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# Erector Spinae Plane Block in pediatric cancer pain: Case report

## *Bloqueo del plano erector espinal en dolor oncológico pediátrico: reporte de caso*

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### Abstract

The advent of the erector spinae plane block brought a new therapeutic option in a multimodal analgesia strategy, as evidenced in this case, which describes a five-year old pre-school patient who presented with severe abdominal cancer pain, secondary to an abdominal neuroblastoma, with partial high-dose opioid response, undergoing bilateral erector spinal plane block. The technique used did not give rise to complications and proved to be effective in blocking pain and reducing the opioid dosage 36 hours after the procedure. The paper discusses the variables involved in the administration mode (continuous infusion vs. bolus) and the benefit for optimal analgesia in the pediatric oncology setting.

### Keywords

Pediatric cancer pain; Children; Regional anesthesia; Erector spinal plane block; Multimodal analgesia.

### Resumen

Con la aparición del bloqueo del plano erector espinal surgen nuevas alternativas terapéuticas dentro de una estrategia de analgesia multimodal, tal como se puede apreciar en este caso, en el cual se describe un paciente preescolar de cinco años, quien cursó con dolor abdominal oncológico intenso secundario a neuroblastoma abdominal con respuesta parcial a opioides en dosis altas y en el que se empleó el bloqueo mencionado aplicado bilateralmente. La técnica empleada no generó complicaciones y demostró ser efectiva al permitir el control del dolor y la disminución de las dosis de opioides en las 36 horas posteriores a su colocación. Se plantea la discusión de variables con relación a la forma de administración (infusión continua vs. bolo) y la utilidad en la optimización analgésica en el contexto oncológico pediátrico.

### Palabras clave

Dolor oncológico pediátrico; Niños; Anestesia regional; Bloqueo del plano erector espinal; Analgesia multimodal.

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## INTRODUCTION

Pain is a frequent, though seldom recognized and usually undertreated occurrence in pediatric patients. (1) A multimodal approach including a non-pharmacological strategy, use of drugs (non-steroidal anti-inflammatory drugs, opioids, adjuvant therapy) and regional anesthesia (RA) is important, with a view to a synergistic action for a more effective pain control and to reduce the treatment side effects. (1) RA has an opioid-sparing effect, reducing adverse effects such as nausea, vomiting, hypoventilation, sedation and delirium. (1,2) Among the locoregional techniques, the Erector Spinae Plane (ESP) block has shown to be effective in managing pain, is a simpler and safer option than the epidural or paravertebral block (2), and its benefits have been reported in various clinical settings, particularly associated with surgical procedures. (3-11)

Following is a description of a case of a pediatric patient diagnosed with an abdominal neuroblastoma, experiencing severe and difficult to control pain, undergoing a bilateral ESP block.

## CLINICAL CASE

Five-year old preschool male from a rural and highly impoverished area, with an otherwise unremarkable history. He initially presented with unquantified weight loss and moderate to severe abdominal pain, unresponsive to NSAIDs (non-steroidal anti-inflammatory drugs). The initial assessment reported chronic moderate malnutrition (weight 15.6 kg [z score -2], height 100 cm [z score, -3]), tachycardic (105 bpm), polypneic (38 bpm), hypertensive (140/70 mmHg, [95 to 99 percentile]), mucotegumentary paleness, overall critical condition, bedridden (Lansky 30%), pain grimaces, severe pain (FLACC 6 points); thoracic dominant breathing with thoracoabdominal dissociation; distended abdomen, free fluids bloating, in addition to a hard mass in the right upper quadrant,

irregular margins of approximately 11 cm in diameter, painful at superficial and deep palpation, increased peristalsis; scrotal edema, atrophic extremities, with pelvic limbs swelling.

Treatment for severe, acute, nociceptive (visceral) abdominal pain secondary to a probable tumor mass was initiated in the emergency department, with paracetamol intravenous analgesia (15 mg/kg/dose) and buprenorphine (initial dose 0.3 µg/kg/h, titrated to 1.5 µg/kg/h). Due to a partial response, adjuvant therapy was added with ketamine (0.1 mg/kg/h), lidocaine (1 mg/kg/h) and dexamethasone (0.3 mg/kg/day), which provided COMFORT 15 and FLACC 1, with stabilization of the baseline pain. Opioid rescue doses were needed because of irruptive pain episodes.

The paraclinical tests revealed normocytic - normochromic anemia (hemoglobin (Hb): 10.40 mg/dL); leukopenia (leucocytes 3.490 10<sup>3</sup>/µL); hypoalbuminemia (albumin 2.61 g/dL) and elevated vanillylmandelic acid (1.234 mg/24 h); contrast CT scan revealed a 11 × 11 × 9 cm mass in the right adrenal gland with cephalic liver displacement and inferior vena cava compression with cavity free fluid. A biopsy confirmed a stage IV neuroblastoma with undifferentiated stroma in the adrenal retroperitoneum. A PET/CT identified 10 mm axillary lymph nodes and a retroperitoneal lesion with extension into the superior pole of the right kidney. The patient was classified as Children's Oncology Group - COG stage IV, and chemotherapy was initiated with etoposide, vincristine and cisplatin at the pediatric oncology service.

