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An Observational Analysis about Novel Chest Wall Blocks (PECS and SERRATUS) During Breast Surgery

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Abstract

Introduction: Nowadays breast surgery is one of the common surgical procedure associate with moderate and severe sequences in term of postoperative pain. Recently new chest wall blocks emerged and appear an optimal solution to decrease acute postoperative pain onset with its chronicization.

Materials and Methods: Five Italian Hospitals participated to an observational study. Women submitted to breast surgery performed with the use of chest wall blocks were enrolled to the study. We analyzed the postoperative pain onset in the first 48 hours, the perioperative complications, the perioperative opioids use and postoperative nausea and vomiting rate.

Results: Our multicenter observational analysis yielded 279 women that performed breast surgery addicted with a chest wall blocks in a period of six month. The procedures analyzed were Ductectomy, Lymphadenectomy, and Mastectomy with lymphadenectomy, Mastoplasty, Nodulectomy, Breast plastic, Quadrantectomy with SLNB (Sentinel Lymph Node Biopsy), Quadrantectomy with SLNB and lymphadenectomy. Mastectomy with lymphadenectomy registered the worse postoperative pain at 6 postoperative hours (3 (1,25-4,75[0-8])). The postoperative rescue opioids use was encountered mainly after mastoplasty (16,6%) and lymphadenectomy (16,6%). Postoperative nausea and vomiting rate was 5,01% (all procedures together). None blocks were related to complications, only 2 women referred a motility alteration on surgical side arm with spontaneous resolution.

Discussion and Conclusion: The use of such innovative techniques allows obtaining analgesia of type long-lasting, in the absence of PONV and major complications, reducing, postoperatively, the additional demand for analgesics and antiemetic. Further randomized studies are necessary to confirm our analysis.

Keywords: Regional anesthesia; PECS block; Chest wall block; Breast surgery

Abbreviations

PONV: Postoperative Nausea and Vomiting; PECS: Pectoral Nerve Blocks; RA: Regional Anesthesia; NRS: Numerical Rating Scale; SLNB: Sentinel Lymphonode Biopsy

Introduction

One of the most common surgical procedures performed in woman population is breast surgery [1]. Literature shows that 40% of women will have severe acute post-operative pain after breast cancer surgery, whereas 50% will develop chronic post-mastectomy pain with impaired quality of life [2-3]. Multimodal analgesia with poly-pharmacological approach is fundamental to prevent acute pain onset treating its chronic development. Opioids, main medications in acute postoperative setting, are a good option to control rest pain but they are less effective in the dynamic control of pain; moreover, they cause dose-related side-effects [4]. The association between acute pain and opioids could modify immunologic system efficiency; the consequence is an alteration of immune status with an angiogenis progression with a direct effect on tumour [5-7]. Moreover, Post-Operative Nausea and Vomiting (PONV) is increased by opioids consumption in the breast surgery where there is a majority of female sex, age < 50y and general anesthesia with volatile anesthetic. Regional Anesthesia (RA) techniques have provided a better acute-pain control and, subsequently, less chronic pain [8]. Nowadays, thoracic epidural analgesia and thoracic paravertebral block are gold-standard for the acute pain control in breast surgery [9] but are related with possible complications and technical difficulties. Rafael Blanco described a less invasive novel technique, the Pectoral nerve block (PECS) [10-12]. This novel technique attempts to block the pectoral, intercostobrachial, intercostals II, III, IV, V, VI and long thoracic nerves.

Our multicentric study involves patients submitted at breast surgery with regional analgesia for acute pain control. We observed patients for 48h postoperative and reported acute postoperative pain. Secondary end points are the incidence of PONV, the consumption of analgesic and antiemetic drugs and the analysis of complications block related.

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Table 1: The surgical procedures characteristics with respectively anesthesiological approach (chest wall block type). Type of anesthesia: inhalatory (I), endovenous (E) or none anesthesia/sedation (none). SLNB (Sentinel lymphonode biopsy).

