
Nerve Stimulator-Guided Paravertebral Block with Intravenous Sedation in an 85-year-Old Female for Modified Radical Mastectomy*

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ABSTRACT

In the majority of breast surgeries performed in this institution, general anesthesia is employed with concomitant endotracheal intubation. In other countries, thoracic paravertebral block has been popularly used in thoracic and abdominal surgeries due to its various advantages.

Ultrasound-guided techniques is the gold standard in performing peripheral nerve blocks, allowing anesthesiologists to accurately identify the target nerve and monitor the distribution of the anesthetic in real time, which results to a higher success rate and less complications.

In institutions where there are limited resources, especially in training institutions, the utilization of an electrical nerve stimulator can be an alternative means to allow the anesthesiologist to make precise correlations between the anatomy, physiology and clinical effect which can be appreciated instantaneously upon induction, and to precisely identify only the specific nerves that need to be targeted. It is a principal component of an anesthesiologist's arsenal to be adept at performing various techniques to alleviate pain even in situations where latest technological advance is lacking.

This is a case of an 85-year-old female with an 8cm x 8cm mass on her right breast who successfully underwent modified radical mastectomy under thoracic paravertebral block with intravenous sedation.

Key words: Thoracic Paravertebral Block (TPVB), regional anesthesia, breast surgery, Peripheral Nerve Block (PNB), nerve stimulator

The cornerstone of individualized anesthesia care anchors on the premise that each patient has his own needs. A popular or traditionally-used anesthetic technique for a specific surgery might be the best option for one patient while it could be detrimental to another. The anesthesiologists are duty-bound to ensure their patients' safety before, during, and after their operations. All factors must be taken into consideration in order to provide the best anesthetic plan that would limit complications while still providing excellent results. Hence, it is the

anesthesiologist's role to determine what technique would be ideal to meet the patient's needs.

Thoracic paravertebral block is an example of a regional anesthetic technique described as administration of local anesthetic into the space immediately adjacent to the thoracic vertebra where the spinal nerves emerge from the intervertebral foramina. This results in a unilateral somatic and sympathetic nerve block along multiple, continuous thoracic dermatomal levels.³ A single dose of 15-20mL of local anesthetic can provide blockade that can be appreciated up to two levels above and two levels below the site of injection, this single dose can decrease intra- and post-operative use of opioid analgesics and this effect may be seen for up to 72 hours.⁵

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Instances where peripheral nerve block can be used as an alternative to general anesthesia with endotracheal intubation are: when the patient is at greater risk of respiratory depression related to general anesthesia such as those with obstructive sleep apnea, severe obesity, or underlying pulmonary disease putting them at risk for delayed extubation; those belonging to the geriatric population; those who are suspected to have difficult airways; those that are at high risk of post-operative nausea and vomiting; and patients who prefer to remain awake and conscious during their procedure. Aside from decreasing the respiratory and cardiovascular risks associated with general anesthesia, it is known to have a lower incidence of post-operative nausea and vomiting and superior post-operative analgesia, which facilitates early ambulation, recovery, and earlier discharge from the hospital.

The gold standard in peripheral nerve blocks is the ultrasound-guided technique where the spread of the local anesthetic injected can be monitored in real time hence increasing its success rate and lowering the chances of possible complications. Since advances in technology may not be easily accessible to some institutions, alternative means could be employed while still ensuring patient safety and technique efficacy. The paravertebral space may be identified with the use of a nerve stimulator, which can be useful in certain patients such as those who have distorted anatomy or there is an increased risk of pneumothorax.¹

The objective of this report was to present the use of nerve stimulator as an alternative to the standard ultrasound guided technique in nerve localization during peripheral nerve block.

THE CASE

An 85-year-old female who had a 7-year history of a slow growing palpable mass on her right breast was scheduled for Modified Radical Mastectomy. The mass started as a 2cm x 2cm, firm breast mass which slowly increased in size into an 8cm x 8cm, hard, firm, non-movable and non-tender mass. Pre-operative evaluation revealed that she is previously diagnosed with heart failure, to which she was uncompliant with her medications and was poorly documented, gouty arthritis and recently discovered hyperthyroidism. Pre-anesthetic assessment was Mallampati 1 with an ASA Physical Status Score 3. Upon careful consideration, thoracic

