International Journal of
Regional Anaesthesia

Technical Communication

External Oblique Intercostal Plane Block

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Abstract

External plane fascial plane block is a newer block that targets lateral cutaneous and anterior cutaneous divisions of the thoracoabdominal intercostal nerves. The intended site of injection is the interfacial plane deep to the external oblique muscle and superficial to the underlying intercostal musculature, which extends longitudinally along the anterolateral thoracoabdominal wall. At the level of the sixth rib, a high-frequency linear ultrasound transducer is placed in the sagittal plane between the midclavicular and anterior axillary lines, with the orientation marker directed cranially. The needle is then advanced in-plane from a superomedial-to-inferolateral direction, with the skin entry point just medial to the anterior axillary line at a level cranial to the sixth rib.

Keywords: External oblique intercostal plane, Thoracoabdominal intercostal nerves, Local anaesthetic

History:

Originally described in 2019 as External plane fascial plane block by Hamilton et al. [1]in cadavers where the injection targeted the plane superficial or deep to the external oblique muscle (EOM) at the sixth intercostal space. In 2021, Elsharkawy et al. [2] discussed a modified technique in patients and cadavers, naming it the 'External Oblique Intercostal Block'. Subsequently, Water and Li proposed the term external oblique intercostal fascial plane Block (EOIPB) to better reflect the intermuscular plane of injection, emphasizing its mechanism as a fascial plane block [3].

Anatomical rationale and target fascial plane:

Anatomical Rationale: Abdominal wall is innervated from intercostal nerves T6 to T10 [4]. They arise from anterior rami of spinal nerves course and gives four major branches: the unmyelinated postganglionic fibers of the gray rami communicantes, the posterior cutaneous branch innervating the muscles and skin of the paraspinal area, the lateral cutaneous division providing cutaneous innervation of the chest and abdominal wall, and the anterior cutaneous branch supplying the midline of the chest and abdominal wall [5](Fig. 1). The posterior cutaneous branch innervates the muscles and skin of the paraspinal area, the lateral cutaneous division provides cutaneous innervation of lateral chest and abdominal wall, and the anterior cutaneous branch supplies the midline of the chest and abdominal wall [5].

The EOIPB primarily targets the anterior branch of the lateral cutaneous and the medial and lateral branches of the anterior cutaneous divisions of the thoracoabdominal intercostal nerves. This results in effective analgesia of the anterior and lateral abdominal wall, with sensory coverage extending from T6 to T9 at the midline and from T6 to T10 along the anterior axillary line [1, 2, 6].

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Submitted: 09-09-2025; Reviewed: 05-10-2025; Accepted: 17-11-2025; Published: 10-12-2025

@Author 2025, DOI: https://doi.org/10.13107/ijra.2025.v06.i02.134 | www.ijrajournal.com |

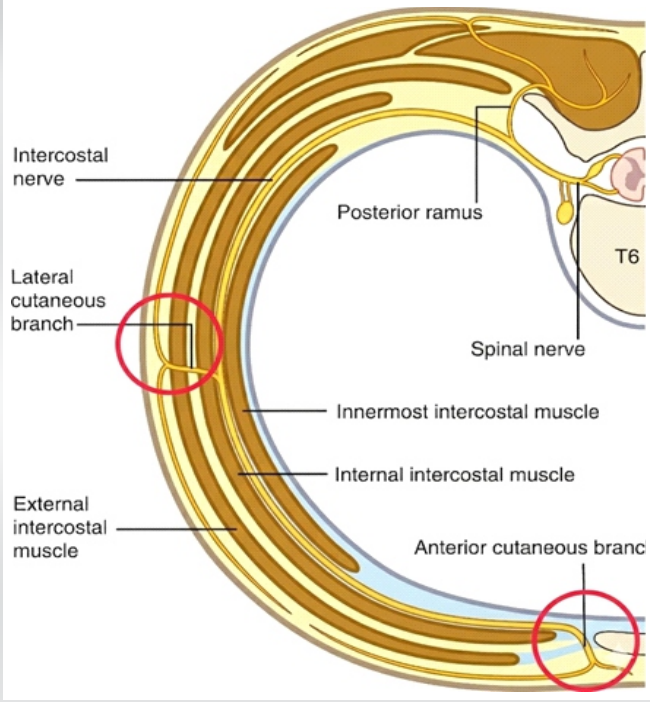

Figure 1: shows anatomy of intercoastal nerves giving anterior and lateral cutaneous branches.

Target Fascial Plane

The intended site of injection is the interfacial plane deep to the external oblique muscle and superficial to the underlying intercostal musculature, which extends longitudinally along the anterolateral thoracoabdominal wall (Fig. 2).