Surgical procedure	N° of patients (tot 279)	Type of anaesthesia (I/E/ none)	Chest wall block performed (n° patients)
Ductectomy	4	0/4/0	PECS II (4)
Lymphadenectomy	6	0/6/0	PECS II (4) Serratus (2)
Mastectomy with lymphadenectomy	40	21/19/0	PECS I+Serratus (6) PECS II (27) Serratus (7)
Mastoplasty	6	2/4/2000	PECS II (4) PECS I (2)
Nodulectomy	35	1/8/2026	PECS II (32) PECS I (3)
Breast plastic surgery	15	9/6/2000	PECS I+Serratus (7) PECS II (8)
Quadrantectomy with SLNB	152	24/128/0	PECS I+Serratus (21) PECS II (89) Serratus (26) PECS II+Serratus (16)
Quadrantectomy with SNLB and lymphadenectomy	22	6/16/2000	PECS II (10) PECS I+Serratus (3) PECS II+Serratus (9)

Table 2: Demographic data. Values are expressed as mean (SD) and number. SLNB (Sentinel lymphonode biopsy).

Surgical procedure	Weight (kg) Mean ± SD	Height (cm) Mean ± SD	Age (years) Mean ± SD	Sex (F/M)	ASA (n° patients)
Ductectomy	64,5±11,5	162,5±2,5	32±7	Apr-00	I 2 II 2
Lymphadenectomy	61,33 ± 6,96	158,66±6,72	66±16,81	1-May	I 2 II 3 III 1
Mastectomy with lymphadenectomy	64±12,50	163±6,54	61±13,98	39/1	I 8 II 29 III 3
Mastoplasty	68±9	163±3,24	56±9,79	Jun-00	I 2 II 4
Nodulectomy	63±14,16	163,31±6,15	43,54±15,67	35/0	I 17 II 18
Breast plastic	67±17,04	163±6,45	50±7,51	15/0	I 5 II 9 III 1
Quadrantectomy with SLNB	66±12,66	161±9,34	62±14,77	152/0	I 38 II 97 III 17
Quadrantectomy with SLNB and lymphadenectomy	66±10	158±6	61±11	22/0	I 2 II 14 III 6

Table 3: The values are expressed are median [IQR (range)]. NRS (Numeric Rating scale). rNRS: Numeric Rating scale at rest, iNRS: Numeric rating scale during activity (incidence). SLNB (Sentinel lymphonode biopsy).

Surgical procedure	rNRS postoperative	iNRS postoperative	rNRS at 6h	iNRS at 6h	rNRS at 24h	iNRS at 24h	rNRS at 48h	iNRS at 48h
Ductectomy	0,5(0-1[0-1])	1(1-1[1-1])	1(1-1[1-1])	1(1-1[1-1])	0,5(0-1[0-1])	0,5(0-1[0-1])	0,5(0-1[0-1])	0,5(0-1[0-1])
Lymphadenectomy	0,5(0-1[0-2])	1(1-2[0-3])	0(0-1[0-3])	1,5(0-3[0-3])	0(0-1[0-1])	0(0-1[0-1])	0(0-1[0-1])	0(0-1[0-2])
Mastectomy with lymphadenectomy	0(0-2[0-4])	2(0-3[0-6])	2(0,25-3,75[0-6])	3(1,25-4,75[0-8])	2(0,25-3[0-7])	3(0,5-4[0-9])	2(0-3[0-7])	2(0-4[0-9])
Mastoplasty	1(1-1[0-4])	1(1-2[1-5])	0,5(0-1[0-2])	0,5(0-1[0-2])	0(0-0[0-0)]	0(0-0[0-0)]	0(0-0[0-0)]	0(0-0[0-0)]
Nodulectomy	1(0-2[0-4)]	1(1-2[0-5])	1(1-2[0-4])	2(1,25-3[0-4])	0(0-1[0-3])	0(0-1[0-3])	0(0-1[0-3])	0(0-2[0-4])
Breast plastic	2(1-2[0-5)]	0(0-3[0-6])	2(0-3[0-4])	2(0-3[0-4])	1(0-2[0-3])	3(0-3[0-5])	2(0-2[0-3])	2(0-3[0-4])
Quadrantectomy with SLNB	1(0-2[0-4])	2(0-3[0-5])	2(0-3[0-6])	2(1-3[0-8])	2(0-2[0-6])	3(1-3[0-7])	1(0-2[0-3])	1(0-3[0-5])
Quadrantectomy with SLNB and lymphadenectomy	2(1-2[0-6])	2(1-3[0-7])	2(1-3[0-4])	3(2-4[0-5])	2(1-2[0-3])	2(2-3[0-4])	0(0-1[0-4])	0,5(0-1[0-4])

