side-effects and length of hospital stay. Moreover, a breast surgeon with expertise in ultrasound-guided breast biopsy was trained to perform the blocks. The patient benefits from regional anesthesia delivered by a non-anesthesiologist were assessed. Results: Significant reductions were noted in all of the following: Intraoperative opioid consumption ($p<0.001$), Numerating Rating Scale pain scores taken 0 and 24 h after surgery ($p<0.001$), post-operative analgesic administration ($p<0.001$), nausea and vomiting at 0, 6, and 12-h intervals ($p<0.05$), and hospital stay ($p<0.001$) were observed in the Pecs group compared with the control group. Furthermore, data obtained from patients receiving the block from the surgeon showed comparable benefits with no complications. Conclusion: Interfascial plane blocks may be an important alternative protocol in MRM, enhancing patient safety and cost benefits. Improvements in cross-disciplinary expertise through flexibility in the training of professionals with other backgrounds may provide effective analgesia and favorable outcomes.*

Regional anesthesia provides better quality acute pain management and subsequently, less chronic pain following breast cancer (BC) surgery (1). Proposed mechanisms for reducing persistent pain include reducing central sensitization (wind-up) and reducing opioid-induced hyperalgesia; anesthesiologists would provide 'preventive analgesia' when these strategies are used (2, 3). The role of local anesthetics given for the peripheral nerve block in affecting post-operative nerve impulse activity, in slowing changes in synaptic neuroplasticity, and in changing the signaling properties of non-neuronal cells, such as central nervous system microglia, has been debated for the past two decades (4, 5).

Use of a high intraoperative fentanyl dose leads to greater pain sensitization and excitability of wide dynamic range neurons at the spinal level, increasing post-operative opioid use and the risk of developing sensory disturbances following surgery (6). Although opioids are the strongest pain management analgesics, they may increase post-operative pain through activation of *N*-methyl-D-aspartate pro-nociceptive systems and subsequently cause hypersensitivity, short-term tolerance, and impaired quality of life (7, 8).

Knowledge of the precise anatomical location of tissue disruption for each breast surgery technique is imperative for developing a perioperative analgesic plan; operations can differ

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Key Words: Pecs block, regional anesthesia, modified radical mastectomy, breast surgery, postoperative pain, nonphysician anesthesia provider.

substantially with regard to the tissues removed or compromised. Similar to lumpectomy, a partial mastectomy or therapeutic mammoplasty involves only cutaneous and subcutaneous breast tissue. Depending on whether surgery is medial or lateral to the nipple, the anterior or lateral cutaneous branches of the intercostal nerves contribute to the innervation of the surgical area. In contrast to the volume displacement techniques, brachial plexus-derived nerves (lateral and medial pectoral, thoracodorsal, long thoracic) can also contribute to perioperative myofascial pain in modified radical mastectomy (MRM), considering that this a more extensive procedure and will often involve the entire subcutaneous breast tissue, varying amounts of overlying skin, and blunt dissection of a pocket for the implant between pectoral and serratus anterior (SA) in conjunction with sentinel node biopsy or axillary dissection (9, 10). Regional anesthesia modalities have gained popularity for breast surgery due to the recent focus on enhanced recovery programs to improve patient outcome, and reduce the length of stay, postsurgical side-effects and hemodynamic or respiratory complications (11). AIthough data are insufficient to recommend conclusively direct protective effects of local anesthetics on cancer cell migration, it is intriguing to speculate on this long-standing controversy of whether regional perioperative techniques might translate into clinical benefits, such as prolonged post-surgical survival (12). Blanco was the first to describe a new ultrasound-guided (USG) interfascial plane technique, the pectoral nerve blocks, where local anesthetic is deposited into the plane between the *pectoralis* major and the *pectoralis* minor muscle (Pecs I block) and above the SA muscle at the third rib (Pecs II block) with the goal of reducing post-operative muscle spasm and myofascial pain (13).

Subsequent efforts attempted to expand the utility of these novel blocks by simultaneously anesthetizing the lateral cutaneous branches of the intercostal nerves with a serratus plane block to provide sensory block of the T2-T9 dermatomes (overlying the fifth rib at the midaxillary line), and targeting the anterior cutaneous branches of intercostals nerves 2 to 3 cm lateral to the sternal border at the fourth rib with a parasternal block, thus covering the breast medially (14, 15).

