

## MUSCULOCUTANEOUS NERVE BLOCK AFTER PECTORAL BLOCK – A RARE SIDE EFFECT

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### БЛОКАДА М'ЯЗОВО-ШКІРНОГО НЕРВА ПІСЛЯ ПЕКТОРАЛЬНОГО БЛОКУ - РІДКІСНИЙ ПОБІЧНИЙ ЕФЕКТ

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Пекторальні блоки стали повсякденним компонентом анестезії для косметичних та реконструктивних втручань на грудях. Блокада латерального грудного нерва покращує післяопераційну аналгезію при операціях, що вимагають введення імплантату в пахову зону. Хоча ця регіональна анестезія забезпечує надійну аналгезію, без потенційного ризику нейроаксіальної блокади, вона не позбавлена ускладнень. Ми описуємо у статті двох пацієнтів, у яких розвинулася блокада м'язово-шкірного нерва після блокади грудного нерва. За нашими даними, цей рідкісний побічний ефект раніше не був описаний в літературі.

**Ключові слова:** блокада м'язово-шкірного нерва, пекторальна блокада, інтенсивна терапія, післяопераційна аналгезія.

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Pectoral nerve blocks have become a common component of anesthesia for cosmetic and reconstructive breast procedures. Blockade of the lateral pectoral nerve improves postoperative analgesia in operations requiring implant insertion in the submuscular plane. Though this regional anesthesia provides reliable analgesia, without the potential risk of a neuraxial block, it is not complication-free. We present two patients who experienced a blocked musculocutaneous nerve after pectoral nerve block. According to our knowledge, this rare side effect was not previously described in the literature.

**Key words:** musculocutaneous nerve block, pectoral block, intensive care, postoperative analgesia.

#### Abstract

Pectoral nerve blocks have become a common component of anesthesia for cosmetic and reconstructive breast procedures. Blockade of the lateral pectoral nerve improves

postoperative analgesia in operations requiring implant insertion in the submuscular plane. Though this regional anesthesia provides reliable analgesia, without the potential risk of a neuraxial block, it is not complication-free. We present two patients who experienced a blocked musculocutaneous nerve after pectoral nerve block. According to our knowledge, this rare side effect was not previously described in the literature.

### **Introduction**

Patients who undergo cosmetic and reconstructive breast procedures may experience severe postoperative pain after the division of pectoralis major muscle fibers. Managing acute postoperative pain is important for achieving positive patient outcomes and satisfaction [1]. Administering regional anesthesia has become common practice for reducing side effects from systemic analgesics and the risk of chronic pain after breast surgery [2].

The pectoral nerves (PEC) block is a superficial nerve block that provides reliable anesthesia. This procedure is less invasive and confers a lower risk of neuraxial complications than other regional anesthesia techniques such as thoracic epidural and thoracic paravertebral block. Though the PEC block is considered safe and efficient, it is not complication-free. We present two patients who experienced a temporary block of the musculocutaneous nerve after PEC block. To the best of our knowledge, this unusual spread of local anesthetic was not previously described in the literature.

### **Case 1**

A 56-year-old woman underwent a modified radical mastectomy of the right breast and immediate breast reconstruction with a tissue expander in total muscular coverage. The expander was inflated with saline solution at 2 weekly intervals postoperatively; to achieve a total volume of 600 cc. Seven months later, the woman was admitted for surgery to replace the expander with a permanent implant. After induction of standard endotracheal anesthesia, PECS I and II blocks were performed under ultrasound (US)-guidance (US machine Sonosite S-Nerve, HFL38/ 13-6 MHz probe, needle Pajunk SonoTAP 80 mm/22G). The fascial plane between the serratus and pectoralis major muscle was visualized at 5 cm depth, and the PECS II block was performed uneventfully with 20 cc of bupivacaine 0.25% solution with the addition of 2 mg of dexamethasone. The fascial plane between the pectoralis minor and major muscles was visualized at 3 cm depth and PECS I was performed on the needle way out movement with 10 cc of bupivacaine 0.25% solution with the addition of 1 mg of dexamethasone. The high injection pressure was increased while injecting the local anesthetic for PECS I. The pressure was considered acceptable for the fascia plane block since no neural structure was considered at risk. The resistance to injection was deemed to be due to high tissue pressure. The patient underwent capsulotomy and the tissue expander was exchanged with a 600-cc round, textured permanent implant. In the early postoperative period, the patient was pain-free. She was discharged to the ward after one-hour observation.

The evening of the same day, the patient complained that she could not flex her arm and had a tingling sensation along the lateral forearm. Otherwise, the neurological exam was normal. Twenty-four hours after the operation, no arm weakness was observed.

### **Case 2**

A 59-year-old woman underwent a modified radical mastectomy of the left breast and immediate breast reconstruction with a tissue expander in total muscular coverage. She was treated postoperatively with chemotherapy and radiation. The expander was inflated with saline solution at 2 weekly intervals to achieve a total volume of 540 cc.

