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The Ultrasound-guided Erector Spinae plane block allows opioid-free Anesthesia in the modified radical mastectomy with axillary lymph node dissection: A pilot study about 14 cases from the national Institut of oncology of Morocco

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Abstract
The Modified radical mastectomy with axillary dissection (MRMAD) is common in the surgical management of breast cancer witch Usually carried out under balanced general anesthesia using opiates. Opioid-free anesthesia (OFA) aims to reduce the undesirable effects of opioids while ensuring optimal anesthesia and analgesia perioperatively. We report the experience of the National Institute of Oncology's Anesthesia team in the implementation of an OFA protocol in breast cancer surgery based on the Erector Spiane plane block (ESPB). We recruited patients scheduled for MRMAD, class ASA I and II, without any contraindications to the anesthetic technique and who are consenting. The protocol included standard monitoring, bispectral index monitoring, propofol-based intravenous induction without curarization, an ultrasound-guided erector spinae plane block and controlled assisted ventilation by a supra-glottic device. Prior to incision, patients received a bolus Ketamine, Ketoprofen, and dexamethasone. Maintenance was performed by sevoflurane. We included 14 patients. The median age was 51 years, the median BMI was 25.9 kg / m². 13 patients were ASA 1. All patients were anesthetized and analgesia without modification of the protocol described. At day 1, out of the 98 VAS surveys performed, in 94 cases the response was less than 3/10. No cases of PONV were noted. Only one patient received a bolus of 3 mg morphine IV as part of the catch-up analgesia. All patients had no resting pain. 5 patients had low mobilization pain without hyperalgesia. The DN4 score was <4/10 in all patients. Overall satisfaction with analgesia had a median of 8.5 / 10. The ESPB allows to practice anesthesia and analgesia in a safe way and with high quality, avoiding the para vertebral block complications and theanterior Serratus Block variable efficiency.

Keywords: opioid free anesthesia, erector Spinae plane block, ketamine, mastectomy

1. Introduction
Breast cancer is the most frequently cancer that occurs to women in morocco according to 2006-2008 data reported by the Rabat Cancer Registry [1]. Surgery is essential for the cure: The Modified radical mastectomy with axillary dissection (MRMAD) is the what is performed the most in breast surgery and especially in our context [2]. Usually carried out under balanced general anesthesia using opiates, it is a source of postoperative nausea, of moderate to severe postoperative acute pain with a risk of postmastectomy pain syndrome in more than 40 % of cases [3].
Opioid-free anesthesia (OFA) implies that no opoids are used during general anesthesia until the patient wakes up [4]. OFA aims to reduce the undesirable effects of opioids while ensuring optimal anesthesia and analgesia, and the post-op complications and speeding recovery times. OFA has been described and used successfully in gynaecological and oncological surgery [5]. Nerve block anaesthesia and analgesia aims to reduce post-op use of opioid to ensure a goal of opioid free analgesia.
We report the experience of the National Institute of Oncology's Anesthesia Department in the implementation of an opioid-free protocol in breast cancer surgery based on ultrasound-guided single shot Erector Spinae Plane Block (ESPB) to ensure opioid free anesthesia and opioid free analgesia.

2. Materials and methods
We recruited for 2 months, in pre-anaesthetic consultation, all female patients scheduled for MRMAD with ASA Class I and II. Patients with a contraindication to the anesthetic technic, or a history of nausea, chronic pain, or prior allergy to local anesthetics, or those who didn't give their consent were excluded.
Anesthesia technic was based on a standard monitoring including ECG, pulse and non-invasive blood pressure (NIBP), an ultrasound-guided single shot erector spinae plane block with 20 ml of 0.25% bupivacaine at T4 level in sitting position under 3 l/min of oxygen and saline perfusion. We used a high-frequency linear ultrasound transducer (Fujifilm Sonosite M-Turbo) witch was placed in a longitudinal orientation 3.0cm lateral to the T5 spinous process. Trapezius, rhomboid major, and erector spinae muscles were identified superficial to the process transverse shadow. The 80 mm 20 G needle was inserted in a cephalic-to-caudal direction until the tip lay in the interfascial plane between rhomboid major and erector spinae muscles, as evidenced by the visible linear spread of fluid between the muscles upon injection.
A propofol-based intravenous induction (2.5 – 3 mg /kg) without curarization case conducted and a supra-glottic device was put in place for controlled assisted ventilation

(EtCO2 at 30-35 mmHg). Maintenance of anesthesia was performed by sevoflurane at 1 MAC. Prior to incision, patients received a bolus of 0.5 mg / kg Ketamine IV, 100 mg Ketoprofen IV, 8 mg dexamethasone IV and 1 g paracetamol IV before waking. In case of haemodynamic repercussions related to nociception or patient move, a bolus of fentanyl at 3 µg / kg was administered in addition to an increase in the sévoflurane dose. For postoperative analgesia, patients had 1 g of paracetamol infusion by 8 hours, 100 mg of ketoprofen if visual analogical scale was > 4/10.