This prospective study compared USG interfascial plane blocks combined with general anesthesia to general anesthesia alone in MRM surgery with and without reconstruction/nodal assessment. Our primary outcome measure was the Numerating Rating Scale (NRS) pain score on the first post-operative day. Secondary measures were perioperative opioid consumption, rescue analgesics need, post-operative nausea and vomiting (PONV), and readiness for ambulatory discharge.

Furthermore, in order to investigate the role of training and competencies by specialist caregivers, we describe how the effectiveness of multimodal analgesia changed when the breast surgeon acquired technical skills to perform these locoregional procedures, providing new insights for management of the disease.

Patients and Methods

After obtaining approval from the Institutional Review Board (ethical statement n. 17.1[16].18), in accordance with The Code of Ethics of the World Medical Association, a total of 255 eligible patients with early primary unilateral, locally advanced, or recurrent invasive BC were prospectively recruited for MRM surgery with or without reconstruction/nodal assessment (sentinel node biopsy or axillary dissection) between April 2016 and September 2019.

Immediate reconstruction with subpectoral tissue expander was performed in 161 procedures (63.1%). Sentinel node biopsies were carried out in 115 interventions (45%), with an equal number of cases requiring axillary dissection. The patients' surgeons informed them of the study during the final preoperative consultation. They were briefed in detail by a specialized BC nurse and received a booklet with information about the study. Upon admission to the hospital, written informed consent for participation was obtained by a protocol team member.

Exclusion criteria included: Declining written informed consent, age <18 years, history of allergy to the medications used in the study, contraindications to regional anesthesia (including coagulopathy and local infection), and body mass index (BMI)>30 kg/m^2.

All patients included in the study were randomly assigned to one of the two groups: The Pecs group receiving interfascial plane blocks (Pecs blocks type I-II, also including serratus and parasternal blocks according to surgical requirements) and general anesthesia (n=120); and a control group receiving general anesthesia alone (n=135). Groups were allocated using a predetermined random 1:1 sequence. All recruited patients were familiarized with the Numeric Rating Scale (NRS) for pain, using a point system ranging from 0 (no pain) to 10 (worst pain imaginable) (16).

In the preoperative holding area, patients were attached to standard American Society of Anesthesiologists (ASA) monitors, and intravenous (*i.v.*) access was obtained. All patients received a premedication *i.v.* of 0.02 mg/kg of midazolam, 1 μg/kg fentanyl, 4-8 mg dexamethasone, and 100 mg of ranitidine. The control group patients were transferred immediately to the operating room, whereas the patients in the Pecs group received USG interfascial plane blocks with variable extension according to the clinical case, and a 15-minute observation time prior to transfer to the operating room.

A skilled anesthesiologist (F.C.) trained a breast surgeon (A.G.) in the appropriate regional anesthetic techniques for several surgical procedures. After an initial theoretical overview, the training on the patients began. Three blocks were performed with the surgeon observing; the subsequent four blocks were performed by the surgeon, guided by the anesthesiologist's hands until the anesthesiologist was satisfied with the skills acquired and the surgeon felt confident enough with the technique. Finally, three blocks were performed alone by the surgeon with the anesthesiologist observing. After 10 days, the surgeon started performing the blocks without help, and after about 30 blocks, the surgeon started teaching the techniques to inexperienced anesthesiologists. At the end of this training, blocks were performed by the surgeon, the expert anesthesiologists, or by inexperienced anesthesiologists under a surgeon's supervision.

A broadband (8-12 MHz) linear array probe connected to a Sonosite M-Turbo portable ultrasound system (KPI Healthcare USA, Yorba Linda, CA, USA) was used, with an imaging depth of 6-8 cm. After cleaning the infraclavicular and axillary regions with chlorhexidine, the probe was placed below the lateral third of the

clavicle, similar to performing an infraclavicular brachial plexus block. After recognition of the appropriate anatomical structures, the skin puncture point was infiltrated with 2% lidocaine, and then the block was performed by using a 20-gauge Stimuplex Ultra 360 100 mm needle (Braun Medical Inc USA, Bethlehem, PA, USA).

