

# The Southern Cross Block (SCB) technique for intraoperative mastectomy analgesia.

Summer Hassan (✉ [summerhassan02@gmail.com](mailto:summerhassan02@gmail.com))

Middlemore Hospital <https://orcid.org/0000-0002-6185-9906>

---

## Research Article

**Keywords:** Mastectomy, Analgesia, Regional Blocks, Local anesthetics, post-mastectomy pain

**Posted Date:** September 21st, 2022

**DOI:** <https://doi.org/10.21203/rs.3.rs-2074143/v1>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

## Purpose :

Mastectomy is a life-altering physical and psychological event for patients. Suboptimal management of immediate postoperative pain increases the risk of post-mastectomy pain syndrome. PECs II block is a regional analgesic technique expected to anesthetize the lateral chest wall. We propose an intraoperative surgeon-delivered modification to the PECs II block to improve the quality of recovery.

## Objective :

To develop a reproducible, efficient, safe intraoperative field block, and to assess its efficacy by pain scores and opiate consumption.

## Patients and Methods :

The SCB was performed on 96 consecutive patients undergoing mastectomy by a single surgeon from 2020 to 2021. The block consisted of 40mls of bupivacaine given under direct vision to five areas : pectoralis major, the interpectoral groove, pectoralis minor lateral intercostal nerves with the nerve to serratus anterior, and the medial cutaneous nerves. Patients were assessed using visual analogue pain scale from 0–10 for movement and at rest at 1,3,6,12, and 24 hours. Rescue analgesia was freely given, and the total requirements were obtained from patient notes.

## Results :

The median pain score at rest and with movement at 1h was 0 out of 10. The median pain score at 3hours, at rest and movement, were 1 and 2, respectively. Only 28.1% of patients required second-line analgesia within the first 24 hours with average commencement at 4.8 hours. Total opioid consumption was minimal, averaging 0.42mg of Oxynorm, 1.3mg of Oxycodone, 1.8mg of Sevredol, and 3.07mg of Morphine. Only 12.5% of patients required a short course of opioids on discharge, and none returned to theatre or required pain-related readmission.

## Conclusion :

The SCB is a simple and effective technique to minimize post-mastectomy pain.

## Study Summary

Breast cancer is the most common type of cancer in women worldwide and mastectomies remain the treatment of choice where breast conserving surgery is inadequate in achieving locoregional control.

Mastectomies induce a significant physiological and psychological insult, exacerbated by pain in the acute post operative period. Undermanagement of acute post mastectomy pain has been associated with worse outcomes and the development of chronic post mastectomy pain syndromes.

This study, simply asks the question of whether infiltrating local anaesthetic at specific five systematic points under direct vision by the surgeon at the conclusion of the operation, would result into adequate analgesic effect post operatively.

The southern cross block is a technique used to target the Medial and lateral pectoral nerves, Medial and lateral intercostal nerves as well as the long thoracic nerve by infiltration Bupivacaine at 5 points at the conclusion of the surgery. It is delivered in under 3 minutes, has excellent analgesic effect, and is not associated with any significant adverse events.

This pilot study needs further validation through a prospective controlled trial to assess whether the southern cross technique is superior to the currently used methods including PECS II block.

## Introduction

Breast cancer is the most common type of cancer among women, affecting one in nine of women in New Zealand (1). New Zealand has the 7th highest incidence of breast cancer worldwide (2). Māori women have a breast cancer incidence of 125.5 per 100,000 age-standardised population, which is the highest known breast cancer incidence of any ethnic group worldwide (3). Pasifika women also have higher rates of breast cancer than Pākehā/European women. Mastectomy (The surgical removal of breast tissue), with or without axillary node dissection (AND) remains the treatment of choice for extensive, multifocal, multicentric breast cancer where breast conserving surgery (BCS) is ineffective in achieving locoregional control (5–9). It was performed in 56% of patients with invasive cancer in the Auckland region in the early 2000s (4). Breast cancer surgeries induce a physiological and psychological insult, resulting in a multitude of post-operative complications. One of the most common post-operative complications is post mastectomy pain (PMP), estimated to affect 20–60% of patients (10–12).