During the hospitalization the patient experienced uncontrolled pain and the basal opioid dosage was increased, with multiple rescue dosages up to a maximum total morphine daily dose equivalency of 17.3mg/day. The patient presented with hypoactive delirium (assessed with the Cornell scale) and constipation. Hence, the decision was made to administer a bilateral ESP block with the classical thoracic T-10 approach.

The patient was admitted to the procedure room in accordance with

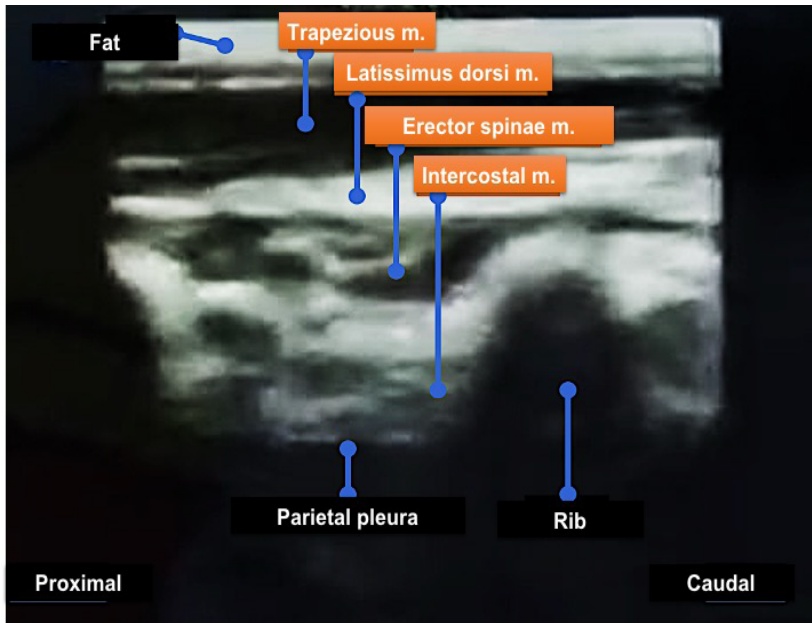
safety protocols. He was sedated with sevoflurane and positioned in lateral decubitus. Asepsis and antisepsis were performed in the dorsal-lumbar region. The patient was scanned with a high-frequency programmed butterfly ultrasound probe in the T10 vertebra. Lidocaine 2% was infiltrated on the skin and subcutaneous tissue; the spinous processes of the T9 - T10 vertebrae were identified, advancing one centimeter externally to identify the transverse process (Figure 1), the lidocaine was infiltrated and subsequently under ultrasound guidance a Touhy #17 needle was introduced, reaching the fascial plane target in the erector spinae muscle. 2% ropivacaine (5 mL) were administered and an 18-G bilateral, 900-1.050 mm long, 9 cm tunneled catheter was placed (after the administration of subdermal lidocaine anesthesia) (Figure 2). The same procedure was used on the opposite side. The procedure was uneventful. Pain was assessed at the end of the procedure resulting in FLACC 0, and sedation-analgesia according to MICHIGAN of 1.

Ropivacaine 0.2% boluses were administered (5 mL every 12 h) in each catheter. The opioid dosage was reduced over the next 36 hours with improved patient's alertness (Table 1). However, the patient complained of discomfort and severe pain when administering the bolus through the catheters. The decision was made to switch to continuous infusion after 48 hours (ropivacaine 0.2 %, 3 mL/h) per each catheter. An increase in the opioid basal and rescue dosage was needed. A bilateral catheter obstruction was identified after 72 hours so the catheters were removed and the decision was made to administer a caudal block as an alternative to regional anesthesia.

## DISCUSSION

The ESP block described for the first time in 2016 by Forero et al. (11), is a technique in which the local anesthetic agent is

**FIGURE 1.** Ultrasound image for a longitudinal approach of the erector spinae muscle at the level of the thoracic vertebra.



SOURCE: Authors.

**FIGURE 2.** Patient with Tunneled ESP block catheters.



SOURCE: Authors.

**TABLE 1.** Variables associated with analgesia management in the case of a pediatric patient with severe cancer pain and ESP block.

Variable	Basal	12 h	24 h	36 h	48 h	60 h	72 h
Total dose of systemic opioids morphine equianalgesic (mg/day)	17.3	8.75	4.3	4.3	6.5	7	9
Bolus infusion	Ropivacaine 0.2% 5 mL every 12 hours per each catheter, total dose every 12 hours 10 mL, total dose every 24 hours 20 mL						
Continuous infusion	Ropivacaine 0.2% 1.5 mL/hour per each catheter = 3 mL hour = 72 mL in 24 hours						
Number of rescue doses *	0	0	0	2	1	2	3
FLACC scale	4	0	0	6	7	7	6
Wong-Baker scale	8	2	2	6	7	7	7
MICHIGAN	3	2	1	1	1	1	1

\* Estimated at 10% of the total daily opioid dose.

