

CONTINUOUS PERIPHERAL BLOCK AS A PAIN TREATMENT FOR REDRESSMENT AND PHYSICAL THERAPY IN A 7-YEAR-OLD CHILD – A CASE REPORT

Ljubica Mikjunovikj-Derebanova¹, Ljupco Donev¹, Lazar Todorovic²,
Vesna Cvetanovska-Naunov², Vasko Demjanski¹, Natalija Cokleska-Shuntov², Violeta Ognjanova¹

¹ University Clinic of Traumatology, Orthopedics, Anesthesiology, Reanimation, Intensive Care and Emergence Center, Skopje, R. N. Macedonia

² University Clinic of Pediatric Surgery, Skopje, R. N. Macedonia

Corresponding author: Ljubica Mikjunovikj-Derebanova, MD, University Clinic for Anesthesiology, Reanimation and Intensive Care Medicine, University "St Cyril and Methodius", Skopje, R. North Macedonia, Mother Theresa St 17, 1000 Skopje, R.N. Macedonia, e-mail: bubemicun@yahoo.com

ABSTRACT

Continuous peripheral nerve block, also known as "local anesthetic perineural infusion," refers to percutaneous placement of a catheter near a peripheral nerve or plexus followed by administration of a local anesthetic through a catheter to provide anesthesia, or analgesia for several days, in some cases even for a month.

This report describes the case of a 7 year old boy with left elbow contracture with limited flexion and extension who was admitted to the Clinic of Pediatric Surgery for redressment of the elbow and physical therapy. An ultrasound-guided axillary brachial plexus block was performed, with placement of a non-tunneled perineural catheter. Redressment of the left elbow was performed twice and before each redressment boluses of local anesthetic were applied through the perineural catheter. Physical therapy was performed painlessly with continuous perineural infusion. On the 5th day of catheter placement, the perineural catheter was removed without any prior complications such as hematoma, infection, catheter dislocation or leakage of local anesthetic.

Our goal is to minimize the psychological and physical trauma to the patient, no matter how immature the patient is. Continuous regional anesthesia in children is a safe technique in postoperative pain management that facilitates early mobilization due to its sufficient analgesia and better comfort. It can provide in-home treatment, with adequate education for patients and parents, and improve rehabilitation in children.

Keywords: continuous peripheral nerve block, axillary nerve block, perineural catheter, pediatric patient

INTRODUCTION

Regional anesthesia, especially peripheral nerve blocks, has a major role in the treatment of perioperative and postoperative pain in patients. A single application of a local anesthetic may provide time-limited analgesia (average 12-15 hours) [1], while continuous infusion through a peripheral nerve catheter prolongs the duration of postoperative analgesia. The use of peripheral

nerve catheters is widespread in the adult population, yet their use in children is increasing [2,3,4].

Advances in pediatric regional anesthesia have helped with the treatment of acute and chronic pain. Continuous peripheral nerve block, also known as "local anesthetic perineural infusion," refers to percutaneous placement of a catheter near a peripheral nerve or plexus followed by

the administration of a local anesthetic through a catheter to provide anesthesia [5], or analgesia for several days, in some cases even a month.

Peripheral nerve catheters (PNC's) have shown similar analgesia compared to neuroaxial blocks, but are also considered safer than neuroaxial approaches because complications such as bleeding or infection are easier to treat in most peripheral blocks. Also, side effects in PNC's are less common [6].

CASE REPORTS

A 7-year-old boy was admitted to the Clinic of Pediatric Surgery due to a left elbow contracture with limited flexion and extension. 9 months earlier, due to a direct fall on his left elbow, the patient was diagnosed with supracondylar fracture of the left humerus which was surgically treated in another hospital with a posterior approach. Upon physical examination, we found limitation in the active flexion and extension of the left elbow as well as poor passive movements. A redressment on the left elbow was indicated. After prior discussion and written consent from the parents, a perineural catheter was placed in the left axillary region. The patient was analogosedated by intravenous administration of 0.1 mg/kg midazolam, 1 mcg/kg fentanyl and 5 mg/kg/h propofol before performing of the continuous peripheral block.