PMP has been defined by the International Association for the Study of Pain (IASP) as persistent pain soon after mastectomy/lumpectomy affecting the anterior thorax, axilla, and/or medial upper arm (13). Although the duration of pain persistence postoperatively remains a topic of debate (14), there is a consensus that suboptimal management of the acute postoperative pain significantly increases the risk of developing PMP (15,16). A literature review published by Larsson et al, summarises the treatment modalities for PMP (17).

The role of intraoperative local and regional anaesthetics is prophylactic and has been interrogated in several clinical trials (18). These trials have demonstrated that regional anaesthetic agents, including

thoracic paravertebral, thoracic epidural and peripheral nerve blocks, can minimize the pathological neural plasticity implicated in the progression to chronic pain (16,19–22). Widespread adoption of these techniques is curtailed by the technical complexity and systemic complications (23). Furthermore, an emerging method of administering regional block is the pectoral nerve-2 block (PECs 2 block). It entails ultrasound (US) guided, interfascial injections of local anaesthetic between the pectoralis major and minor muscles, above the serratus anterior muscle (24,25). PECs block is gaining popularity owing to its effects in prolonging the duration of postoperative analgesia and decreasing the requirement for rescue analgesia (26). Although limited data is available on the complications of PECs block, it has been associated with intravascular injection in the acromiothoracic artery and cephalic vein, as well as inducing pneumothorax in some cases (26).

The obvious limitation to adequate post mastectomy analgesia, remains the inability to address all the nociceptive regions of the breast. Multimodal analgesia is the most likely solution. Enhanced Recovery After Surgery (ERAS) protocols aim to expedite patients' return to equilibrium postoperatively. ERAS protocols for mastectomy recommend using long-acting local anaesthetics e.g., Bupivacaine as an integral part of delivering multimodal analgesia (27). This paper aims to present Southern Cross Block (SBC) technique, a consecutive series of a systematic five region field block using bupivacaine.

## Technique

At the conclusion of the mastectomy a maximal dose of bupivacaine is diluted to 40mls and infiltrated into five areas: Pectoralis major tendon 10mls, Interpectoral groove 10 ml, pectoralis minor tendon 5 ml, nerve to serratus 5 ml, and finally medial wound 10 ml (Fig. 1). This aims to block the medial and lateral pectoral nerves, nerve to serratus anterior, as well as the medial and lateral intercostal nerves.

## Methods

This is a single centre, single surgeon study evaluating the outcomes of the SCB mode of analgesia in 96 patients who underwent a mastectomy surgery for breast cancer from Jan 2020 to Dec 2021. Informed consent was obtained. Participants receiving any other type of blocks were excluded. Post-operative pain was assessed prospectively using Pain severity scale (0–10) at rest and upon movement. The outcomes measured included: Time to first analgesic post operatively, Type of first Analgesic given, type and total dose of analgesics administered in the first 24hours, Pain scores at 1, 3, 6, 12 and 24hours on rest and movement and Analgesia administered on discharge. The collected data was analysed using IBM SPSS Statistics Version: 28.0.0.0 (SPSS Inc., Chicago, IL, USA). The Pearson correlation analysis was performed to examine the relationships among variables of interest.

## Results

The study population included 96 participants, 95 females and 1 male between the age of 29 to 89 years old, the mean age was 58.57. The ethnic background of the recruited population is summarised in

Table 1. No statistically significant correlations were observed between patients' ethnicity and pain scores. The patients' BMI ranged between 17 to 52 with the mean BMI being 30.67, a positive correlation was detected between patients' BMI and the operative duration ( $r(96) = .236, p < 0.05$ ).