SOURCE: Authors.

deposited into the deep fascial plane of the erector spinae muscle and superficial to the tip of the transverse process (2,11,12). The action mechanisms suggested by cadaveric anatomical studies and MRI include the extensive epidural, paravertebral, intercostal, lateral and longitudinal spread of the local anesthetic agent which may significantly contributing to the analgesic effect of the drug (2,11). As is the case with many other regional techniques, the reports on its use in pediatric patients are still limited and are restricted to case series.

The bibliographic review describes the use of the ESP block for postoperative analgesia in various pediatric surgeries, such as thoracotomy (3,4), pectus excavatum/carinatum repair (5), vascular ring repair (6), sternotomy (7), major abdominal surgery (8), laparoscopic cholecystectomy (3,9), nephrectomy (3,10), hip surgery, inguinal hernia repair, orchidopexy, hydrocelectomy, varicocelectomy, ovarian surgery, breast surgery, anoplasty, pyeloplasty, circumcision y colostomy (3,12). There are also case reports of ESP block use in the treatment of neuropathic pain in

burn patients (13), pediatric osteosarcoma, lumbar and epidural invasion. (14) The ESP block is a promising, simpler, and safer alternative to RA, epidural block or thoracic paravertebral block, because the ultrasound target can easily be visualized and the injection site is distant from the neuroaxis, the pleura and the principal vascular structures, reducing the possibility of complications. Moreover, the fascial plane under the erector spinae muscle allows for a craniocaudal spread of the anesthetic and hence a multi-dermatomal coverage which improves pain and allows for a reduction in the use opioids. (3,12) Consequently, the ESP block may be considered a valuable tool for managing children, not just for postoperative pain, but also in case of cancer-associated pain.

The ESP block technique in pediatrics uses a single orifice adult 18-G epidural catheter, since there is no specific pediatric catheter available. While no block-associated complications were reported in this particular case, it should be highlighted that there may be some technical difficulties in the pediatric population due to anatomical and physiological differences. This group of patients has thinner muscle layers, loose connective tissues, and sliding fascial planes. The depth from the skin to the transverse process may be less than 1 cm, according to the age of the patient; therefore, placing the needle immediately under the erector spinae muscle may be a significant challenge requiring a fine puncture technique and a stable patient position.

The 2% ropivacaine bolus dose was estimated at 0.32 mL/kg every 12 h (5 mL), but there are some studies using volumes ranging from 0.2 to 1.25 mL/kg. (3-15) The behavioral FLACC (Face, Legs, Activity, Crying, Consolability) scale and the Wong-Baker scale with pediatric validation and self-report were used. In this particular case, the ESP block was able to provide analgesic control with lower opioid dosage – since pain decreased by 75% (according to the Wong-Baker scale) and 100 % (according to FLACC) —, as well a 75% reduction in the

basal dose of opioids up to 36 hours (Table 1).

Initially the drug was administered in boluses; however, due to the patient's discomfort and severe pain during the administration, the decision was made to switch over to continuous infusion; consideration was given to the possibility of secondary pain, probably due to the activation of polymodal interfascial nociceptors with regards to volume and rate of administration of the bolus. Following this maneuver, it was necessary to increase the total opioid dose and the number of rescue doses (Table 1).

## CONCLUSION

The treatment of cancer pain in pediatric patients is challenging and a multimodal analgesia strategy is recommended. In this situation, RA may provide better analgesia control with fewer side effects. This case exhibits some elements to consider the value of the ESP block in the treatment of cancer-associated abdominal pain in children, as an innovative approach, since as far we know, the ESP block has not yet been described for this indication. However, further studies are needed for more significant evidence of the effectiveness, advantages and limitations of the procedure, in addition to a discussion about the dosing regimen, the concentration and the mode of administration (continuous infusion vs. bolus) of the anesthetic agent in the ESP block needs to be addressed in further studies.

## ETHICAL RESPONSIBILITIES

### Protection of persons and animals

The authors declare that no experiments in humans or animals were conducted for this report. The authors hereby affirm that the procedures followed were consistent with the ethical standards of the responsible

human experimentation committee and in accordance with the World Medical Association and the Declaration of Helsinki.

### Confidentiality of the data

The authors declare that their institutional protocols on the publication of patient data have been adhered to, respecting the protection of personal data.

### Right to privacy and informed consent

The authors declare that there are no patient data disclosed in this article. The authors received the informed consent of patients and/or subjects mentioned in the article. The corresponding author is in possession of this document.

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### Contribution by the authors

**GEAO:** Planning of the report and final draft.

**JARG:** Planning of the report, bibliographic review, final drafting.

**PHBA, MRP and OSR:** Bibliographic review, initial draft.

**JACM:** Conducted the procedure, made comments to the manuscript.

**OCM and JAAE:** Bibliographic review, comments to the manuscript.

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## Conflict of interests

The authors have no conflict of interests to disclose.

## Presentations

None declared.

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