

Combinations of fascial plane block techniques: a new era and broad horizons in anesthesia and analgesia management

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ABSTRACT

The development of ultrasound-guided fascial plane blocks (FPBs) has revolutionized regional anesthesia, extending their use beyond postoperative analgesia toward surgical anesthesia, particularly in high-risk patients. Combining FPBs to target multiple anatomical planes has emerged as a promising approach to achieve broader sensory coverage and improve analgesic efficacy. This review explores clinically relevant combinations of fascial plane block techniques and their applications in various surgical settings. FPB combinations represent a significant advancement in regional anesthesia by optimizing analgesic coverage, reducing reliance on general or neuraxial anesthesia, and improving perioperative outcomes. Despite their growing use, limitations include variability in local anesthetic spread, requirement for high volumes, and incomplete sensory blockade compared with traditional regional techniques. Future prospective studies are needed to confirm their efficacy and define standardized protocols. Nevertheless, FPB combinations constitute a versatile and evolving component of multimodal anesthesia practice.

Keywords: Fascial plane block, block combination, regional anesthesia, analgesia, multimodal analgesia, ultrasound-guided block

INTRODUCTION

Regional anesthesia techniques performed under ultrasound guidance have become increasingly popular in recent years and are now central to anesthetic practice. The term “regional anesthesia”, used for over twenty years to describe neuroaxial techniques such as spinal/epidural, has undergone a major evolution over the past decade, focusing on fascial plane blocks (FPBs). The contribution of newly defined plane blocks has been significant in this transformation and in the advancement of regional anesthesia. Gaining popularity due to their simple applicability, ease of learning, and safety profiles, FPBs were initially used primarily for postoperative analgesia but are now also being considered as an alternative anesthetic method to general anesthesia or neuraxial anesthesia in carefully selected high-risk patient groups.¹

The main efficacy of fascial plane blocks is based on the prospect that the local anesthetic (LA) agent, when administered between two fascial layers, will reach the

relevant nerves or neural structures.^{2,3} However, the mechanism of action has not been fully proven; for example, mechanisms such as systemic absorption of LA, immunomodulatory effects, and direct innervation of the fascia may also play a role in the efficacy of the Erector Spinae Plane Block (ESPB).⁴

The use of FPBs for analgesia in large areas such as the abdomen and for surgical anesthesia is complex, so clinicians may be uncertain about which block or combination to use in which clinical scenario. At this point, combination blocks that target two anatomical planes and aim to increase the effectiveness of sensory blockage become important. The main mechanism of combinations is to target cutaneous nerve branches that are missed in a single block at a more superficial or deeper fascial plane, cover other nerves innervating the target area, and facilitate the spread of LA beyond the injection site.¹ The spread of high-volume LA

between different fascial layers can result in different clinical outcomes, and combined approaches play a critical role in targeting anatomical variations.

PROMISING FASCIAL PLANE BLOCK COMBINATIONS FOR SURGICAL ANESTHESIA AND ANALGESIA MANAGEMENT

Fascial plane blocks should be combined to fully cover the targeted area when it is difficult to achieve the complex innervation of the surgical site with a single block. The combinations recommended for the desired surgical areas and their analgesic/anesthetic potentials are discussed below:

Breast Blockade (Combinations for Breast Surgery)

Breast surgery requires blocking a more complex dermatome area than Video-Assisted Thoracoscopic Surgery (VATS) because it also involves the axilla and nipple. In awake breast surgery, due to the use of electrocautery, not only sensory block of the skin but also motor block of the pectoral and serratus anterior muscles is mandatory.^{5,6} The breast has a complex innervation (T1-T6 spinal nerves, supraclavicular, pectoral, and intercostobrachial nerves).⁶ To cover this innervation, two or more techniques should be used.

PECS-I (Interpectoral) and PECS-II (Pecto-serratus) blocks+SAPB (serratus anterior plane block): The pectoral and serratus anterior muscles can be blocked both motorly and sensorily with this combination.⁶

PECS II+parasternal block: In order to block those complicated anastomoses in the medial portion of the breast and the midline surgical incision, the Parasternal Block should be added to PECS II and SAPB, which target the lateral and axillary portions of the breast.⁷ In order to offer complete analgesic/anesthetic coverage to all dermatome zones (lateral, central, and medial) needed for breast surgery, this triple combination may be effective.

PECS II+RIB (rhomboid intercostal block) or ESPB+PECS-II/SAPB: These methods can be applied to cover the breast and axilla in conjunction with peri-paravertebral blocks.⁸

Combined SAPB (C-SAPB): Postoperative analgesia can be achieved by blocking the lateral cutaneous branches of the thoracic spinal nerves through the SAPB technique.^{9,10} In the superficial SAPB approach, in addition to the lateral cutaneous branches, the thoracodorsal and long thoracic nerves are also blocked, resulting in motor blockade. Consequently, in breast and VATS surgeries, C-SAPB not only helps prevent block failure but also provides motor blockade, thereby enhancing analgesic efficacy.^{11,12}

Total Abdominal Coverage (Combinations for Extensive and Multiple Dermatome Areas)

The anterior and lateral abdomen are innervated by the T7-T12 thoracoabdominal nerves and the L1 spinal nerve. A single block is obviously insufficient for abdominal surgical procedures that involve large and many dermatome regions.