Of our 96 recruited participants; 50 underwent left mastectomy; 41 Right mastectomy and 5 patients had a bilateral mastectomy. AND was completed for most patient, a descriptive summary of AND level can be found in Table 2. The mean operating time was 1.12 hours (minimum: 00.38h, maximum: 2:25h) and the block administration took less than 3 minutes on average to perform. 39 patients (40.62%) were on analgesic agents pre-operatively for chronic pain conditions. The median pain score at rest and with movement at 1h was 0 out of 10. Similarly, at 3 hours, the median pain scores reported were 1 and 2, at rest and movement respectively. The pain scores reported at different time intervals are summarised in Table 3. In our study population 67.7% of the participants received Paracetamol as the first analgesics within the first 6 hours post operatively. Only 28.1% of patients required second-line analgesia within the first 24 hours with average commencement at 4.8 hours. The total opioid consumption was minimal, averaging 0.42mg of Oxynorm, 1.3mg of Oxycodone, 1.8mg of Sevredol, and 3.07mg of Morphine Table 4. This indicates an average oral morphine equivalent of 9.7mg. Only 12.5% of patients required a short course of opioids on discharge, with a median of 1 day of inpatient stay. There were no injection adverse events, none returned to theatre or required pain-related readmission.

## Discussion

There is consensus on the value of optimising post mastectomy analgesia for a multitude of reasons, including the prevention of chronic pain syndromes, the detrimental consequences of pain on the patients' physiological state, the demand on nursing care, and to decrease opioid analgesics consumption inpatient, and on discharge. This is particularly important considering the overwhelming association between prescription analgesics and the number of overdose deaths (28). Furthermore, and although controversial, some studies demonstrated a correlation between regional nerve blocks and the reduction of oncological recurrence (29,30). The most likely answer to optimising post operative analgesia is a multimodal approach that enables addressing the dispersed nociceptors in the region. Different types of regional blocks have been proposed, including thoracic paravertebral, Erector Spinae, Intercostal, serratus anterior, and pectoral nerves blocks, utilising different types of Local anaesthetics (LA). Two techniques of pectoral blocks have been described: under Ultrasound (US) guidance, the Pecs I block anesthetizes both the medial pectoral nerve and the lateral pectoral nerve, addressing the interfascial region between the pectoralis major muscle and the pectoral minor muscle at the level of the third rib. PECS II, on the other hand, anesthetizes the area between the pectoralis major and the pectoralis minor as for a Pecs I block, followed by infiltration of LA between the pectoralis minor and the serratus anterior, which will block the 3rd to 6th intercostal nerves, and the long thoracic nerve (31). Similarly, the SCB, aims to anesthetise the medial and lateral pectoral nerves, nerve to serratus anterior, as well as the medial and lateral intercostal nerves. It has the advantage of being a quick method not requiring US guidance. In a systematic review collating data from ten clinical trials investigating the role of wound infiltration with LA following different types of breast surgeries, six trials demonstrated statistically significant reduction

in pain scores, all be it short-lasting, and four observed reductions in pain scores and opioid use (32). The authors questioned the clinical relevance of the small, short lasting pain reduction. It is worth noting that this study results demonstrates 3–4 points of pain reduction compared to the reported average post-mastectomy pain score of 5 (33). This represents about 50–70% reduction which is not dismissible. This finding is in keeping with other studies that demonstrated a clear value of LA infiltration in achieving adequate analgesia and opioid sparing effect (34). Furthermore, the mean oral morphine equivalent use in this study was found to be 9.7mg which is significantly lower than what has been reported in the literature (35). Some of the complications reported with Paravertebral and PEC blocks include intravascular injury considering the proximity to the acromiothoracic artery and cephalic vein, as well as pneumothorax on rare occasions (26). These risks are significantly lower with LA infiltration techniques and were not observed in our patient population.

## Conclusion

The SCB is easy to perform, safe, and it provides significant analgesic effect as demonstrated by over 50% reduction in acute post-mastectomy pain scores and opiate intake.

## Declarations

**Sources of funding:** No funding

**Manuscript type:** original article.

**Disclosure statement:** No conflicts to declare.

**Data availability:** Data is available for review upon request.

**Consent and ethics approval:** All patients consented as per good clinical practice and ethics approval obtained.

The project received ethics approval locally from the surgical department at Middlemore Hospital and was determined to be an audit-like work not requiring ethics approval.