The needle was advanced to the tissue plane between the *pectoralis* major and minor muscles at the vicinity of the pectoral branch of the thoracoacromial artery, and 0.2 ml/kg of 0.375% ropivacaine was deposited. In a comparable manner, 0.3 ml/kg of 0.375% ropivacaine was deposited at the level of the third rib above the SA muscle with the intent of spreading injectate to the axilla. The serratus plane block was performed by further injection of local anesthetic (0.375% ropivacaine at 0.4 ml/kg) more distal and lateral than the Pecs II block, overlying the fifth rib at the midaxillary line either superficial or deep to the SA muscle, in an attempt to provide sensory block of the T2-T9 dermatomes. The parasternal block was achieved at the medial aspect of the breast, 2-3 cm lateral to the sternal border at the level of the fourth rib. The *pectoralis* major muscle was visualized superficial to the external intercostals muscle, and 4 ml of local anesthetic (ropivacaine 0.375%, 0.3 ml/kg) were deposited between these two muscles. Standard ASA monitors were attached to the patients.

General anesthesia was provided with fentanyl 0-2 μg/kg, propofol 2% by target-controlled infusion with Diprifusor® pump (Braun) at the effector site (5-7 μg/ml for induction and 2-4 μg/ml steady-state). The airway was secured with a laryngeal mask or endotracheal intubation. If needed, additional boluses of fentanyl (0.05 mg) or a continuous infusion of remifentanil (0.05-0.5 μg/kg/min) was administered to maintain an adequate level of intraoperative analgesia. When surgery was nearly completed, paracetamol (Perfalgan) was administered by *i.v.* infusion at 1 g/100 ml. After recovery from general anesthesia, all patients were transferred to the Post-Anesthesia Care Unit.

In the Post-Anesthesia Care Unit, patients were monitored (with standard ASA monitors) for pain intensity using the NRS pain score, and for incidence of PONV. At the discretion of the anesthesiologist, a loading dose of morphine, paracetamol, ketorolac or fentanyl was administered *via* slow *i.v.* When necessary, soon as oral feeding was permitted, oral paracetamol (1 g) and *i.v.* ketorolac (30 mg), were administered (maximum three times daily). A 3 mg granisetron *i.v.* was used to treat nausea and vomiting, or alternatively 10 mg metoclopramide and 0.625 mg droperidol. Patients were discharged from the hospital based on surgical team protocols, which included a pain score of less than 3, without morphine, and absence of PONV.

The following data were collected: Intraoperative fentanyl consumption; postsurgical NRS pain scores (at 0, 6, 12, and 24 h post-operatively); rescue analgesic requirements (need for *i.v.* morphine, tramadol, paracetamol or ketorolac); PONV incidence (at 0, 6, 12, and 24 h post-operatively) and length of hospital stays (days).

Moreover, descriptive analyses were conducted to compare the number and the quality of regional anesthesia procedures performed by a trained breast surgeon during the 3 years of the study period in order to verify outcome and benefit of the surgeon performing these tasks in collaboration with anesthesiologists in a perioperative setting.

Statistical analysis. All analyses were carried out according to a pre-established plan. Data for continuous variables are presented as the mean±standard deviation (SD) with 95% confidence levels and analyzed by Student's t-test. Equality of variances was estimated using Levene's test. Data for categorical or ordinal variables are presented as the median and range. Data for categorical variables or data without a normal distribution were analyzed using the nonparametric Mann–Whitney *U*-test. Fisher's exact test and odds ratios were used as a combined effect indicator for dichotomous variables. In addition, all categorical variables, including the NRS score of the Pecs and the control groups, were compared using the Mann–Whitney *U*-test for pairwise comparison at each time point. Our sample size calculation was based on the assumption that the difference in NRS scores for pain at different time intervals after surgery would be significant if there was at least one point of difference between patients who received a Pecs block before BC surgery (Pecs group) and those who only received general anesthesia (C group). All statistical analyses were performed using IBM SPSS 23 software (IBM, Armonk, NY, USA). All *p*-values were two-sided, and $p<0.05$ was considered significant.

Table I. *Participant characteristics and demographics*.

	Pecs group (n=120)	Control group (n=135)	*p*-Value (α=0.05)
Age, years	53.7±13.2	54.4±14.2	0.180
Weight, kg	64.8±13.8	67.2±16.2	0.250
Height, cm	164.1±6.4	163.9±6.8	0.660
BMI, kg/m^2	23.9±4.5	24.9±5.6	0.130
ASA physical status			
ASA I	14 (66.7%)	7 (33.3%)	0.196
ASA II	90 (45.0%)	112 (55.0%)	
ASA III	15 (51.7%)	14 (48.3%)	
ASA IV	1 (33.3%)	2 (66.7%)	
Duration of surgery, min	151.1±52.6	142.2±48.6	0.760

ASA: American Society of Anesthesiologists; BMI: body mass index.

