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Case report

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Brachial plexus block with costoclavicular approach for forearm surgery in special cases: presentation of 2 clinical cases

Abstract

Some trauma and orthopedic pathology procedures must be performed immediately; delaying them can lead to a poor prognosis and sequelae that compromise patients' quality of life. However, patients sometimes present with comorbidities such as respiratory infections, which can increase the risk of adverse events during the perioperative period, such as laryngospasm, bronchospasm, and desaturation, and can be life-threatening. Furthermore, if general anesthesia is required, the spread of these pathogens to the lower airway can increase the risk of ventilator-associated pneumonia. With the advent of ultrasound and its use in regional anesthesia, risks have been reduced, techniques have been refined, and postoperative pain has been better controlled. Brachial plexus block can be performed using various approaches. The recently described ultrasound-guided costoclavicular block in the costoclavicular space has gained popularity, showing promising results for upper limb anesthesia and postoperative analgesia. This block is presented as an alternative to the traditional infraclavicular approach, with results showing better block quality and a lower risk of complications.

Keywords: Costoclavicular block, regional anesthesia, respiratory tract infection

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Case report

We present 2 clinical cases of pediatric patients with upper respiratory tract infection plus upper limb fracture and their management with brachial plexus block with costoclavicular approach for forearm surgery.

Case 1

A 2-year-old male presents with a diagnosis of upper respiratory infection of one week's duration, treated symptomatically, and a fracture of the left elbow. The traumatology and orthopedics service requests urgent surgical-anesthetic time for exploration, open reduction, and internal fixation with Kirschner wires. Family History: Mother denies any relevant history for the patient's current condition. Past Medical History: Mother denies allergies or any illnesses experienced during development. She reports that the patient is the product of a fourth pregnancy, born via uncomplicated cesarean section, weighing 4.5 kg at birth, with no complications and normal development since birth. She reports a one-week history of cough treated by a physician (treatment not specified). She denies fever and denies any other relevant medical history. Present Condition: The patient fell yesterday while playing, landing on his left elbow, resulting in pain and deformity of the elbow. He was brought to this hospital for treatment. Physical examination: Apparent age as stated, alert, responsive, normocephalic, pupils are isocoric and normoreflexic, oropharynx with hypertrophic, hyperemic tonsils and purulent pinpoints. Lung fields well ventilated, without added sounds, heart sounds rhythmic, abdomen soft and compressible, upper extremity with brachiopalmar splint, other extremities normal, capillary refill of both extremities less than 2 seconds. Laboratory tests: Hemoglobin: 11.6 mg/dl Hematocrit: 36% Platelets: 319,000 PT: 16 APT: 36 INR: 1.2. Weight: 15 kg Height: 90 cm.

Physical status: ASA I/VI. Anesthetic Plan: Brachial Plexus Block plus Inhalational Sedation. Risks and benefits of the anesthetic procedure were explained to the family member. Informed consent signed. Instructions: Have venous access. Go to the operating room upon request.

Anesthetic management

Male, 2 years old. Postoperative open reduction and internal fixation with nails to the lateral condyle of the humerus. Admission vital signs: BP: 90/50, HR: 105, SpO2: 94%, RR: 22. Premedication: Midazolam 2 mg, Fentanyl 30 mcg, Hydrocortisone 150 mg. Under inhalational sedation with sevoflurane 2 % vol, supported with a face mask and spontaneous ventilation. The left arm was positioned at 90 degrees. Asepsis and antisepsis of the infraclavicular region were performed. A fenestrated drape was placed. Using sterile technique, a 12 MHz linear ultrasound transducer was inserted. Color Doppler was performed to confirm the axillary artery and vein. A needle was inserted in-plane, and 7 ml of 0.35% bupivacaine was deposited around the axillary artery. There were no incidents or complications. Latency was 12 minutes with no changes in monitoring or clinical status.

Intraanesthetic: Inhalational sedation with sevoflurane 1.5 vol% BP: 80/40 HR: 90 SpO2: 96% Adjunctive medication: paracetamol 150 mg, dexamethasone 2 mg Surgery duration: 60 minutes Anesthesia duration: 80 minutes Discharged from the operating room awake, active, and reactive with stable vital signs; transferred to post-anesthesia care unit. Pain was assessed at 6, 12, and 24 hours post-surgery; no pain was reported.