## Acknowledgments:

N/A

## Disclosure

The author reports no conflicts of interest in this work.

# References

<https://www.breastcancerfoundation.org.nz/breast-awareness/breast-cancer-facts/breast-cancer-in-nz>

<https://www.breastcancercure.org.nz/the-facts>

Seneviratne S, Campbell I, Scott N, Coles C, Lawrenson R. Treatment delay for Māori women with breast cancer in New Zealand. *Ethn Health*. 2015;20(2):178-93. doi: 10.1080/13557858.2014.895976. Epub 2014 Mar 18. PMID: 24635721.

Neave L, Harvey V, Benjamin C, Thompson P, Pellett O, Whitlock J, Jones W, Poole G; Auckland Breast Cancer Register Auckland Breast Cancer Study Group. The Auckland Breast Cancer Register: a special project of the Auckland Breast Cancer Study Group. *N Z Med J*. 2003 Oct 24;116(1184):U648. PMID: 14583806.

Franceschini G, Martin Sanchez A, Di Leone A, Magno S, Moschella F, Accetta C, Masetti R. New trends in breast cancer surgery: a therapeutic approach increasingly efficacy and respectful of the patient. *G Chir*. 2015 Jul-Aug;36(4):145-52. doi: 10.11138/gchir/2015.36.4.145. PMID: 26712068; PMCID: PMC4732583.

Kurtz JM, Jacquemier J, Amalric R, Brandone H, Ayme Y, Hans D, Bressac C, Spitalier JM. Breast-conserving therapy for macroscopically multiple cancers. *Ann Surg*. 1990 Jul;212(1):38-44. doi: 10.1097/00000658-199007000-00006. PMID: 2363602; PMCID: PMC1358072.

Legendijk M, van Maaren MC, Saadatmand S, Strobbe LJA, Poortmans PMP, Koppert LB, Tilanus-Linthorst MMA, Siesling S. Breast conserving therapy and mastectomy revisited: Breast cancer-specific survival and the influence of prognostic factors in 129,692 patients. *Int J Cancer*. 2018 Jan 1;142(1):165-175. doi: 10.1002/ijc.31034. Epub 2017 Sep 18. PMID: 28884470.

Sakorafas GH, Farley DR. Optimal management of ductal carcinoma in situ of the breast. *Surg Oncol*. 2003 Dec;12(4):221-40. doi: 10.1016/S0960-7404(03)00031-8. PMID: 14998563.

Leopold KA, Recht A, Schnitt SJ, Connolly JL, Rose MA, Silver B, Harris JR. Results of conservative surgery and radiation therapy for multiple synchronous cancers of one breast. *Int J Radiat Oncol Biol Phys*. 1989 Jan;16(1):11-6. doi: 10.1016/0360-3016(89)90004-7. PMID: 2536361.

Couceiro TC, Valença MM, Raposo MC, Orange FA, Amorim MM. Prevalence of post-mastectomy pain syndrome and associated risk factors: a cross-sectional cohort study. *Pain Manag Nurs*. 2014 Dec;15(4):731-7. doi: 10.1016/j.pmn.2013.07.011. Epub 2013 Oct 19. PMID: 24144570.

Vilholm OJ, Cold S, Rasmussen L, Sindrup SH. The postmastectomy pain syndrome: an epidemiological study on the prevalence of chronic pain after surgery for breast cancer. *Br J Cancer*. 2008 Aug 19;99(4):604-10. doi: 10.1038/sj.bjc.6604534. PMID: 18682712; PMCID: PMC2527825.

Wang L, Guyatt GH, Kennedy SA, Romerosa B, Kwon HY, Kaushal A, Chang Y, Craigie S, de Almeida CPB, Couban RJ, Parascandalo SR, Izhar Z, Reid S, Khan JS, McGillion M, Busse JW. Predictors of persistent pain after breast cancer surgery: a systematic review and meta-analysis of observational studies. *CMAJ*. 2016 Oct 4;188(14):E352-E361. doi: 10.1503/cmaj.151276. Epub 2016 Jul 11. PMID: 27402075; PMCID: PMC5047835.