Results

There were no significant differences ($p>0.05$ for all) between groups in terms of age, weight, height, BMI, ASA physical status, and duration of surgery. The mean age of the Pecs group was 53.7±13.2 years and of the control group was 54.4±14.2 years. The median duration of surgery was 151±52 min for the Pecs group and 142±48 min for the control group (Table I).

The intraoperative opioid requirements (fentanyl) were found to be lower for the Pecs group (n=120; 227.5±84.4 μg) than for the control group (n=135; 318.1±79.1 μg) ($p<0.05$).

The NRS peaked at a mean of 12 h for the Pecs group and at 24 h for the controI group. The NRS scores in the Pecs group were low at 0 h, then elevated at 6 h, reaching a peak at 12 h after surgery, and decreased to 24 h. The NRS scores in the controI group were higher at 0 and 6 h, but progressively elevated to 12 and 24 hs after surgery (Figure 1). The NRS scores were significantly lower at 0 h and 24 h ($p<0.05$ for both), and not different at 6 and 12 h post-surgery ($p=0.63$; $p=0.21$, respectively).

Sixty-seven cases (26.3%) out of 255, of which 73.1% (n=49) in the Pecs group, had no need for pain relief

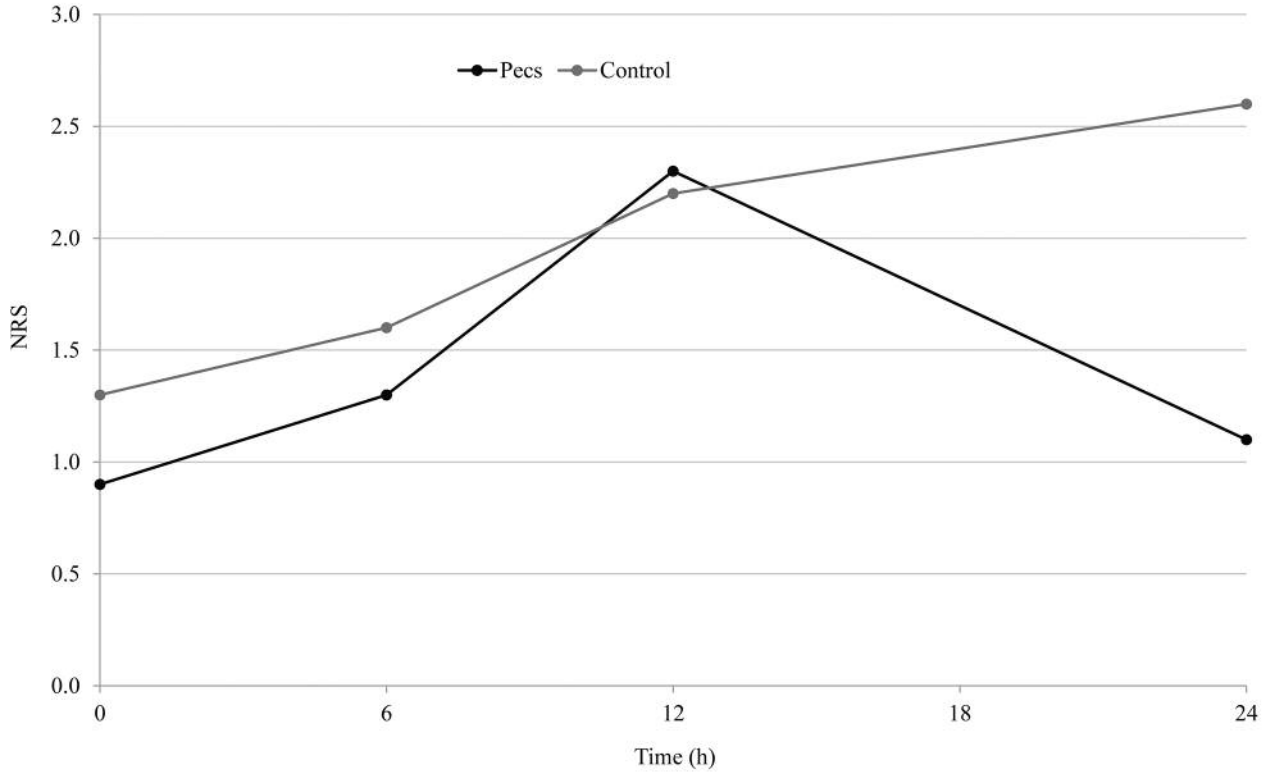

Figure 1. *Trend of pain referred with Numerating Rating Scale (NRS) scale at time 0, at 6, 12 and 24 h for the two groups (with block: Pecs or without block: Control). Data are the means of 120 and 135 patients, respectively.*