Materials and Methods

Study design, setting and recruitment

This is an observational, multi-center study. Study involves five Italian Hospital: Hospital "Circolo Fondazione Macchi" (Varese), Hospital of Cremona, Hospital of Lodi, Hospital "dei Colli" (Napoli) and Hospital of L' Aquila. After the approval of our scientific and research ethic committee, and clinical trials registration (NCT02414256; Principal Investigator Andrea L Ambrosoli. April 7,2015) written informed consent was taken from 279 ASA physical

Table 4: Incidende of PONV and complications block related. The values are expressed as number of patients (percentage). SLNB (Sentinel lymphonode biopsy).

Surgical procedure	PONV n° patients (percentage)	Complications (n° patients)
Ductectomy	0 (0%)	-none
Lymphadenectomy	0 (0%)	-none
Mastectomy with lymphadenectomy	6 (15%)	-none
Mastoplasty	0 (0%)	-none
Nodulectomy	4 (11%)	- Failure to adduct ipsilateral arm (1)
Breast plastic	1 (6,6%)	none
Quadrantectomy with SLNB	2 (1,31%)	none
Quadrantectomy with SLNB and lymphadenectomy	1 (4,5%)	- Failure to adduct ipsilateral arm (1) -Paresthesia ipsilateral brachial plexus (1)

Table 5: Rescue opioids used in breast procedures. Value are expressed as number of patients (percentage). SLNB (Sentinel lymphonode biopsy).

Surgical procedure	Patients received opioids dose rescue n° patients (percentage)
Ductectomy	0 (0%)
Lymphadenectomy	1 (16,6%)
Mastectomy with lymphadenectomy	1 (2,5%)
Mastoplasty	1 (16,6%)
Nodulectomy	0 (0%)
Breast plastic	1 (6,6%)
Quadrantectomy with SLNB	11 (7,2%)
Quadrantectomy with SLNB and lymphadenectomy	2 (9,09%)

status I–II-III patients, with age major of 18 years, scheduled for elective breast surgery between September 2014 and February 2015. Exclusion criteria were ASA physical status IV patients, loco-regional anesthesia contraindication, toxic abuse history, neuropatic disease, and patient's refusal. During preoperative visit; demographic data were recorded and numerical rating score (NRS; 0–10, 0 = no pain, 10 = worst pain) was explained to patients. After informed consent, all patients were placed in the supine position and given sedation in the form of midazolam and fentanyl. Under ultrasonography guidance, patients received single shot pectoral nerve blocks with levobupivacaine 0.25% (analgesia for general anesthesia patients) or mepivacaine 2% (anesthesia in sedated awake patients). Pecs block was performed while the patient in supine position with placing the ipsilateral upper limb in abduction at 90° position with a 80mm needle (SonoTap, Pajunk, Geisingen, Germany) using a linear US probe of high frequency (6-13 MHz) after sheathing. The US probe was first placed at infraclavicular region after skin sterilization and moved laterally to locate 1st rib where pectoralis major and pectoralis minor muscles are identified at this US window. The US probe was moved toward axilla till serratus anterior muscle was identified above 2nd, 3rd and 4th ribs then the needle was inserted in plane injecting 10mL and 20mL of local anesthetic into the fascial plane between Pectoralis muscles (PECS I) and into the fascial plane between pectoralis minor muscle and serratus muscle (PECS II) respectively. Serratus plain block was performed in the same position of PECS II but underneath the serratus muscle, instead above it injecting 10mL of local anesthetic. Patients were then taken to the operating room and received general anesthesia or intravenous sedation if necessary. In the first 48 post-operative hours, every 12h, an investigator monitored and registered Numeric Rating Scale, analgesic drugs consumption, antiemetic drugs consumption and PONV.

Results and Discussion

Our multicenter observational analysis yielded 279 patients that performed breast surgery addicted with a chest wall blocks in a period of six month. Table 1 describes which type of anesthesia/sedation (inhalatory, endovenous) performed and surgical procedures characteristics. Table 2 shows the demographical data of the patients enrolled in the analysis. We have recorded the NRS values (at rest and during activity) registered at scheduled time Table 3. In Table 4 are showed the total events of PONV (defined as necessity to assume postoperative anti-emetics drugs) and complications occurred during and after chest wall blocks execution. We have only three case of strength reduction during of arm abduction in patients that received PECS II block, with a spontaneous resolution after 6 hours Table 4. In Table 5 we have noted the dose rescue of opioids intraoperative or in the immediate postoperative.

