The Medipol Combination: Novel Rectointercostal Fascial Plane Block and Pectointercostal Fascial Plane Block for Postoperative Analgesia Management After Cardiac Surgery: A Report of 15 Cases

Bahadir Ciftci, MD,*† Burak Omur, MD,* Selcuk Alver, MD,* Ayse Nurmen Akin, MD,* Yahya Yildiz, MD,* and Serkan Tulgar, MD†

The parasternal blocks cannot cover the T7 and lower anterior and lateral branches of the thoracoabdominal nerves. In the open heart surgeries, chest drainage tubes are generally outside the target of the parasternal blocks. Recently, Tulgar et al described a novel interfascial plane block technique named "recto-intercostal fascial plane block" (RIFPB). RIFPB is performed between the rectus abdominis muscle and the sixth to seventh costal cartilages. RIFPB targets the anterior and lateral cutaneous branches of the T6–T9 thoracoabdominal nerves. In this clinical report, we want to share our experiences about pectointercostal plane block and RIFPB combination (Medipol Combination) after cardiac surgery. (A&A Practice. 2024;18:e01794.)

There is growing interest in the use of regional anesthesia for cardiac surgical patients. A number of factors contribute to pain after cardiac surgery including median sternotomy, thoracic retraction, sternal wires, and chest tubes.[1–4] Parasternal fascial plane blocks have become popular and target the anterior branches of the T2–T6 intercostal nerves. Although these blocks can effectively relieve pain associated with sternotomy, they do not mitigate pain from chest tubes that may be placed in the epigastric region through the rectus abdominis muscle (RAM). Chest tube pain continues to be a major problem after cardiac surgery.[5] Recently, Tulgar et al[5] described a novel interfascial plane block technique named "recto-intercostal fascial plane block (RIFPB)." RIFPB is performed at the insertion point of the RAM, between the RAM and the sixth to seventh costal cartilages, just inferolateral to the xiphoid. RIFPB targets the anterior and lateral cutaneous branches of the T6–T9 thoracoabdominal nerves. This novel technique may be a good alternative analgesic choice for pain relief in the area of epigastric drainage tubes. We combined pectointercostal fascial plane block (PIFPB) and RIFPB (Medipol Combination) for postoperative analgesia management in patients who underwent open heart surgery. We want to share our experiences with this combination in this report.

CASE SERIES

Written informed consent was obtained from the patients for this report. This clinical report was retrospectively approved by the Istanbul Medipol University Ethics and Research Committee (Decision No. 840). The demographic data of the patients are shown in Table 1. The PIFPB + RIFPB combination was administered to 15 patients aged between 38 and 88 years. We performed the combination on 10 patients as part of multimodal postoperative analgesia management at the end of the surgery before extubation. We administered the combination to 5 patients for rescue analgesia after surgery in the cardiovascular intensive care unit (CICU). All patients underwent open heart surgery with median sternotomy and an epigastric/subxiphoid drainage tube. Two 28–36 F drainage tubes were inserted in the epigastric area at the end of the surgery. Eight of the patients underwent coronary artery by pass grafting (CABG), 2 had aortic valve replacement, 1 had aortic grafting, 1 had total pericardiectomy, and 3 had mitral valve replacement (Tables 1 and 2). Patients were given 1000 mg paracetamol and 100 mg tramadol intravenous (IV) for multimodal analgesia management 20 minutes before the end of the surgery. The PIFPB+RIFPB combination was performed bilaterally at the end of the surgery.

PIFPB Procedure

We used a high-frequency linear probe (4–12 MHz) and a 22-G, 80-mm block needle for the block procedure. Under sterile conditions, the transducer was covered with a sterile sheath. Then, the transducer was parasagittally placed 1 to 2 cm lateral to the sternal border at the level of the fourth and fifth ribs. The pectoralis major muscle (PMm), intercostal muscle, and pleura were visualized. By using an in-plane technique, the needle was directed toward the fascial plane between PMm and the fourth rib. The needle was inserted here, and 5 mL of isotonic

*From the Department of Anesthesiology and Reanimation, Istanbul Medipol University, Istanbul, Turkey; †Department of Anatomy, Istanbul Medipol University, Istanbul, Turkey; and ‡Department of Anesthesiology and Reanimation, Samsun University Faculty of Medicine, Samsun Training and Research Hospital, Samsun, Turkey.

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Availability of data and material: The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Address correspondence to Ciftci, Bahadir, MD, Department of Anesthesiology and Reanimation, Istanbul Medipol University School of Medicine, Istanbul 34040, Turkey. Address e-mail to bciftci@medipol.edu.tr.