medications after surgical treatment. In addition, the number of patients requiring post-operative rescue analgesia needed to keep NRS scores less than 3 was statistically lower in the Pecs group, showing an increased risk of additional demand in the controI group (OR=4.486; 95% CI=2.42, 8.301; $p<0.05$). The mean post-operative morphine dose administration was higher in the controI group than in the Pecs group (8.1±5.4 mg *vs*. 0.5±2.4 mg, respectively). The difference was found to be statistically significant ($p<0.05$). Consequently, patients in the controI group had a higher risk of morphine use (OR=63.25, 95% CI=23.899-167.392; $p<0.05$). Furthermore, the mean post-operative paracetamol consumption was significantly lower in the Pecs group at 1.4±1.5 g compared with 1.9±1.6 g in the controI group ($p<0.05$). These findings confirmed that patients in the controI group had a higher risk of paracetamol administration (OR=1.89, 95% CI=1.12-3.177; $p<0.05$). No statistical analysis was performed on tramadol and ketorolac requirements because of the small number of patients (n=16 and n=4, respectively). Tables II and III show the post-operative analgesic requirement and a comparison of post-operative PONV incidence, respectively, among study groups.

Moreover, the number of patients requiring post-operative rescue analgesia was statistically lower in the group performed by the surgeon [19 (26.8%) *vs*. 52 (73.2%), respectively; $p=0.023$], showing a reduced risk of additional demand compared to the control group (OR=0.413, 95% CI=0.192-0.891; $p<0.05$) but no significantly shorter hospital stay (2.9±0.2 *vs*. 2.9±0.5 days, respectively, $p=0.515$). Table IV shows the statistically significantly lower NRS pain scores observed in the group performed by the surgeon compared to that by an anesthesiologist at all test times, with $p<0.05$. Conversely, there was no statistically difference of postoperative PONV incidence between care providers ($p>0.05$) (Table V). Furthermore, the total post-operative morphine administration did not differ between groups ($p=0.145$), except for paracetamol, which was statistically lower when the surgeon performed the procedure compared to the anesthesiologist (1±1.3 *vs*. 1.6±1.5 g, respectively; $p=0.028$). There were no intraoperative or post-operative block-related complications, such as hematoma, pneumothorax, or artery puncture, reported in the study. Furthermore, there were no indications of block-related infections, such as purulent drainage, localized swelling, redness or heat, pain, or tenderness at the site of injection.

Table II. *Comparison of post-operative analgesic requirement between groups.*

Analgesic	Required	Pecs group (n=120), n (%)	Control group (n=135), n (%)	*p*-Value (α=0.05)
All	Yes	71 (37.8%)	117 (62.2%)	<0.001
	No	49 (73.1%)	18 (26.9%)	
Morphine	Yes	5 (4.8%)	99 (95.2%)	<0.001
	No	115 (76.2%)	36 (23.8%)	
Paracetamol	Yes	69 (41.6%)	97 (58.4%)	0.018
	No	51 (57.3%)	38 (42.7%)	

Table III. *Comparison of incidence of post-operative nausea and vomiting (PONV) among study groups.*

Time point (h)	PONV	Pecs group (n=120), n (%)	Control group (n=135), n (%)	*p*-Value (α=0.05)
0	Yes	6 (23.1%)	20 (76.9%)	<0.01
	No	114 (49.8%)	115 (50.2%)	
6	Yes	2 (9.5%)	19 (90.5%)	<0.001
	No	118 (50.4%)	116 (49.6%)	
12	Yes	6 (25.0%)	18 (75.0%)	0.023
	No	114 (49.4%)	117 (50.6%)	
24	Yes	1 (14.3%)	6 (85.7%)	0.078
	No	119 (48.0%)	129 (52.0%)	