This observational multicenter study points out the safety and feasibility of the thoracic wall blocks during inpatient and outpatient breast surgery to manage the postoperative pain, improving outcomes comprehensive surgical success. In literature few reports define the analgesic effects of these techniques and only one randomized controlled trial shows the clinical benefits as diminishing rescue analgesics dose and opioids use [13]. The breast surgery is one of the most common procedures conducted in a hospital setting and is associated with the onset from moderate to severe postoperative pain [1,14-16]. Despite the efforts of the anesthesiologists and the multiple therapeutic strategies actually available there is an increasing, following breast surgery, of chronic pain onset syndromes with a significant quality of life impairment [17]. Generally, in the absence of RA techniques, the maintenance of an adequate postsurgical pain management is achieved by systemic opioids administration.

However, these drugs, while having a proven analgesic efficacy, are characterized by many side effects, such as nausea, vomiting, pruritus, sedation, respiratory depression, delayed channeling, hypotension, urinary retention, as well as immunosuppressive effects and, recently, pro-metastitic rule [4,18-21]. Additionally the surgical stress, pharmacological agents, and anesthetic techniques interact with the immune system and affect the long-term surgical outcome [22-24]. It has been demonstrated that the opioids, are able to depress the defenses, by inhibiting the cell-mediate system, in particular the activity of Natural Killer cells in animal models and humans. On the contrary, local anesthetics accomplish anti-proliferative and cytotoxic effects. Therefore scientific evidence suggests a role of LRA techniques in the prevention of tumor recurrence and the metastasis long-term onset, due to attenuation of the neuro-endocrine response caused by surgical stress and the reduction of intraoperative drugs use that depress immune defenses [24].

Despite advances in research and the many drug therapies available, a lot of patients continue to report PONV within 24 hours after breast surgery. The risk factor to generate postoperative nausea is well documented and the reduction of opioids use is the pillar about prevention strategies. A persistent PONV can result in serious adverse effects extending the duration of hospital care with decreased satisfaction patient. In light of these observations, these locoregional techniques appear as a chance to avoid general anesthesia with adequate antiemetic prophylaxis before or during surgery [25].

Currently, Thoracic Epidural Anesthesia (TEA) and Thoracic Paravertebral Block (TPVB) represent the main techniques to manage postoperative analgesia in breast surgery [26,27]. However, although these techniques allow excellent control of pain, they are not always easy to perform and their clinical effectiveness is limited by the presence of several contraindications, as well as the possible occurrence of systemic side effects or procedural complications [28,29]. Recent literature emphasizes the role of new blocks chest wall block in this surgical field as innovative and simple reproducible locoregional techniques, placed in the context of a multimodal approach [30].

The main limits of our study are related to the observational study type characteristics. These locoregional techniques are closely linked with the physician experience. The use of ultrasound, in experienced hands, allows increasing the success rate of locoregional blocks while reducing the risk of iatrogenic damage. Therefore our survey, providing a multicenter analysis, could present the variability in the clinical efficacy of the technique attributed to execution by different operators. Moreover actually it isn't really possible to define the optimal type, dosage, concentration and volume of local anesthetic, in order to have an effective block of the chest wall, in the absence of systemic complications. Finally, although the results are promising, no analysis was carried out regarding the possible onset of chronic pain in the patient population studied.

Conclusion

The results from our survey, within the limits of the study, demonstrate that the chest wall blocks may be an alternative effective and safe to TEA and TPVB. The use of such innovative techniques allows obtaining analgesia of type long-lasting, in the absence of PONV and major complications, reducing, postoperatively, the additional demand for analgesics and antiemetic. These advantages, suggest the usefulness especially in outpatient surgery thanks to the possibility of an early discharge, without increasing the rate of re-admission. Is our belief that coming studies will demonstrate that chest wall blocks may be complementary to central block as TPVB and TEA in according with the right respect owed to these ancient and scientifically effective loco regional techniques.

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