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Table 1. Demographic Data of the Patients, Surgery Type, Volume of the Block, NRS Assessment at Different Time Points, Dermatomal Evaluation, and Need for Rescue Analgesia

Patient	Gender	Age	Height/ weight	Surgery type	Volume	NRS at 1st, 4th, 8th, 16th, 24th, 48th respectively	Dermatome	Rescue analgesia
1	Male	58	170 cm, 80 kg	CABG median sternotomy	40 mL	2, 2, 1, 1, 1,2	T1–T8	None
2	Male	38	172 cm, 75 kg	Aortic valve replacement median sternotomy	40 mL	2, 3, 1, 1, 0,1	T4–T9	None
3	Male	45	175 cm, 87 kg	Total pericardiectomy median sternotomy	60 mL	3, 2, 3, 2, 1,1	T2–T8	None
4	Female	48	169 cm, 80 kg	Aortic valve replacement median sternotomy	40 mL	2, 1, 2, 2, 1,2	T1–T9	None
5	Male	56	172 cm, 98 kg	Mitral valve replacement median sternotomy	40 mL	6, 3, 3, 3, 3,3	N/A	100 mg tramadol
6	Female	53	155 cm, 80 kg	Mitral valve replacement median sternotomy	40 mL	0, 0, 2, 1, 0,0	T1–T9	None
7	Male	42	175 cm, 90 kg	CABG median sternotomy	40 mL	1, 3, 3, 2, 1,0	T2–T7	None
8	Female	88	167 cm, 89 kg	CABG median sternotomy	40 mL	0, 0, 1, 2, 0,1	T1–T8	None
9	Female	56	160 cm, 60 kg	CABG median sternotomy	40 mL	0, 1, 2, 1, 0,2	T2–T8	None
10	Male	62	178 cm, 82 kg	CABG median sternotomy	40 mL	2, 1, 3, 2, 1,1	T2–T9	None

Abbreviations: CABG, coronary artery by pass grafting; NRS, Numeric Rating Scale.

Table 2. Demographic Information and Block Evaluation Results for All Patients Who Were Performed RIFPB as Rescue Analgesic Technique

Patient no.	1	2	3	4	5
Age/gender	53/F	73/F	47/M	46/M	55/M
Height (cm)/weight (kg)	161/79	168/71	170/79	173/79	180/90
Surgery type	CABG median sternotomy	Mitral valve replacement median sternotomy	CABG median sternotomy	Aortic grafting median sternotomy	CABG median sternotomy
Volume (mL)	40 mL	40 mL	40 mL	40 mL	40 mL
NRS change	10 → 2	9 → 3	9 → 1	8 → 2	10 → 1

Abbreviations: CABG, coronary artery by pass grafting; NRS, Numeric Rating Scale; RIFPB, recto-intercostal fascial plane block.

saline was administered for correction. After correction, 10 to 15 mL of 0.25% bupivacaine was administered (Figure 1).

RIFPB Procedure

The sterile transducer was sagittally placed 3 cm lateral and 3 cm caudal to the xiphoid. The RAM and costal cartilage were visualized at the level of the sixth to seventh ribs. The needle was directed, with an in-plane technique, towards the plane between RAM and costal cartilage in a caudo-cranial way. Five mL of isotonic saline was administered here for correction. After correction, 10 to 15 mL of 0.25% bupivacaine was administered (Figure 2).

Postoperative Management and Evaluation

After block application, patients were transferred to the CICU. A dose of 1000 mg paracetamol IV was administered every 8 hours as a routine postoperative analgesic protocol.

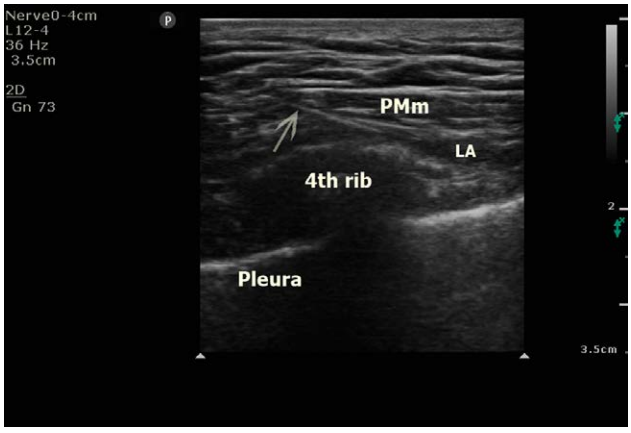

Figure 1. Sonoanatomy of PIFPB and spread of local anesthetic during PIFPB. Arrow indicates the needle. LA indicates local anesthetic; PIFPB, pectointercostal fascial plane block; PMm, pectoralis major muscle.