The blocks and combinations listed below can be utilized to provide anesthesia and significant abdominal analgesia:

Serratus intercostal plane block (SIPB) and rectus sheath block (RSB) combination: This combination works well for both medial and lateral upper abdominal operations.¹³ While the SIPB targets the lateral cutaneous branches of the thoracic nerves, the RSB aims to be effective in managing midline incision and visceral pain. External oblique intercostal plane block can also be chosen for the lateral abdomen.¹⁴

Dual TAPB (transversus abdominis plane block) and TAPA/M-TAPA: Target significant portions of the abdominal wall in an attempt to block the T7-L1 nerves.¹

ESPB and quadratus lumborum block 3 (anterior QLB): Both methods are recommended for large and multiple dermatome areas because of their epidural and paravertebral distribution.¹

TAPB+transversalis fascia plane block (TFPB): A successful combination for lower abdominal and inguinal procedures performed simultaneously.¹⁵

Combinations for Sternotomy + Epigastric Thoracic Drain + Chest Tube

The epigastric thoracic drain and chest tube procedures performed in conjunction with sternotomy require blockage of the sternum, the epigastric area, and the anterolateral chest wall.

Parasternal Blocks: Preferred for the sternal area.^{16,17}

Rectointercostal Plane Block: It has been described for the substernal regions; epigastrium and subxiphoid.¹⁸

Thus, the combination of parasternal blocks with rectointercostal plane blocks, which target the anterior midline of the thorax and the epigastrium, will logically comprise a robust method to produce comprehensive anesthesia or analgesia.¹⁹

SAPB: Following sternotomy procedures, pain caused by the sternotomy line and chest tubes placed along the anterolateral chest wall often leads to significant patient discomfort. In addition to parasternal blocks, the application of SAPB has proven beneficial in alleviating this pain. By performing SAPB-either in its deep or superficial form-effective analgesia of the lateral chest wall can also be achieved.²⁰

Combinations for Hip and Knee Surgery

The lower extremity involves complex innervation of the femoral, sciatic, and obturator nerves. It is important to provide analgesia for both the anterior and posterior capsules of the hip and knee.

Combinations for hip surgery (arthroplasty or fractures):

PENG block (pericapsular nerve group) and QLB combination: Whereas QLB targets the posterior capsule innervation and an extensive dermatome region, PENG targets the hip's anterior capsule innervation to provide analgesia.²¹

Lumbar ESPB and anterior QLB combination: This combination can also be used for surgical anesthesia as an

alternative to neuraxial and general anesthesia in high-risk patients.²² The widespread thoracolumbar distribution of ESPB, combined with QLB's ability to block deep areas, can provide comprehensive anesthesia or analgesia without the need for a sciatic nerve block, even in procedures such as femoral neck fracture hemiarthroplasty.

Knee surgery: IPACK block and adductor canal block (ACB) combination:

IPACK block (interspace between the popliteal artery and capsule of the posterior knee): IPACK targets the sciatic nerve branches that innervate the knee joint's posterior capsule, thus it provides analgesia for posterior knee.²³

ACB: ACB targets the saphenous nerve (sensorial branch of the femoral nerve); it covers the anteromedial part of the knee. This combination provides complete analgesia around the knee and enables mobilization by maintaining the strength of the quadriceps muscle.²⁴

The BiFes block, a novel block for the posteromedial region of the knee, can also be added to these combinations.²⁴

CONCLUSION AND FUTURE DIRECTIONS

Combinations of fascial plane blocks advance regional anesthesia practice and offer an important alternative that minimizes the risks of general anesthesia in high-risk patients with comorbidities. The use of multiple blocks, such as PECS II + SAPB + Parasternal Block to manage complex innervation in breast surgery, and innovative approaches like PENG + QLB or ESPB + QLB to target both the anterior and posterior capsules in hip surgery, demonstrate the analgesic and anesthetic potential of these combinations.

However, limitations exist, such as the inability to provide more intense nerve blockade compared to traditional regional techniques, dependence on larger volumes of LA, and inconsistent dermatome coverage due to variable distribution patterns. Evidence regarding whether combinations can provide surgical anesthesia is still insufficient, and well-designed, randomized, prospective studies are needed in this area. Nevertheless, the long-term effects of FPB combinations on postoperative analgesia and their advantages in preventing complications associated with general anesthesia make them an indispensable part of modern anesthesia. To fully realize the potential of FPBs in the field of surgical anesthesia, more research is needed to validate the effectiveness of combined methods and novel techniques that take anatomical variations into consideration.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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