The parameters collected were epidemiological and oncological. Outcomes were

- Modification of anesthetic protocol during the surgery (injection of opiates)
- Occurrence of PONV (nausea, retching or vomiting in the first 24h after surgery)
- Occurrence of postoperative acute pain assessed by the visual analogical scale (on a 10 cm scale, recorded every 2 hours the first day of recovery), and by total consumption (of intravenous catch up morphine in mg), and by DN4 score the morning of day two

3. Results & Discussion

Results

We included 14 out of the 18 recruited patients (2 refusals for regional anesthesia, 2 patients did not give consent for data use). The mean age was 51 years, the mean BMI was 25,9 kg/m². Thirteen patients out of 14 had ASA Status 1. Oncological data are summarized in table 1.

Table 1: Preoperative and oncological data of the fourteen cases

N°	Id	Age	BMI	Side	TNM Class	ASA status	Peropératoire chemotherapy
1	F H	64	27	Left	T4NxM0	1	Yes
2	T H	62	30	Right	T4N2M0	1	Yes
3	L N	52	26	Left	T1N0Mx	1	No
4	M N	48	28	Left	T1N0Mx	1	No
5	K Z	70	25	Right	T4N0Mx	1	Yes
6	S M	41	25	Right	T2N0M0	1	No
7	A F	59	23	Right	T2N1M0	2	Yes
8	C R	49	27	Right	T2N0M0	1	No
9	F F	63	26	Left	T4N0M0	1	Yes
10	E N	28	23	Left	T1N0Mx	1	No
11	C M	38	27	Right	T1N0Mx	1	No
12	S A	50	28	Right	T4N0Mx	1	Yes
13	O A	43	24	Bilateral	T1N0M0	1	No
14	B S	47	24	Left	T2N1M0	1	Yes

BMI: Body mass index

All patients were anesthetized and analgesia without modification of the defined protocol. Hemodynamic data are presented in table 2. Their variations were all less than 20% of baseline. No patient had any intraoperative analgesia supplemented by an opiate.

Table 2: Anesthesiological intra operative data of the fourteen cases

N°	Id	Propofol total dose	Fentanyl infusion	Duration surgery (minutes)	Base line BP (mmHg)	Base line HR (bpm)	Incision BP (mmHg)	Incision HR (bpm)	Dissection BP (mmHg)	Incision HR (bpm)
1	F H	200	0	120	160/80	65	122/70	63	130/70	63
2	T H	250	0	90	170/80	89	132/70	75	130/77	83
3	L N	200	0	120	160/83	92	123/75	85	135/79	89
4	M N	200	0	90	140/90	85	113/65	67	112/62	65
5	K Z	200	0	80	135/76	66	125/75	63	134/78	60
6	S M	150	0	120	142/82	76	124/65	76	133/78	74
7	A F	200	0	120	160/74	95	116/65	66	129/70	64
8	C R	300	0	120	140/73	65	134/65	72	136/66	64
9	F F	300	0	110	140/7 2	94	125/78	69	124/67	65
10	E N	200	0	70	120/7 4	88	101/68	83	114/65	85
11	C M	300	0	85	128/76	75	116/64	71	129/67	71
12	S A	150	0	90	137/78	75	128/66	10	121/63	70
13	O A	250	0	130	134/87	83	108/65	83	104/6 8	83
14	B S	200	0	45	158/79	102	137/75	93	126/74	83

BP: Blood pressure; HR: Heart rate

Upon waking (table 3), patients had a median visual analogical scale of 2/10 [0; 3]. During the first 24 hours, out of the 98 VAS surveys performed, in 94 cases the response was less than 4/10. No cases of PONV were noted. Only one patient received a bolus of 3 mg morphine IV as part of the catch-up analgesia. At 24 h, all patients had no resting pain. Five out of 14 patients had low mobilization pain without hyperalgesia. The DN4 score was < 4/10 in all patients. Overall satisfaction with analgesia had a median of 8.5 / 10.