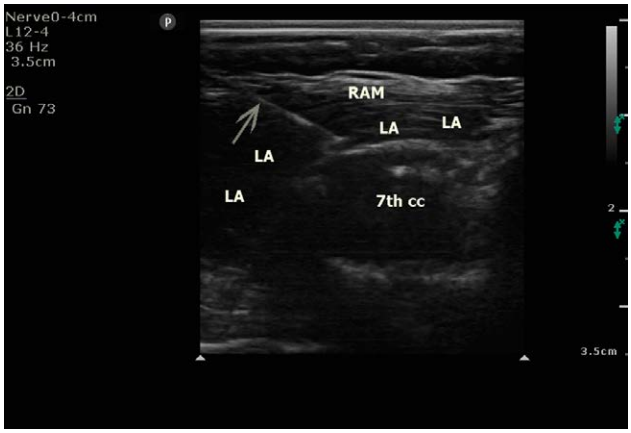

Figure 2. Sonoanatomy of RIFPB and spread of local anesthetic during RIFPB. Arrow indicates the needle. LA indicates local anesthetic; RAM, rectus abdominis muscle; RIFPB, recto-intercostal fascial plane block.

The patients were extubated at the postoperative second hour in the CICU. Pain assessment was performed with a Numeric Rating Scale (NRS) during the postoperative 24 hours. The dermatomal evaluation was performed with a pin-prick test at the postoperative4th hour. As rescue analgesia, 0.5 mg/kg tramadol IV was administered to patients if the NRS was ≥4. Only one of the 10 patients for whom we performed the combination at the end of the surgery had a high pain score (NRS = 6) and required rescue analgesia (tramadol 100 mg). The dermatomal coverage was between T1 and T9 in patients (Table 1). The drainages were removed at the postoperative 24th to 36th hour. The patients were mobilized out of the bed at the postoperative 12th hour. We followed patient's pain score 48 hours after surgery. We continued the patient's pain therapy on the second day after surgery with our classical multimodal analgesia protocol. The average pain scores at each time point for the 10 patients were 1.8 (1st hour), 1.6 (4th hour), 2.1 (8th hour), 1.7 (16th hour), 0.8 (24th hour), and 1.3 (48th hour).

We administered the combination as a rescue analgesic technique to 5 patients (Table 2). The classical multimodal analgesia protocol without regional anesthesia was administered for these patients. Since the patients had high pain scores after being extubated, we applied the block combination in the CICU. There was a dramatic decrease in pain scores. patient 5 in Table 2 had elevated carbon dioxide (Pco_2: 55 mm Hg), respiratory acidosis (pH = 7.12), and desaturation (Po_2: 80 mm Hg) in his blood gas due to severe chest pain. After the combination, the patient's pain was relieved, his acidosis improved (pH = 7.21), his carbon dioxide decreased (Pco_2: 48 mm Hg), and his saturation increased (Po_2: 95 mm Hg).

DISCUSSION

Several methods may be used for analgesia management after cardiac surgery. According to our experiences, the PIFPB + RIFPB combination provided effective postoperative analgesia management after cardiac surgery with median sternotomy and epigastric drainage tubes. In addition, the combination may be used as a rescue analgesia method for patients in the intensive care unit who cannot breathe adequately due to severe pain after surgery. However, it may be hard to perform rescue blocks when chest tubes and bandages are already in place. This disadvantage of the PIFPB + RIFPB combination used for rescue analgesia should not be forgotten. According to our experiences, the expected duration of these blocks is 12 to 24 hours like other interfascial plane block techniques. Other alternative techniques such as bilateral erector spinae plane blocks (ESPB) and thoracic epidural block may be considered for such cases.[6,7] However, to perform ESPB, the patient must be placed in a lateral decubitus position or a sitting position. This situation is difficult for patients who have undergone cardiac surgery and have a thorax tube. The PIFPB + RIFPB combination can be performed comfortably in the supine position without changing the patient's position. Since thoracic epidural is difficult to apply in the thoracic region and has complications such as cord injury, plane blocks may be an easier and safer option in these patients. Opioid agents are commonly used in the postoperative period; however, they have undesirable adverse effects such as sedation and respiratory depression. Indeed, regional anesthesia techniques are performed for postoperative analgesia management after cardiac surgery.[1,2] The sternum is innervated by the anterior branches of the T2–T6 intercostal nerves (Figure 3A). In cardiac surgery with median sternotomies, drainage tubes are commonly placed