Eleven months later, the patient was admitted for replacement of the expander with a permanent implant. Regional anesthesia was performed as before, with the same equipment and local anesthetic solution, with the addition of dexamethasone, at the same dose. The PECS II block fascial plane was visualized at ~4.5 cm depth, and the PECS I block plane was visualized at ~2.5 cm depth. Also here, the injection of a local anesthetic to the PECS I block demanded high injection pressure. The patient underwent capsulotomy and the tissue expander was exchanged with a 500 cc round textured permanent implant. Five hours after the operation, the patient complained that she could not flex her left arm. Physical examination confirmed her inability to flex her left arm, and decreased sensation in her forearm. Otherwise, the physical examination was normal. The morning after the operation, no arm weakness or decreased sensation was observed.

**For both cases presented, informed written consent for publication was obtained from the patients after assuring that no personal identification data would be presented.**

### **Discussion**

The medial pectoral nerve originates from the medial cord of the brachial plexus, pierces the pectoralis minor muscle, innervating it, and continues to supply the lower half or lower two-thirds of the pectoralis major muscle. Similarly, the lateral pectoral nerve originates from the lateral cord of the brachial plexus. In some cases, two branches of the lateral cord join to form the lateral pectoral nerve. In other cases, a common trunk from the lateral cord of the brachial plexus branches to both the medial and lateral pectoral nerves. The nerves run along the upper border of the pectoralis minor muscle and then run under the surface of the pectoralis major muscle, along with a pectoral branch of the thoracoacromial artery. The latter supplies the upper portion or most of the proximal two-thirds of the pectoralis major muscle [3].

The musculocutaneous nerve (MCN) emerges as the terminal branch of the lateral cord of the brachial plexus. The nerve pierces the coracobrachialis muscle and its branches supply this muscle. From here, the MCN runs along the flexor compartment superficial to the brachialis but deep to the biceps brachii muscle. As it descends, the MCN innervates both these muscles. The MCN terminates as the lateral cutaneous nerve of the forearm, where it supplies the anterolateral skin [4]. As a result, blockade of the MCN is associated with weakness of arm flexion and sensory loss along the lateral forearm.

The two components of the PECS block are PECS I and PECS II. The PECS I block consists of a local anesthetic injection in the fascial plane between the pectoralis major and minor muscles. It anesthetizes the medial and lateral pectoral nerves. The PECS II block consists of a local anesthetic injection in the plane between the pectoralis minor and serratus anterior muscles, and blocks the upper intercostal nerves. PECS I & II blocks are widely accepted techniques for analgesia in patients who undergo breast surgery. Blanco [5] was the first to describe the pectoral block. Later, Blanco et al [6] described the effectiveness of the PECS block for patients with breast expanders and implants. Similarly, Semenza [7] reported successful ultrasound-guided blockade of the lateral pectoral nerve to improve postoperative analgesia after submuscular breast augmentation. Although the PECS block has a lower risk of complications than other neuraxial regional anesthesia, complications are possible. These include the risk of injection into a blood vessel such as the pectoral artery, and the risk of pneumothorax.

MCN block is a rare side effect of PEC I, and may be due to a proximal spread of the local anesthetics affecting the lateral cord. The reasons for this rare side effect are not clear. We believe that local tissue resistance and high injection pressure may be contributing factors.

The increased resistance to local anesthetic injection encountered in our patients could be due to the submuscular prosthesis, which induces high local tissue tension and scarring from previous surgery and radiation therapy. In addition, the prior surgery could have contributed to the observed complication by impairing tissue that serves as a natural barrier to proximal spread of the anesthesia.

In some situations, high pressure can signal imminent intraneural injection. This is a safety issue that should be considered in "classical" nerve block procedures. In the procedures described, the intensity of the applied force did not raise concern, since essential neural structures of substantial size are not present in this area. Moreover, the typical fascial splitting was seen during injection, although of lesser width than usual.

Notably, only the MCN from the lateral cord was blocked and blockage of medial cord nerves was not observed. The course of the median pectoral nerve to the interfascial plane, through the pectoral minor muscle, may have prevented the local anesthesia from blocking the median cord. On the other hand, the lateral pectoral nerve enters this plane through the clavipectoral fascia; thus, no anatomic "obstacle" prevented proximal spread of the local anesthetic.

What can we learn from the cases described? First, there is no need to panic if the side effect described occurs to your patient. The effect is most likely temporary. However, the cases presented underscore a more generalized concern, that interfascial plane blocks could in some circumstances induce unexpected proximal or atypical spread. This raises the question as to the role of high injection pressure. Since interfascial plane blocks require hydrodissection to cover a wide area, a certain degree of force is needed for their application. Clearly, the relation between PEC blocks and blockade of the brachial plexus block is not obvious. The effect of the high injecting pressure at the specific anatomical location needs further investigation. The rare side effect described should be familiar to care providers, both anesthesiologists and surgeons.

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