

Modified Thoracoabdominal Plane Block (M-TAPA): Narrative Technical Review

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The modified thoracoabdominal plane block through a perichondrial approach (M-TAPA) is an emerging ultrasound-guided fascial plane technique developed to improve analgesia for upper abdominal surgery. This narrative technical review summarizes current anatomical concepts, procedural technique, injectate spread, clinical applications, and available evidence. Relevant anatomical, cadaveric, ultrasound, and clinical studies were critically reviewed to provide a practical overview. Available data indicate that M-TAPA predominantly provides anterior abdominal wall analgesia with preferential involvement of anterior cutaneous branches and may reduce postoperative pain and opioid requirements in selected procedures. Dermatome spread, however, remains variable and appears to depend more on fascial anatomy, probe positioning, and accurate perichondrial plane identification than on injectate volume alone. Existing literature is limited by small sample sizes and heterogeneity in methodology, limiting direct comparisons with established fascial plane blocks. Overall, M-TAPA represents an anatomy-driven refinement with promising clinical utility when performed using meticulous ultrasound guidance and sound anatomical principles.

M-TAPA is a promising ultrasound guided fascial plane block that offers targeted anterior abdominal wall analgesia. Further high-quality comparative studies are needed to define its optimal indications, reproducibility, and role in contemporary perioperative pain management.

Keywords: Modified thoracoabdominal plane block, M-TAPA, Ultrasound-guided fascial plane block, Abdominal wall analgesia, Perioperative pain management.

Introduction

Recent advances in truncal regional anaesthesia have increasingly emphasized detailed anatomical understanding and interfascial spread patterns rather than exclusively nerve-centric approaches. Fascial plane blocks, including the transversus abdominis plane (TAP) block and its variants, have demonstrated clinically meaningful analgesia through strategic deposition of local anaesthetic within continuous fascial planes [1]. Within this context, the modified thoracoabdominal plane block via a perichondrial

approach (M-TAPA) has emerged as a technically distinct interfascial technique designed to potentially improve cranial anterior abdominal wall coverage compared with classical TAP approaches [2].

This article is intended as a narrative technical review integrating available anatomical, ultrasound, cadaveric, and clinical evidence regarding the M-TAPA block. Relevant literature was identified through focused searches of PubMed, Google Scholar, and regional anaesthesia literature using the keywords “M-TAPA”, “thoracoabdominal plane block”, “subcostal TAP”,

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“fascial plane block”, and “thoracoabdominal nerves”.

Anatomical Rationale and Target Plane

Current anatomical understanding suggests that thoracoabdominal nerves traverse beneath the costal margin before continuing between the internal oblique and transversus abdominis muscles. Cadaveric studies have proposed that local anaesthetic deposited in the perichondrial plane near the costochondral junction may spread proximally along fascial pathways and potentially involve anterior divisions of thoraco- abdominal nerves before distal branching [3].

Unlike the classical subcostal TAP block, M-TAPA focuses on the fascial interface adjacent to the lower costal cartilage [4]. This distinction may influence injectate trajectory, cranial spread, and anterior cutaneous branch involvement. However, anatomical variability in thoracoabdominal nerve pathways and costochondral fascial continuity may partly explain inconsistent dermatomal findings reported in both cadaveric and clinical literature [5].

Ultrasound Technique and Needle Trajectory

To perform the M-TAPA block, a high-frequency linear ultrasound probe is positioned in the sagittal orientation over the 10th costal cartilage to identify the external oblique, internal oblique, and transversus abdominis muscle layers [6]. The costal cartilage appears as a hypoechoic structure associated with posterior acoustic shadowing, and the challenge lies in identifying the subtle fascial plane immediately deep to internal oblique muscle.

The needle is typically advanced in-plane toward the inferior aspect of the costal cartilage, with careful attention to identification of the perichondrial fascial plane. Hydro-dissection with small aliquots of saline can facilitate plane identification and confirm appropriate needle placement

before local anaesthetic injection [2,6].

Local Anaesthetic Spread

Available cadaveric and imaging studies suggest that injectate spread following M-TAPA may follow a curvilinear distribution along the lower costal margin. This spread pattern differs from the relatively planar distribution observed with conventional TAP approaches and may contribute to preferential involvement of anterior cutaneous branches [7]. However, lateral spread remains inconsistent, and clinical sensory blockade appears predominantly anterior rather than circumferential [2].

Clinically, this may provide effective analgesia for anterior trocar insertion sites and upper abdominal midline or paramedian incisions, while lateral abdominal wall analgesia may remain variable. This observation challenges some of the early enthusiasm surrounding the block. While initial descriptions suggested broad dermatomal coverage extending from T5 to T12, both cadaveric and clinical data indicate that the effective sensory blockade is narrower and heterogenous dermatomal spread [3]. This is not necessarily a limitation, but it does require a recalibration of expectations. M-TAPA is best understood as a targeted anterior abdominal wall block rather than a comprehensive truncal analgesic technique.

Although larger volumes are frequently used to facilitate spread within the perichondrial plane, current evidence does not clearly demonstrate a linear relationship between injectate volume and dermatomal coverage. Cadaveric and clinical studies suggest that fascial anatomy and injection accuracy may exert a greater influence on spread patterns than volume alone [2,6].

