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Review Article

Pectorial nerve blocks in modern era – A review

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ABSTRACT

The PEC block is a new and innovative technique for the various perioperative procedures. It provides analgesia and anesthesia for breast and other chest surgeries. Since the evolution in USG guided nerve block the PEC block became famous due to easy approach and very good in providing analgesia. There are two ways and two types to provide PEC block and is discussed in this review.

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1. Introduction

With the evolution of technology in regional anesthesia like ultrasound the different types of regional anesthesia are being discovered. Among various types of thoracic regional blocks Pectorial nerve blocks (PECs) block is one the important regional nerve block. In 2011 Blanco et. al., first time described the Pecs I block in which it was described that it is a high volume interfascial block between the pectoralis major and minor muscles.^{1,2} Blanco et al. described a second version of the Pecs block called modified Pecs block or Pecs II block in 2012. Although various techniques are used to provide anaesthesia for surgeries on the chest like, general anesthesia, thoracic epidural, thoracic paravertebral blocks etc, PECs has got added advantages as described below in the text. The article reviews different types of PECs, the approach and local anesthetics used, advantages and disadvantages, indications

and complications.

2. Indications of PECs

Various surgical procedures can be carried out using Pecs I and II blocks. To name some insertion of breast expanders and or prosthesis, placement of permanent pacemaker chamber, automated implantable cardioverter and defibrillator (AICD), thoracic surgeries, breast surgeries.³⁻⁵

2.1. The origin, course and innervation of pectorial nerves

The Pectorial nerve has two components ie, medial and lateral. The medial Pectorial nerve (MPN) which is also known as medial anterior thoracic nerve is a lateral branch of medial cord of brachial plexus thus having route value of C8 and T1. MPN is a motor nerve and supplies both Pectoralis major (PJ) and Pectoralis minor (PM).

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The MPN runs along with the axillary artery and vein and enters the PM muscle. It also receives fibers from Lateral Pectoral Nerve (LPN). The injury to the nerve will cause inability to extend the shoulder joint.

The Lateral Pectoral Nerve (LPN) which is also known as lateral anterior thoracic nerve is a branch of lateral cord of brachial plexus thus having a route value of C5,C6,C7. Upon its origin the nerve runs anterior to axillary vessels and near to clavicle, making entry into the PM muscle. It gives fibers to MPN and makes ansa pectoralis. The LPN supplies both PJ and PM muscles.

In PEC II block the spread of local anesthetic and the clinical efficacy is thought to be independent of whether the local anesthetic is injected between PM and serratus anterior or deep to serratus anterior. The local anesthetic is injection deep to serratus anterior and onto the rib is technically easy but one should be careful about the proximity of pleura. The cadaveric study, injecting deep to serratus plane produced significantly less axillary spread thus making this this approach may be less effective for axillary dissection.⁶

The PEC blocks mainly aims to block both medial and lateral pectoral nerves, 3 to 6 intercostal nerves and the long thoracic nerve.⁷

2.2. The technique and tips for PEC blocks: (Figures 1 and 2)

Always identify the planes before injection of the local anesthetics. The PEC 2 block should be given prior to PEC1 as prior is quite deeper. A total volume of local anesthetic required for the PEC 1 is 10ml and for PEC 2 is 20ml. Patient should in supine and arm in abducted position. Initially the probe should be placed in paramedian position, medial to coracoid process and over the clavicle. If rib is visualized then it will be a second rib. Slowly the probe is moved caudal direction and the 3rd rib is identified. Once 3rd rib is identified the probe should be rotated 90 degrees and reach lateral aspect of PM muscle. Identify the pectoral branch of thoracoacromial artery in that region. Thoracoacromial artery is one of the landmarks and should be taken care while doing PEC blocks. Combined PEC 1 and 2 should be considered whenever breast surgeries with axillary dissection are considered. The target area should be traced from cephalic to caudal area. One should start the scanning from mid clavicular area in sagittal plane and move lateral and caudally and identify the landmarks. Always consider in plane approach for the USG guided PEC blocks. It is comfortable to do the procedure standing at head end of the patient. Always maintain the depth in target area and not to puncture pleura or lung. Whenever bilateral block is planned ensure the toxic doses are not crossed.

Whenever the breast surgery without axillary dissection are planned then both PEC1 and 2 works well; however, for axillary dissection, the conventional Pecs II is likely to produce superior analgesia, i.e injection between serratus

anterior and PM. This will also ensure complete coverage of the deeper pectoral nerve branches.