The patient was positioned with the arm abducted at 80-90°, externally rotated and flexed at the elbow at 80° because that was the maximum flexion (if the patient does not have a contracture in the elbow, the flexion position should be 90°) (Figure 1). The skin of the left axilla was cleaned with iodine solution. The Siemens ACUSON P500 ultrasound with a linear probe of 8-12 MHz was used for placement of the peripheral nerve catheter and a Perifix ONEPaed Set 20 epidural catheter was placed percutaneously. The linear probe was isolated with a long sterile probe sleeve. The probe was positioned in a transverse plane perpendicular to the axis of the humerus over the location of the palpable axillary artery. The scan visualized a. axillaris, several smaller axillary veins, and the three terminal nerves of the plexus brachialis or n. medianus, n. radialis and n. ulnaris. With a slight pressure of the probe, the axillary veins collapsed in order to prevent accidental puncture and application of the local an-

esthetic when we were placing the catheter perineurally. The nerves were visualized around a. axillaris with an oval honeycomb-like appearance of hypoechoic structures, surrounded by hyperechoic connective tissue or epineurium [7,8]. N. medianus was placed little bit above a. axillaris, between the artery and biceps brachii muscle, n. ulnaris was localized medially and n. radialis posterior to the artery (Figure 2).



Figure 1. Position of the arm prior placement of the continuous peripheral block

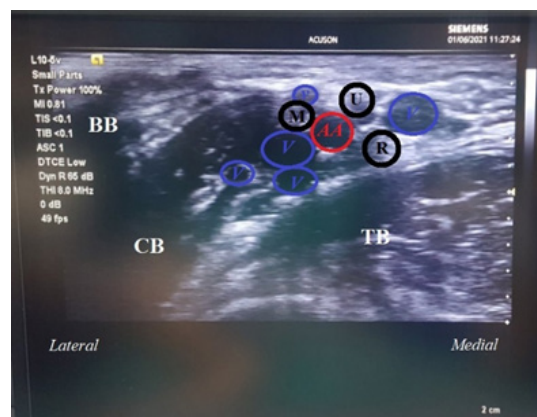


Figure 2. Ultrasound finding of the plexus brachialis – axillary approach: AA – a. axillaris, V – veins, BB – m. biceps brachii, CB – m. coracobrachialis, TB – m. triceps brachii, M – n. medianus, U – n. ulnaris, R – n. radialis

After visualization of all structures, a 20G Tuohy needle was inserted in-plane with respect to the probe axis (Figure 3). The needle was advanced until the tip was placed in the appropriate position which was confirmed by applying 1-2ml of 5% dextrose. 5% dextrose is used to hydro-dissect the tissue to confirm the position of the needle tip, to provide space for catheter advancement, and to create a better contrast medium for visualization of the needle tip and the cath-



Figure 4. *Ultrasound finding of placement of the epidural catheter perineurally: AA - a. axillaris, the black arrows indicate the Tuohy needle, and the red arrows mark the epidural catheter with its tip*

Clinic with achieved flexion of 140° and extension of 10°.

DISCUSSION

Pain is often underestimated in the pediatric population, due to the fear of the use of opiate analgesics and their side effects which leads to insufficient pain treatment in these patients. Repeating painful procedures, especially in young children, determines the pain threshold for life. However, inadequate treatment of acute pain is also one of the risk factors that can lead to the development of chronic pain [9]. Therefore, a multimodal approach that include use of weaker analgesics in combination with peripheral nerve blocks provides good pain control with minimal side effects from the use of high doses of strong opiate analgesics [10].

In pediatric patients, PNCs are used for postoperative analgesia in orthopedic surgery or in general surgery and are usually removed after 2 to 3 days [11], while long-term use occurs in patients with chronic pain such as oncology patients for palliative therapy [12-15].