Classification of chronic pain. Descriptions of chronic pain syndromes and definitions of pain terms. Prepared by the International Association for the Study of Pain, Subcommittee on Taxonomy. *Pain Suppl*. 1986;3:S1-226. PMID: 3461421.

Waltho D, Rockwell G. Post-breast surgery pain syndrome: establishing a consensus for the definition of post-mastectomy pain syndrome to provide a standardized clinical and research approach - a review of the literature and discussion. *Can J Surg*. 2016 Sep;59(5):342-50. doi: 10.1503/cjs.000716. PMID: 27668333; PMCID: PMC5042722.

Bruce J, Thornton AJ, Powell R, Johnston M, Wells M, Heys SD, Thompson AM, Smith CW, Chambers AW, Scott NW; Recovery Study Group. Psychological, surgical, and sociodemographic predictors of pain outcomes after breast cancer surgery: a population-based cohort study. *Pain*. 2014 Feb;155(2):232-243. doi: 10.1016/j.pain.2013.09.028. Epub 2013 Oct 4. PMID: 24099954.

Wang L, Guyatt GH, Kennedy SA, Romerosa B, Kwon HY, Kaushal A, Chang Y, Craigie S, de Almeida CPB, Couban RJ, Parascandalo SR, Izhar Z, Reid S, Khan JS, McGillion M, Busse JW. Predictors of persistent pain after breast cancer surgery: a systematic review and meta-analysis of observational studies. *CMAJ*. 2016 Oct 4;188(14):E352-E361. doi: 10.1503/cmaj.151276. Epub 2016 Jul 11. PMID: 27402075; PMCID: PMC5047835.

Larsson IM, Ahm Sørensen J, Bille C. The Post-mastectomy Pain Syndrome-A Systematic Review of the Treatment Modalities. *Breast J*. 2017 May;23(3):338-343. doi: 10.1111/tbj.12739. Epub 2017 Jan 30. PMID: 28133848.

Humble SR, Dalton AJ, Li L. A systematic review of therapeutic interventions to reduce acute and chronic post-surgical pain after amputation, thoracotomy or mastectomy. *Eur J Pain*. 2015 Apr;19(4):451-65. doi: 10.1002/ejp.567. Epub 2014 Aug 4. PMID: 25088289; PMCID: PMC4405062.

Woolf CJ, Salter MW. Neuronal plasticity: increasing the gain in pain. *Science*. 2000 Jun 9;288(5472):1765-9. doi: 10.1126/science.288.5472.1765. PMID: 10846153.

Moller JF, Nikolajsen L, Rodt SA, Ronning H, Carlsson PS. Thoracic paravertebral block for breast cancer surgery: a randomized double-blind study. *Anesth Analg*. 2007 Dec;105(6):1848-51, table of contents. doi: 10.1213/01.ane.0000286135.21333.fd. PMID: 18042892.

Doss NW, Ipe J, Crimi T, Rajpal S, Cohen S, Fogler RJ, Michael R, Gintautas J. Continuous thoracic epidural anesthesia with 0.2% ropivacaine versus general anesthesia for perioperative management of

modified radical mastectomy. *Anesth Analg*. 2001 Jun;92(6):1552-7. doi: 10.1097/00000539-200106000-00041. PMID: 11375845.

Kolawole IK, Adesina MD, Olaoye IO. Intercostal nerves block for mastectomy in two patients with advanced breast malignancy. *J Natl Med Assoc*. 2006 Mar;98(3):450-3. PMID: 16573313; PMCID: PMC2576110.

Blanco R, Fajardo M, Parras Maldonado T. Ultrasound description of Pecs II (modified Pecs I): a novel approach to breast surgery. *Rev Esp Anesthesiol Reanim*. 2012 Nov;59(9):470-5. doi: 10.1016/j.redar.2012.07.003. Epub 2012 Aug 29. PMID: 22939099.