Superficial boundary: External oblique muscle

Deep boundary: Intercostal muscles (medially) or internal oblique (more caudally)

Location: At the caudal end of 6th rib, usually between the midclavicular and anterior axillary lines

This fascial plane is typically entered at caudal border of sixth rib, between the sixth and seventh ribs facilitating cranio-caudal spread of local anaesthetic along the costal margin, enabling blockade of multiple segmental lateral and anterior cutaneous branches of thoracoabdominal nerves from ventral rami of spinal nerves [2, 6].

Ultrasound Technique and Needle Trajectory

The preferred patient position is supine. At the level of the sixth rib, a high-frequency linear ultrasound transducer is placed in the sagittal plane between the midclavicular and anterior axillary lines, with the orientation marker directed cranially. The sixth rib can be identified either by placing the transducer at the lower costal margin to identify the tenth rib and counting cranially, or by identifying the seventh rib at the level of the xiphoid process and moving one rib superiorly. The transducer is then slightly rotated so that the cranial end is directed medially and the caudal end laterally, producing a paramedian sagittal oblique view with a short-axis view of the ribs (approximately 1–2 cm medial to the anterior axillary line).

The following structures are identified from superficial to deep: subcutaneous tissue, external oblique muscle, intercostal muscles, pleura, and lung.

The needle is advanced in-plane from a superomedial-to-inferolateral direction, with the skin entry point just medial to the anterior axillary line at a level cranial to the sixth rib. The needle is advanced through the external oblique muscle into the target plane. (Fig. 3) Hydrodissection of the fascial plane should be performed using 1–2 mL of saline or diluted local anesthetic. Real time visualisation of fascial separation confirms the correct placement [2, 6].

Local Anesthetic Volume and Spread

Commonly used local anaesthetics include bupivacaine (0.25%), ropivacaine (0.2%–0.375%), and levobupivacaine, with typical volumes ranging from 20 to 30 mL per side. For bilateral blocks, the total dose should be adjusted to remain within safe limits (bupivacaine 2 mg/kg, levobupivacaine 2.5 mg/kg, ropivacaine 3 mg/kg). Dermatomal spread following EOIPB appears to be volume dependent, as cranio-caudal dissemination of local anaesthetic within the continuous external oblique–intercostal fascial plane underlies its sensory coverage. Most clinical and cadaveric studies have used 20–30 mL of local anaesthetic per side, consistently achieving blockade of the T6–T10 dermatomes along the anterior axillary line and T6–T9 at the midline, may occasionally range from T5-T11 (Figure 4)[7,8]. However, a definitive volume–response relationship has not yet been established, and dedicated studies evaluating the influence of injectate volume on dermatomal spread are currently lacking. As large volumes of local anaesthetic drug is required for adequate effect, clinical consideration should be given to the total dose as there is risk of local anaesthetic systemic toxicity (LAST) especially in lean and thin patients, patients with

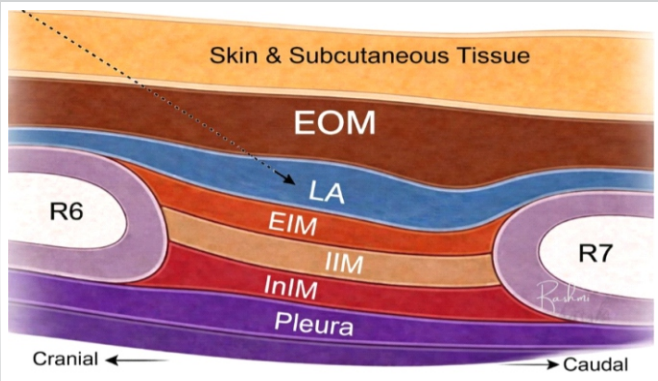

Figure 2: Detailed schematic representation of the external oblique intercostal plane block. EOM = external oblique muscle, EIM = external intercostal muscle, IIM = internal intercostal muscle, INIM = innermost intercostal muscle, R6 = sixth rib, R7 = seventh rib, LA = local anaesthetic, slant black dashed line = in plane needle trajectory

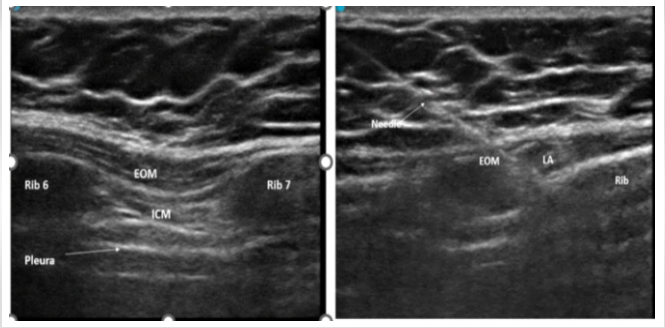

Figure 3: The ultrasonography picture of external oblique intercostal plane block. EOM- External Oblique Muscle, ICM- Intercostal muscles, LA- Local Anaesthetic

impaired drug clearance or where multiple regional techniques are used. Careful dose calculation, incremental injection with frequent aspiration, and adherence to established LAST management protocols are therefore essential.