paravertebral block was deemed appropriate for the patient to lessen the possible cardiovascular and respiratory complications associated with general anesthesia, and to have better control of the patients' hemodynamics. Regional anesthesia was also considered upon the request of both the patient and the surgeon. On the day of the surgery, the patient was received with stable vital signs. Anesthesia induction was started by positioning the patient on left lateral decubitus position. Anatomic landmarks were identified and the right spinous process of fourth thoracic vertebra was palpated. Strict asepsis and antisepsis were done. Superficial and deep infiltration with Lidocaine 2% was done. An electrical nerve stimulator (B.Braun Stimuplex Dig REV 403) was used and the stimulating needle was inserted at 3 cm lateral to the spinous process of T4. Upon noting visible contractions, a mixture of 15cc mixture of Lidocaine 1% and Levobupivacaine 0.25% was administered to the identified space. Sensory testing was done through pinprick method. Intravenous sedation was provided using fractional doses of Midazolam and Fentanyl, titrated to effect. The procedure lasted for 1 hour, with minimal blood loss. She was then transferred to the post anesthesia care unit with stable vital signs and discharged on the fourth hospital day, second post-operative day without subjective complaints.

DISCUSSION

Thoracic paravertebral block (TPVB) gained popularity for breast surgeries due to numerous advantages including nausea and vomiting and excellent post-operative pain relief, which helps in early ambulation and subsequently early discharge from the hospital as compared to doing general anesthesia.² Studies have also reported that another advantage of using paravertebral anesthesia for breast cancer surgery is that it reduces the risk of recurrence or metastasis.⁷

Evidence suggests that thoracic paravertebral blocks are as effective as epidural blocks for perioperative pain management without many of the side effects of neuraxial techniques. Thoracic paravertebral block offers the advantage of unilateral blockade with significantly lower incidence of hypotension with better hemodynamic stability, urinary retention and respiratory problems. Breast surgeries done under thoracic paravertebral block

(TPVB) have shown that it is an excellent alternative technique as it provides superior pain control (VAS) than conventional techniques.⁹

Peripheral nerve blocks (PNB), specifically thoracic paravertebral blocks (TPVB) are widely used for surgical anesthesia as well as for both post-operative and acute and chronic surgical and non-surgical pain management.⁵ An example of an acute surgical indication in doing thoracic paravertebral block is breast surgery as what was done to the patient. When performing nerve blocks, the goal is to deposit the local anesthetic as close to the nerve as possible while avoiding intraneural injection which may cause trauma and direct toxicity to the nerve. It is classified as a regional anesthetic technique which provides ipsilateral analgesia thru direct effect of local anesthetic resulting in a somatic and sympathetic blockade in a continuous dermatomal manner. It is used most commonly to provide anesthesia or analgesia for mastectomies, cosmetic and other breast surgeries, thoracic surgery, nephrectomy and rib fractures. For breast operations, paravertebral blocks are performed at level T1 to T6.

The thoracic paravertebral space can be described as wedge-shaped which runs continuously from T1 to L1 and is seen on either side of the vertebral column. It is a potential space that contains fatty tissue where the nerves, arteries and veins are found accompanied by the sympathetic trunk. It is limited anteriorly by the parietal pleura, posteriorly by the transverse ligaments and superior transverse ligaments.⁵ A single injection thoracic paravertebral block at T4 level could be performed in lieu of general anesthesia especially in minor procedures providing adequate analgesia for five dermatomal levels. For this case, a single injection block was performed at the T4 level to block two dermatomes above and two dermatomes below the level of injection providing blockade from T2 to T6 level.

The investigator used a nerve stimulator in this case to help her identify her target point. In the absence of the gold standard which is the ultrasound guided technique, the use of the nerve stimulator, plus a sound basic knowledge of anatomical landmarks, makes nerve localization relatively safer than a purely anatomical search and loss of resistance technique. Newer generation resident trainees can still benefit from seeing the specific nerve anatomy and clinical effect which can be appreciated instantaneously upon induction, and to precisely identify only the specific nerves that need to be targeted.

CONCLUSION

Peripheral nerve block and thoracic paravertebral block are excellent alternatives to general anesthesia for patients undergoing breast surgeries due to multiple advantages, specifically better hemodynamic stability, lower incidence of post-operative nausea and vomiting, less post-operative pain and early mobilization and shorter hospital stay. The usage of ultrasound-guided techniques in performing paravertebral block improves success rates and reduces complications, decreases the placement time, vascular puncture, local anesthesia systemic toxicity, and reduces the incidence of pneumothorax. However, using a nerve stimulator could still be used as an alternative tool in performing paravertebral blocks especially in institutions where there are limited resources. The nerve stimulator is both an excellent teaching device and useful tool with potential for future innovations. The utilization of a nerve stimulator allows the anesthesiologists to make precise correlations between the anatomy, physiology and clinical effect which can be appreciated instantaneously upon induction.

Moreover, regional anesthesia may avoid the need for general anesthesia and airway management, especially in this time of pandemic where aerosolization of airway secretion and possible viral spread should be avoided.

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