Table 3: Postoperative pain data of the fourteen cases

N°	Id	PAIN at (by VAS)				PONV	Catch up morphine total dose (mg)	Satisfaction at H24 By VAS / 10
		H2	H12	H24	H36			
1	F H	3	2	2	0	0	0	8
2	T H	3	2	2	0	0	0	8
3	L N	3	2	2	0	0	0	8
4	M N	2	2	3	0	0	0	6
5	K Z	3	2	3	1	0	0	7
6	S M	1	2	3	0	0	0	5
7	A F	5	3	2	1	0	3	6
8	C R	1	2	2	0	0	0	9

9	F F	3	2	1	1	0	0	9
10	E N	1	3	2	2	0	0	9
11	C M	1	1	1	0	0	0	6
12	S A	1	2	2	3	0	0	5
13	O A	2	1	2	0	0	0	8
14	B S	1	2	2	1	0	0	7

VAS: Visual analogic scale

4. Discussion

Opioid-free anesthesia, which is very interesting in breast surgery, is used to avoid short-term and long-term adverse effects of opioids, such as: nausea, post-op hyperalgesia, chronic pain and tumor recurrence. OFA focused also on post-op respiratory safety for patients undergoing ambulatory surgery.

It is possible to achieve a pain free recovery after OFA in breast cancer surgery with a multi target approach combining several autonomic blocking agents, allowing a lower dose of each drug and less operative sedation and hemodynamic repercussion [4]

In our hospital, we have opted for an OFA protocol which is suitable with the products and anaesthetic techniques available in our structure. Knowing that the Dexmedetomidine is not yet available in our hospital, we chose to develop nerve block analgesia. During the year 2017 and 2018, we organized training workshops for the anaesthesia team of the National Institute of Oncology focusing on ALR in breast surgery. The trained doctors were certified in October 2018 for Serratus Plane Block and ESPB.

As blocks were used in postoperative analgesia in mammary surgery, we gradually reduced the use of opioids perioperatively, by systematically instituting a postoperative multimodal analgesia protocol, then operative analgesia and then reduction of opioid doses intraoperatively until complete arrest in the cases described.

In the reported series, we did not have any particular intraoperative, hemodynamic or respiratory difficulties in patient management. No patient required intravenous opioid analgesia supplementation. Postoperative follow-up of patients is satisfactory.

Studies have shown that when used in conjunction with opioid-based general anesthesia, nerve blocks can reduce postoperative pain and opioid requirement [6, 7]. It can also been reduced just by an OFA strategy without nerve block technics. We aimed to associate them.

Traditional regional analgesia techniques such epidural analgesia are very efficient but unsuitable in ambulatory breast surgery [8], and we had difficulties to ensure safety with Thoracic paravertebral blockade witch is still the reference in breast surgery [9]. Recent studies have found greater opioid sparing and analgesic benefits of the anterior blocks as serratus plane block and pecs blocks over the PVB [10,11].

The ESPB, is a diffusion place block targeting myofascial plane located between the erector spinae puscles and the posterior aspect of the transverse process. The objectif is diffusion of the local anesthetic agent in the neural foraminal and in intercostals spaces in several vertebrals levels even with a single shot block. Such as thoracotomy [12], abdominal surgery [13], and spine fusions [14] postoperative pain control, the ESPB have reported safe and efficient in breast surgery [15]

5. Conclusions

ESPB is a good addition to the current multimodal analgesia regimen for breast surgeries.It also allows to practice anesthesia and analgesia in a safe way and with high quality, avoiding the para vertebral block complications and the anterior Serratus Block variable efficiency. By this way, OFA was safe, effective, and provides good postoperative morphine sparing analgesia, facilitates early recovery and discharge after breast surgeries. Prospective and comparative cohort studies are needed to support these clinical findings.

6. Data Availability

The clinical data used to support the findings of this study are included within the article.

7. Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

8. Funding Statement

The 4 authors are members of the anesthesia team of the National Institute of Oncology of Rabat (Morocco), all the medical equipment is provided by the hospital structure. SE and BE have self financed their training at ESPB in 2017. The Institute for Cancer Research (Fes - Morocco) has participated financially in the organization of a certification workshop of the anesthesia team in the realization of ESPB in 2018 (IRC 522 / AAP2017 project).

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