Adjuvants don't have any much role in fascial plane blocks.

Clinical indications, limitations and misconceptions:

The EOIPB is a relatively superficial block and is easily identifiable, even in obese patients [3, 9, 10]. It can be performed in the supine position, and the injection site is typically away from the surgical field. Additionally, the location is suitable for catheter placement, allowing continuous analgesia.

Indications:

1.Anterolateral Upper Abdominal Wall Surgery- cholecystectomy, sleeve gastrectomy, hepatobiliary procedures, bowel resection, upper abdominal incisions (subcostal/Kocher). It is particularly useful when incision is lateral rather than midline

2. Laparoscopic Surgery (Port-site Analgesia)-ports along costal margin / lateral abdomen, adjunct to multimodal analgesia

3. Breast & thoracoabdominal overlap procedures- selected lower breast surgeries (inferolateral quadrant), chest wall procedures near costal margin

4. Rib/costal margin pain- trauma or post-surgical pain involving lower ribs (T6–T10)

5. When deeper blocks are contraindicated as an alternative to paravertebral block especially in coagulopathy and high-risk patients.

Limitations:

1. EOIPB primarily targets the lateral and anterior cutaneous branches of intercostal nerves with minimal coverage of midline incisions

As a result, EOIPB is not suitable as a sole analgesic technique for midline laparotomy or centrally located surgical incisions.

2. As a fascial plane block, its efficacy is dependent on the longitudinal spread of local anaesthetic, which can vary due to differences in fascial plane continuity and compliance among patients. This variability may result in inconsistent cranio-caudal spread and unpredictable dermatomal coverage, typically ranging from T6 to T10, and occasionally extending from T5 to T11. Differences in the precise injection site and needle placement between operators may further contribute to variability in local anaesthetic distribution within the fascial plane. Consequently, incomplete or patchy analgesia may occur, particularly when lower volumes of local anaesthetic are used.

3. It is a purely somatic block and does not affect visceral afferents, sympathetic pathways. Therefore, it cannot address visceral pain components, necessitating adjunctive systemic analgesics or additional regional techniques.

4. Effective blockade requires relatively large volumes of local anesthetic (20–30 mL per side). In bilateral applications, this may increase the risk of local anaesthetic systemic toxicity (LAST)

Potential risks - risk of pneumothorax from needle insertion, vascular injury, site infection, and anaesthetic toxicity from systemic uptake. Pneumothorax can be reduced by continuous real time visualisation of needle tip throughout the procedure [9]. If a catheter is used in this block, there is a risk of infection and bleeding at the catheter site.

Misconceptions:

1. It is often incorrectly regarded as a modification of the transversus abdominis plane (TAP) block; however, the two techniques differ significantly in both anatomical plane and

Figure 1: Approximate dermatomal coverage following a successful external oblique intercostal block. The dark blue area indicates sensory blockade of the lateral branches of the intercostal nerves (T6–T10), while the light blue area indicates blockade of the anterior branches (T6–T9/10).

neural targets.

2. It may be considered to provide both visceral as well as somatic analgesia whie in reality it is a pure somatic block which provides superior somatic analgesia for the upper anterolateral abdominal wall.

3. Although concerns regarding procedural depth and visceral injury exist, EOIPB is generally considered a relatively superficial fascial plane block with lower theoretical risk of peritoneal puncture when performed under ultrasound guidance.

Practical Insights From Current Practice

1. Careful selection of patient with upper abdominal wall incision significantly influences the success and outcome of block.

2. Hydro dissection of plane is critical as it confirms correct plane and improves speed.

3. Accurate identification of fascial plane block is must. If needle is too superficial, it can lead to subcutaneous spread and deep needle injections can cause unintended spread to TAP plane blocks. So real-time visualisation of fascial spread is more reliable.

4. The technique may be performed as a single-shot block or with catheter placement for continuous analgesia, with bilateral blocks considered when surgical incisions cross the midline.

5. As a volume-dependent block, larger volumes are generally associated with improved cranio-caudal spread and dermatomal coverage.

6. It provides somatic analgesia with sometimes irregular spread. So, it should be integrated into multimodal analgesia strategy rather used as stand-alone technique for major abdominal surgery.

Conclusion:

The external oblique intercostal plane block represents an evolving fascial plane technique with significant potential for upper abdominal analgesia. Its anatomical basis, technical simplicity, and encouraging clinical outcomes support its growing role in multimodal perioperative pain management, although further high-quality studies are warranted.

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Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his/her consent for his/her images and other clinical information to be reported in the Journal. The patient understands that his/her name and initials will not be published, and due efforts will be made to conceal his/her identity, but anonymity cannot be guaranteed.

Conflict of interest: Nil **Source of support:** None

How to cite this article: Syal R. External Oblique Intercostal Plane Block. International Journal of Regional Anaesthesia. July-December 2025; 6(2): 12-15. DOI: https://doi.org/10.13107/ijra.2025.v06.i02.134