Versyck B, van Geffen GJ, Chin KJ. Analgesic efficacy of the Pecs II block: a systematic review and meta-analysis. *Anaesthesia*. 2019 May;74(5):663-673. doi: 10.1111/anae.14607. PMID: 30957884.

Versyck B, van Geffen GJ, Chin KJ. Analgesic efficacy of the Pecs II block: a systematic review and meta-analysis. *Anaesthesia*. 2019 May;74(5):663-673. doi: 10.1111/anae.14607. PMID: 30957884.

Kulhari S, Bharti N, Bala I, Arora S, Singh G. Efficacy of pectoral nerve block versus thoracic paravertebral block for postoperative analgesia after radical mastectomy: a randomized controlled trial. *Br J Anaesth*. 2016 Sep;117(3):382-6. doi: 10.1093/bja/aew223. PMID: 27543533.

Rojas KE, Fortes TA, Flom PL, Manasseh DM, Andaz C, Borgen PI. Mastectomy is no longer an indication for postoperative opioid prescription at discharge. *Am J Surg*. 2019 Oct;218(4):700-705. doi: 10.1016/j.amjsurg.2019.07.017. Epub 2019 Jul 18. PMID: 31350009.

Wilson N, Kariisa M, Seth P, Smith H 4th, Davis NL. Drug and Opioid-Involved Overdose Deaths - United States, 2017-2018. *MMWR Morb Mortal Wkly Rep*. 2020 Mar 20;69(11):290-297. doi: 10.15585/mmwr.mm6911a4. PMID: 32191688; PMCID: PMC7739981.

Exadaktylos AK, Buggy DJ, Moriarty DC, Mascha E, Sessler DI. Can anesthetic technique for primary breast cancer surgery affect recurrence or metastasis? *Anesthesiology*. 2006 Oct;105(4):660-4. doi: 10.1097/00000542-200610000-00008. PMID: 17006061; PMCID: PMC1615712.

Sessler DI, Pei L, Huang Y, Fleischmann E, Marhofer P, Kurz A, Mayers DB, Meyer-Treschan TA, Grady M, Tan EY, Ayad S, Mascha EJ, Buggy DJ; Breast Cancer Recurrence Collaboration. Recurrence of breast cancer after regional or general anaesthesia: a randomised controlled trial. *Lancet*. 2019 Nov 16;394(10211):1807-1815. doi: 10.1016/S0140-6736(19)32313-X. Epub 2019 Oct 20. PMID: 31645288.

Ben Aziz M, Mukhdomi T. Regional Anesthesia For Breast Reconstruction. 2022 Feb 10. In: *StatPearls [Internet]*. Treasure Island (FL): StatPearls Publishing; 2022 Jan-. PMID: 33620809.

Byager N, Hansen MS, Mathiesen O, Dahl JB. The analgesic effect of wound infiltration with local anaesthetics after breast surgery: a qualitative systematic review. *Acta Anaesthesiol Scand*. 2014 Apr;58(4):402-10. doi: 10.1111/aas.12287. PMID: 24617619.

Fecho K, Miller NR, Merritt SA, Klauber-Demore N, Hultman CS, Blau WS. Acute and persistent postoperative pain after breast surgery. *Pain Med.* 2009 May-Jun;10(4):708-15. doi: 10.1111/j.1526-4637.2009.00611.x. Epub 2009 Apr 22. PMID: 19453965.

Campbell I, Cavanagh S, Creighton J, French R, Banerjee S, Kerr E, Shirley R. To infiltrate or not? Acute effects of local anaesthetic in breast surgery. *ANZ J Surg.* 2015 May;85(5):353-7. doi: 10.1111/ans.12541. Epub 2014 Apr 22. PMID: 24754798.