When performing a peripheral nerve block and catheter placement in children, anatomical and physiological differences between adults and children should always be considered, newer local anesthetics such as ropivacaine and levobupivacaine should be used, and equipment intended for pediatric patients must be used [16]. Great progress has been made in pediatric anesthesia with the use of high-resolution ultrasound. Better visualization of the anatomical structures provides greater precision in guiding the needle and placement of the perineural catheter, but it can also be confirmed that the drug has been administered in the right place.

There are three techniques for placing perineural catheters: the non-stimulating catheter technique, the stimulating catheter technique, and ultrasound-guided catheter technique [17]. In recent years, with the use of ultrasound in regional anesthesia, placement of ultrasound-guided perineural catheters in pediatric patients is considered a safe technique and is one of the latest trends in this population [18]. A non-stimulating epidural catheter or a "stimulating" catheter may be used through which current is delivered.

Continuous peripheral block reduces the incidence of nausea and vomiting in patients, makes patients more satisfied, provides better and faster postoperative rehabilitation, and reduces the incidence of postoperative chronic pain syndromes. The use of PNC in outpatients, that is, patients who are sent home with an implanted PNC, is a growing trend worldwide [19].

CONCLUSION

The safety of continuous regional anesthesia in children is due to the use of low concentrations of L-enantiomers (ropivacaine and levobupivacaine) so that the concentration of local anesthetics is low and thus the risk of systemic toxicity from these drugs is reduced to minimum. Perineural catheters facilitate early mobilization due to sufficient analgesia and better comfort, provide in-home treatment with adequate education for patients and parents, and improve rehabilitation in children.

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Резиме**КОНТИНУИРАН ПЕРИФЕРЕН БЛОК КАКО ТРЕТМАН НА БОЛКА ПРИ РЕДРЕСМАН И ФИЗИКАЛНА ТЕРАПИЈА КАЈ 7-ГОДИШНО ДЕТЕ – ПРИКАЗ НА СЛУЧАЈ**

Љубица Микуновиќ Дереванова¹, Љупчо Донеv¹, Лазар Тодоровиќ²,
Весна Цветановска-Наунова², Васко Демјански¹, Наталија Цоклеска-Шунтов², Виолета Огњанова¹

¹ Универзитетска клиника за трауматологија, ортопедија, анестезија, реанимација, интензивно лекување и ургентен центар, Скопје, РС Македонија

² Универзитетска клиника за детска хирургија, Скопје, РС Македонија

Континуираниот периферен блок, познат уште како „перинеурална инфузија на локален анестетик“, претставува перкутано пласирање на катетер во близина на периферниот нерв или плексусот и администрирање на локален анестетик преку катетерот, со цел да се обезбеди анестезија или аналгезија во текот на неколку дена, а во некои случаи дури и до еден месец.

Нашиот приказ на случај е момче на 7-годишна возраст со контрактура во левиот лакт и ограничена флексија и екстензија примено на Клиниката за детска хирургија за редресман на лактот и физикална терапија. Беше изведен аксиларен блок на плексус брахиалис воден под ултразвук со пласирање нетунелизирачки перинеурален катетер. Редесманот на левиот лакт беше изведен во два наврати и пред секој редресман беше аплициран болус од локален анестетик преку перинеуралниот катетер. Физикалната терапија беше спроведена безболно со помош на континуирана перинеурална инфузија од локален анестетик. Петтиот ден од пласирањето на катетерот, тој беше отстранет без претходна присурна компликација како хематом, инфекција, дислокација на катетерот или перкутано истекување на локалниот анестетик.

Нашата цел е да ја минимизираме психичката и физичката травма на пациентот, без разлика колку е тој незрел. Континуираната регионална анестезија кај децата е безбедна техника за постоперативен менаџмент на болка, која обезбедува рана мобилизација поради задоволителна аналгезија и подобар комфор, обезбедува третман во домашни услови со претходна адекватна едукација на пациентите и родителите и ја подобрува рехабилитацијата кај децата.

Клучни зборови: континуиран периферен блок, аксиларен нервен блок, перинеурален катетер, педијатриски пациент