Discussion

The role of regional anesthesia in the management of post-operative pain in BC patients is well known (17-19). The evaluation of conventional intravenous analgesia associated with USG anterior interfascial chest wall blocks may provide important insights for an alternative MRM protocol with or without breast reconstruction and removal of lymph nodes. These blocks are relatively easy to perform and have a low-risk profile (20). The analgesic effect of these techniques has significant opioid-sparing effect intraoperatively and during the first 24 h after surgery. This was evident based on the reduced fentanyl or remifentanil requirements, suggesting that these procedures were useful for better suppression of nociception while reducing morbidity related to a high intraoperative opioid dosage. This finding may explain the significant reduction in hemodynamic responses to surgical stress in the group of patients who received pre-emptive peripheral approaches (lower intraoperative heart rate and mean blood pressure), as was the case for the studies of Hassn *et al*. (20) and Sopena-Zubiria *et al*. (21). Our results also revealed lower pain scores during the initial period after surgery, since the sensory block is expected to have fast-acting and sustained analgesic effects (14). This is supported by our demonstration of morphine reduction up to 24 h after surgery, with lower opioid-related adverse effects and PONV incidence in the Pecs group. According to several studies, reducing opioid dosage and particularly, intraoperative fentanyl and post-operative morphine administration, is able

Table IV. *Comparison of post-operative Numerating Rating Scale (NRS) pain score according to Pecs block provider.*

	NRS pain score (mean±SD)		
Time point (h)	Trained surgeon (n=42)	Anesthesiologist (n=78)	*p*-Value (α=0.05)
0	0.4±1.2	1.1±1.9	<0.001
6	0.8±1.9	1.6±2.2	0.007
12	1.3±1.9	2.9±2.5	0.012
24	0.7±1.5	1.4±1.9	0.011

prevent the occurrence of PONV, with improved patient outcomes and faster recovery (22-24). However, multimodal approaches, based on patient and anesthesia-related factors (non-smoking, history of motion sickness, long operative duration, use of volatile anesthetics) still appear to be the most effective way to reduce the occurrence of PONV (24).

Our findings are consistent with a recent report in which post-operative non-opioid analgesic requirements (*e.g.* paracetamol) during the early post-operative period were significantly reduced in patients who received interfascial plane blocks, potentially enhancing the quality of recovery and secondary outcome measures such as length of hospital stay and readiness for discharge (25). Thus, the percentage of cases demanding supplemental analgesics was significantly different between the Pecs and controI groups (37.8% *vs*. 62.2%,

Table V. *Comparison of incidence of post-operative nausea and vomiting (PONV) according to Pecs block provider.*

Time point (h)	PONV	Trained surgeon (n=42), n (%)	Anesthesiologist (n=78), n (%)	*p*-Value (α=0.05)
0	Yes	2 (33.3%)	4 (66.7%)	<0.001
	No	40 (35.1%)	74 (64.9%)	
6	Yes	0 (0.0%)	2 (100.0%)	0.007
	No	42 (35.6%)	76 (64.4%)	
12	Yes	1 (16.7%)	5 (83.3%)	0.012
	No	41 (36.0%)	73 (64.0%)	
24	Yes	0 (0.0%)	1 (100.0%)	0.011
	No	42 (35.3%)	77 (64.7%)	

$p<0.05$), specifically morphine (4.8% *vs*. 95.2%, respectively; $p<0.05$) and paracetamol administration (41.6% *vs*. 58.4%, respectively; $p<0.018$); likely because long-lasting analgesic benefits of a Pecs block extend beyond the immediate intraoperative period (26). Furthermore, this marked reduction in the severity of immediate post-operative pain seems to correlate with reduced chronic pain incidence on follow-up, with superior patient satisfaction, lower analgesic requirement, and early attenuation of the surgical stress response (20). Therefore, the goal of preventive analgesia through adequate deposition of local anesthetic drugs under real-time ultrasound into the fascial planes of the described muscles is to reduce the central sensitization that arises from noxious inputs experienced in the course of the entire perioperative period and not just from those occurring during the surgical incision (27). Moreover, suppression of this afferent nociceptive traffic by means of appropriate analgesic strategies, in addition to the diminution of post-operative pain, may suppress the development of chronic pain after surgery (28). There is an emerging understanding of the drawbacks of repeated administration of opioids intraoperatively, creating an acute state of tolerance, hyperalgesia, or both (7, 29). Mechanisms related to N-methyl-D-aspartate receptor activation and translocation of protein kinase C in dorsal horn neurons have been implicated in the development of persistent pain, hyperalgesia, and tolerance to opioid analgesia (30).