Offodile AC 2nd, Gu C, Boukovalas S, Coroneos CJ, Chatterjee A, Largo RD, Butler C. Enhanced recovery after surgery (ERAS) pathways in breast reconstruction: systematic review and meta-analysis of the literature. *Breast Cancer Res Treat.* 2019 Jan;173(1):65-77. doi: 10.1007/s10549-018-4991-8. Epub 2018 Oct 10. PMID: 30306426.

## Tables 1-3

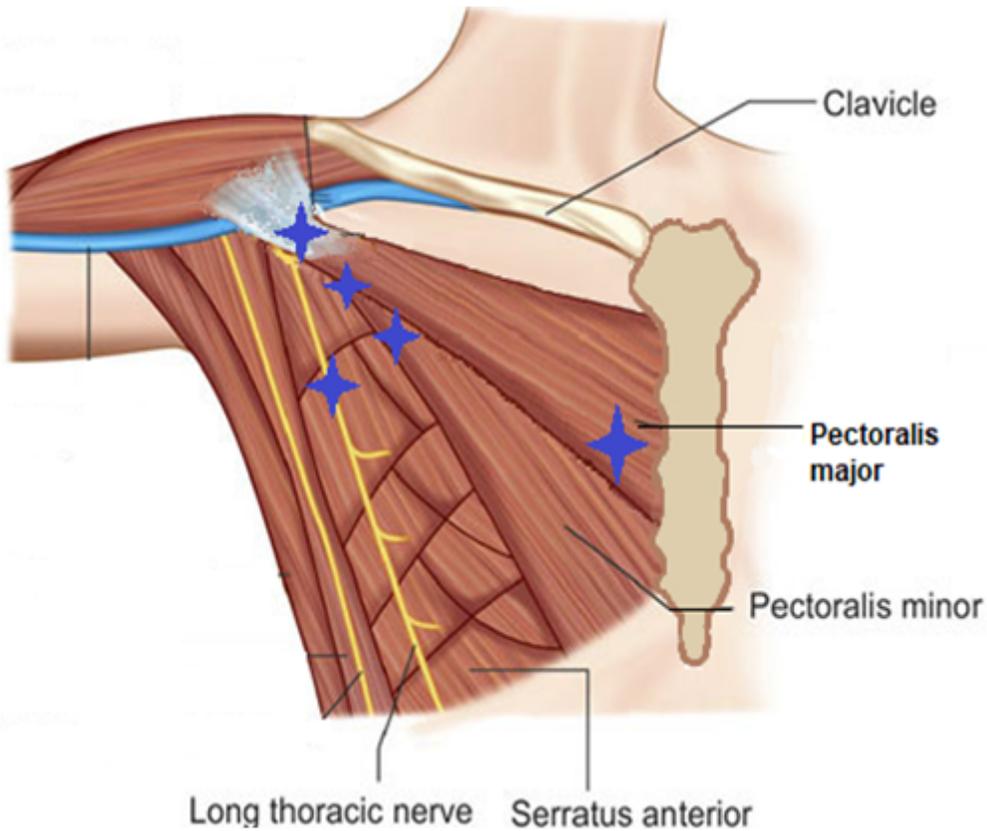
Tables 1-3 are available in the Supplementary Files section.

## Table 4

Table 4

<b>Paracetamol</b>	<b>08.42 g</b>
<b>NSAID</b>	<b>94.00 mg</b>
<b>Tramadol</b>	<b>37.00 mg</b>
<b>Oxynorm</b>	<b>00.40 mg</b>
<b>Oxycodone</b>	<b>01.32 mg</b>
<b>Sevredol</b>	<b>01.80 mg</b>
<b>Morphine</b>	<b>03.07 mg</b>
<b>Table 4: The average analgesics consumption 24 hours post mastectomy</b>	

## Figures



**Figure 1**

At the conclusion of the mastectomy a maximal dose of bupivacaine is diluted to 40mls and infiltrated into five areas: Pectoralis major tendon 10mls, Interpectoral groove 10 ml, pectoralis minor tendon 5 ml, nerve to serratus 5 ml, and finally medial wound 10 ml.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [floatimage1.png](#)
- [floatimage2.png](#)
- [floatimage3.png](#)