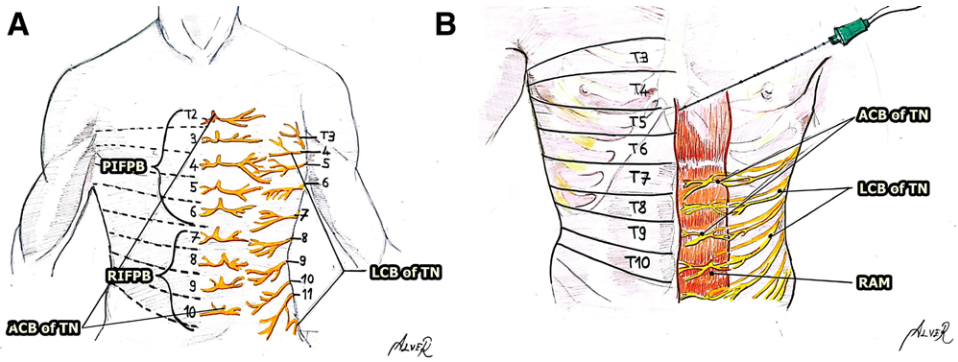

Figure 3. The innervation of sternum and upper abdomen and application areas of the blocks. A, Sternal innervation and innervation of the upper abdomen are seen. The targets of PIFPB and RIFPB are shown schematically. B, Schematic representation of the RIFPB application area and target nerves. The needle targets the fascial plane between the costal cartilage and the rectus abdominis muscle. PIFPB indicates pectointercostal fascial plane block; RIFPB, recto-intercostal fascial plane block.

in the epigastric region. This area is innervated by the T7 and lower anterior/lateral cutaneous branches of the thoracoabdominal nerves (Figure 3A). Superficial and deep parasternal intercostal plane blocks target T2–T6 intercostal nerves (Figure 3A). They fail to block the T6 and lower thoracoabdominal nerves.[5] Therefore, Tulgar et al defined a novel technique, RIFPB, to block T7 and lower levels to provide lower sternal, epigastric, and upper abdominal analgesia (Figure 3A). In their cadaver study, they performed 30 mL of methylene blue between the costal cartilages and RAM (Figure 3B) and reported that there was dye from the fifth to the ninth rib, and the anterior and lateral cutaneous branches of T5–T9 were stained. Toscano et al[3] performed PIFPB and rectus sheath block (PIRS) on a patient with comorbidities who underwent awake sternum revision surgery. They performed the rectus sheath block as a complementary technique to PIFPB. Instead of a classical rectus sheath block, injecting local anesthetic between the costal cartilage and RAM guarantees the blockade of the cutaneous nerves passing through this area.

Our combination has some limitations. It may be hard to perform rescue blocks when chest tubes and bandages are already in the subxhiphoidal area. In addition, since arteria and vena epigastrica inferior move superiorly to the rectus muscle, care must be taken to avoid damaging these vascular structures.

CONCLUSIONS

In our clinic, we have combined PIFPB and RIFPB for postoperative analgesia management after open heart surgery and named this combination "Medipol Combination." According to our clinical observation and experiences, Medipol Combination would be a useful and effective analgesic technique for patients who underwent cardiac surgery. However, randomized-controlled trials (RCTs) instead of case reports are needed to evaluate the efficacy of this combination.

DISCLOSURES

Name: Bahadir Ciftci, MD.
Contribution: This author helped in conceptualization, investigation, methodology, visualization, writing the original draft, and review and editing of the article.
Name: Burak Omur, MD.
Contribution: This author helped in conceptualization, investigation, methodology, visualization, and writing the original draft.
Name: Selcuk Alver, MD.
Contribution: This author helped in conceptualization, investigation, methodology, and visualization.
Name: Ayse Nurmen Akin, MD.
Contribution: This author helped in conceptualization, investigation, methodology, and visualization.
Name: Yahya Yildiz, MD.
Contribution: This author helped in conceptualization, investigation, methodology, and visualization.
Name: Serkan Tulgar, MD.
Contribution: This author helped in conceptualization, investigation, methodology, visualization, and review and editing of the article.
This manuscript was handled by: Kent H. Rehfeldt, MD.

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