Thus, as growing evidence supports the notion that regional anesthesia improves patient outcomes, utilization of regional anesthetic techniques has similarly increased. In this context, best care should not be restricted by the background of care providers. However, replicating the benefits of regional anesthesia when it is delivered by a non-anesthesiologist is unclear.

In this study, the provision of interfascial plane blocks by the breast surgeon with appropriate training in USG and quality assurance verified by expert anesthesiologist oversight showed comparable benefits for patients in the absence of immediate complications. Furthermore, the surgeon's patients demonstrated superior analgesia and functional outcomes than the anesthesiologists' patients. We speculate this was because a surgeon has a better anatomical knowledge due to performing complex oncoplastic and reconstructive surgical procedures with a consequent understanding of the structures disrupted by the various techniques. The surgeon also has better sonoanatomy knowledge and better ultrasound needling skills as a result of USG localization and biopsy background, which was developed at our teaching hospital (31, 32). Therefore, it is imperative that these practices should be assessed and developed for improvement in technique and maintenance of standards in areas with the fastest growth (ophthalmic, plastic, general and orthopedic surgery, critical care, emergency, and prehospital medicine) (33). In this context, sharing the possession of these competencies with the appropriate training and quality assurance between several specialties can improve patient experience as well as increase satisfaction, reduce costs, and mitigate the surgical stress response, thus accelerating functional recovery and reducing perioperative complications (34, 35). This approach was proven successful in this study and is worthwhile considering. Although there is a lack of specialist societies specifically advocating improved quality, safety, and cross-disciplinary education in regional anesthesia, anesthesiologists should focus on defining standards and basic procedures that can be performed safely, whilst ensuring adequate education and training for non-anesthesiologists (36).

Due to subjectivity assessing currently available data, we have a responsibility as researchers to generate prospective, high-quality data to clarify whether the background of practitioners has an actual effect on outcomes, safety, or resource utilization. There are theoretical benefits and drawbacks of non-anesthesiologists delivering regional anesthesia, either alone or as part of a team including anesthesiologists. However, the model of care must be tailored to the target population, local infrastructure, and demonstrate benefits to patients and policymakers alike. Providers must have the competency to deliver regional anesthesia safely, regardless of professional background, and cross-specialty bridge-building and standard-setting significantly benefit all stakeholders.

There are several limitations to this study. Firstly, we used a multimodal peri-operative analgesic regimen, including midazolam, fentanyl, dexamethasone, and ranitidine in both groups. A recent study indicated that dexamethasone not only had anti-emetic effects but also strong analgesic effects in patients undergoing BC surgery (37). However, we believed that all the participants in the study should receive a standardized peri-operative multimodal analgesic regimen even if it reduced the chances of our finding a significant difference between the Pecs group and the controI group. Another limitation is that in an attempt to minimize morphine consumption, we did not offer patient-controlled analgesia in this prospective trial, which might have helped standardize tramadol administration for all patients. In addition, we did not measure any hemodynamic and pulmonary function parameters of the two groups, nor the potential development of chronic pain syndrome or effects on tumor progression overall to see if there was any significant difference post-operatively and during the follow-up period. A study with greater statistical power is needed further to reinforce the findings of this report.

Conclusion

Contemporary evidence suggests that regional anesthesia is gaining traction in perioperative practice as a common component of multimodal analgesia regimens. Acute post-operative pain following mastectomy remains a challenge for the anesthesiologist despite a range of treatment options available. Inadequate pain management in the acute setting may increase the risk of chronic pain development, negatively affecting quality of life. Lack of any complication, combined with a high success rate in this study, supports the safety and efficacy of anterior interfascial plane blocks for post-operative analgesia for MRM. The regular use of these procedures as part of a multimodal approach for post-surgical pain is recommended for quicker recovery, and reduced hospital stay and complications. With further research, it is possible to promote post-operative treatment with nonopioid analgesics and modalities, resulting in higher patient satisfaction, reduced health care costs, and enhanced recovery after surgery.

Conflicts of Interest

The Authors declare that there are no conflicts of interest in regard to this study.

Authors' Contributions

The Authors were fully responsible for the content, editorial decisions, and opinions expressed in the current article. All Authors were involved in the critical revision and review of the article text and figures, as well as approval of the final draft for submission.

Acknowledgements

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors received no financial support for the research, authorship, and/or publication of this article.

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Received February 2, 2020
Revised February 16, 2020
Accepted February 18, 2020