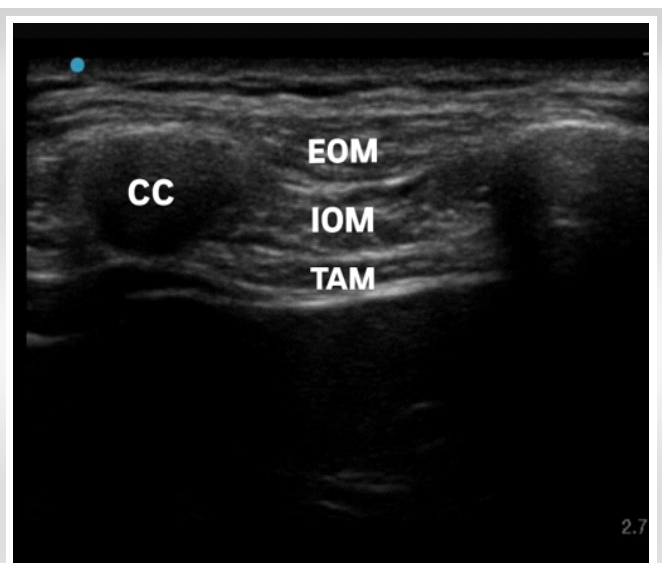


Figure 2: Sonoanatomy of M-TAPA. CC- costal cartilage, EOM- External oblique muscle, IOM- Internal oblique muscle, TAM- Transverse abdominus muscle.

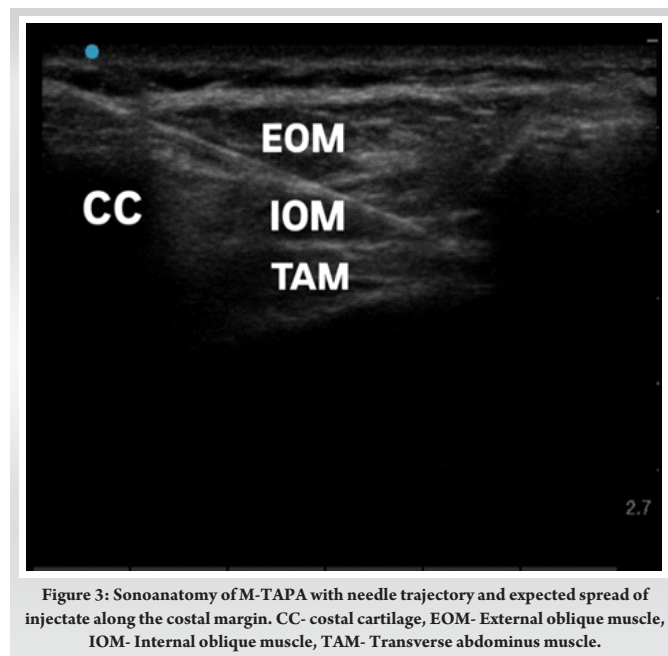


Figure 3: Sonoanatomy of M-TAPA with needle trajectory and expected spread of injectate along the costal margin. CC- costal cartilage, EOM- External oblique muscle, IOM- Internal oblique muscle, TAM- Transverse abdominus muscle.

Clinical Indications and Comparative Mechanisms

Current evidence suggests that M-TAPA may reduce postoperative pain scores and opioid consumption in selected upper abdominal procedures, although available data remain heterogeneous and are largely derived from small studies [8].

However, when compared directly with established techniques such as the subcostal TAP block, the differences in analgesic efficacy are often modest. This raises an important question: is M-TAPA truly superior, or is it simply another way of achieving a similar endpoint? [9]

Compared with quadratus lumborum block techniques, which may provide visceral analgesia through potential paravertebral spread, M-TAPA predominantly targets anterior abdominal wall somatic innervation [10]. Consequently, M-TAPA should not be considered a substitute for posterior truncal approaches when visceral

pain modulation is required.

Practical Technical Insights

Current evidence suggests that M-TAPA is highly operator dependent and technically sensitive. Common procedural challenges include costal cartilage acoustic shadowing, difficulty in consistent fascial plane identification, variable injectate spread, and inconsistent lateral dermatomal coverage. Probe manipulation, needle trajectory optimization, and careful hydrodissection play important roles in improving procedural consistency.

Limitations of Current Evidence

Current evidence regarding M-TAPA remains limited by relatively small sample sizes, heterogeneity in comparator techniques, variability in injectate volumes, and inconsistent methods of dermatomal assessment. Many published studies are single-center experiences or cadaveric investigations with limited external validity. Larger comparative trials with standardized sensory mapping and imaging correlation are required before definitive conclusions regarding superiority or optimal indications can be established.

Conclusion

The modified thoracoabdominal plane block represents an anatomically guided refinement of the anterior abdominal wall interfascial techniques. Available evidence suggests potential advantages in selected upper abdominal procedures, particularly for anterior abdominal wall analgesia. However, current data also demonstrate variability in dermatomal spread and technical reproducibility. Careful patient selection, precise ultrasound-guided plane identification, and an understanding of anatomical variability remain central to successful clinical application.

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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.

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