The Table 1 shows the comparison between PEC1 and PEC2 block.

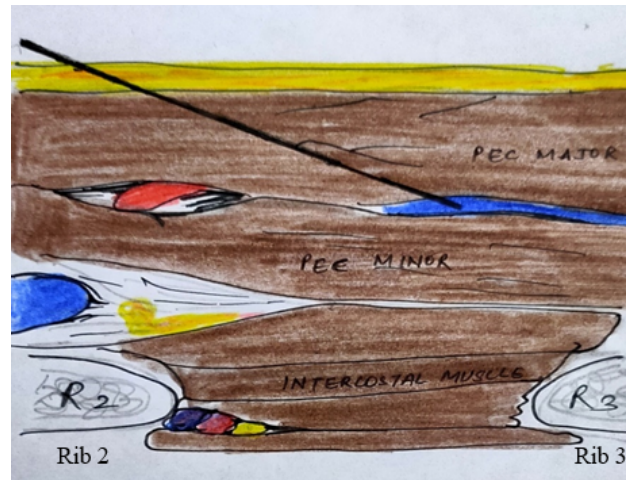


Fig. 1: PEC 1 block, the target and needle placement



Fig. 2: PEC 2 block, the target and needle placement

3. Local Anesthetic Use

The combination of Lignocaine (2%) with adrenaline and Bupivacaine (0.5%) for a total of 30 ml will cover 4 to 6 hours. The various additives like, dexamethasone, dexmedetomidine and fentanyl are practiced.^{8,9} The other local anesthetics like ropivacaine or levobupivacaine can also be used for these blocks. The nerves are of small in diameter thus requiring lesser concentration of drug, however it is a facial plane block it requires high quantity of local anesthetics.

Table 1: Comparison between PEC 1 and PEC 2 blocks.

S.N	PEC 1	PEC 2
1	This block is also known as interpectoral plane block	This block is also known as Serratopectoral plane block
2	Local anesthetic is deposited at the facial plane between PJ and PM muscles	This includes the PEC 1 procedure with local anesthetic deposit between PM and serratus anterior muscle plane
3	The main aim is to block MPN and LPN	The main aim is to block both MPN and LPN with intercostal nerve branches
4	It covers C5 to T1 [LPN (C5-7) MPN (C8-T1)]	It covers C5 to T5/T6 [LPN+MPN+ICN(T2-6)+LTN(C5-7)]
5	Can be used for the minimal invasive procedure of thorax, any surgeries related to PM and PJ muscles.	Along with indications of PEC1, the use can be extended to extensive breast surgeries which has axillary dissection
6	Easy to perform as it is more superficial block	Technically it is complex
7	Less possibility of pneumothorax as a complication	Higher chances of pneumothorax

LPN: Lateral Pectoral Nerve MPN: Medial Pectoral Nerve ICN: Intercostal Nerve

4. Anatomical Landmark Technique

Although it is preferable to give ultrasound guided certainly in some set up where the person is not trained for ultrasound and non-availability of the machine makes to opt this technique. Here one can hit the 3rd rib using 24 G hypodermic needle and feel the loss of resistance while insertion of the needle to give PEC 1 and 2 blocks. It is not uncommon to see the complications like pneumothorax and vascular injuries.

5. Alternative Techniques to PEC Blocks

General anesthesia, thoracic epidural and thoracic paravertebral blocks can be considered. Whenever the PEC blocks are not possible due to visibility which intern due to tumor growth then direct instillation of local anesthetic can be done in facial plan after tissue dissection and this also provides good analgesia.¹⁰

6. Contraindications

Patient refusal, infection at the site of injection and local anesthetic injections are absolute contraindication. The relative contraindications are patient on anticoagulation therapy and extensive tumor spreads.¹¹

7. Complications or Disadvantages

Injury to the thoracoacromial artery, pneumothorax injection of local anesthetics in wrong plane, local anesthetic systemic toxicity and infection at the insertion point are some of the complications. The surgeons concern of recurrence of tumors as possible deposition of cancer cells on normal area, thus one should be cautious while choosing the patient. It is also important to that large amount of local anesthetics does affect the monopolar cautery. One of the major limitations of this block is that it cannot block the internal mammary region thus making.¹²

8. Source of Funding

None.

9. Conflict of Interest

None.

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