Clinical case 2

A 12-year-old male with a diagnosis of a left elbow fracture and a two-week history of upper respiratory infection, currently under symptomatic treatment, is scheduled for open reduction and internal fixation. Family history: No relevant medical history for his current condition. Personal history: Denies allergies, chronic degenerative diseases, or other illnesses. Presenting symptoms: Reports that he

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was injured yesterday in a car accident while riding his motorcycle. He was struck by a moving vehicle and fell onto his left lower extremity. He reports remaining alert, experiencing only intense pain in his elbow and decreased forearm mobility. He also reports that he began experiencing flu-like symptoms a week ago, which have not yet subsided, and is currently under symptomatic treatment. Physical examination: Alert and oriented, normal skin and mucous membrane color, normocephalic, cylindrical neck, hyperemic pharynx, hypertrophic tonsils without purulent material. Mallampati Grade I, Patil -Aldrete Grade I, BHD Grade I. Chest with adequate expansion and retraction, rhythmic respiratory and cardiac sounds. Soft abdomen, left upper extremity with brachiopalmar splint, right upper and lower extremities anemic but functionally intact. Laboratory tests: Hemoglobin: 13, Hematocrit: 36,

Platelets: 220,000, PT: 17, APT: 23, INR: 1.0

Anesthetic risk: I/VI Anesthetic Plan: Brachial Plexus Block plus intravenous sedation. Indications: Have a peripheral IV line. Go to Request.

Anesthetic management

Male, 12 years old. Post-operative open reduction and internal fixation with nails and plate in the lower left elbow. Costoclavicular brachial plexus block plus intravenous sedation. Transfer to the operating room; non-invasive monitoring was performed with vital signs: BP: 125/65 HR: 90 SpO2: 95% Temp: 36.5. Weight: 50 kg Height: 1.50 After anxiolysis with Midazolam 3 mg plus 75 mcg of fentanyl and oxygen support with a fascial mask reservoir bag, the patient is placed in supine position with the contralateral side to the block area, left arm at 90 degrees. Using sterile technique, a scan is performed with a 12 MZH linear transducer at the costoclavicular level. A blunt 21-echogenic needle tip is visualized. The axillary artery is visualized. Bupivacaine .35% 12 ml is deposited in the periphery of the artery, with a latency of 10 minutes. Motor and sensory block is confirmed. The patient is placed in the prone position to perform the surgical procedure.

Intraanesthetic: Vital Signs: BP: 100/50, HR: 70, SpO2: 96%. Oxygen at 3 liters per minute. Adjunctive medication: Midazolam 3 mg, Paracetamol 750 mg, Dexamethasone 4 mg, Ondansetron 4 mg, Hartmann's solution 250 ml. Blood loss: 20 ml. Surgery duration: 65 minutes. Anesthesia duration: 80 minutes. Discharged from the operating room with Vital Signs: 100/60, HR: 76, SpO2: 96 %, conscious, active, and responsive. Pain was assessed in postanesthesia care and subsequently at bedside at 2, 8, and 24 hours; no pain was reported, and no motor or sensory block was observed.

The two patients were kept sedated after the block; the first under inhalational sedation with Sevorane CAM 1.5 Vol.%, and the second under intravenous sedation. There were no trans- or postoperative incidents; they did not present nausea or vomiting. Paracetamol was added for postoperative pain control, which was minimal.[1-5]

Discussion

Upper respiratory tract infections remain the most frequent cause of surgical postponement. In a 2022 study by Sabounji, they accounted for 52.1% of surgical postponements. Jeffrey, in his 2019 publication, emphasizes the concern regarding surgical postponement of orthopedic procedures in pediatric patients and its long-term functional impact. In 2018, a systematic review by Girmay issued the first evidence-based recommendations on the perioperative management of pediatric patients, emphasizing adequate pre-anesthetic assessment and risk stratification. The use of medications such as salbutamol, lidocaine, antimuscarinics, and anesthetics such as propofol and sevoflurane is considered first-line. There is a strong recommendation for the use of a laryngeal mask airway with optimal depth of anesthesia to reduce the risk of perioperative complications. In recent years, ultrasound-guided regional anesthesia has become increasingly important, especially in the pediatric population, allowing for a greater degree of safety and offering better peri- and postoperative analgesic control.

Due to developmental differences compared to adults, many children and adolescents are less likely to tolerate regional anesthetic techniques without anxiolytics or general anesthesia. Zachary, in his 2022 publication, refers to the historical debate surrounding whether this approach actually improved the safety profile of peripheral nerve blocks. Much of this debate has been resolved by the North American Pediatric Regional Anesthesia Network database, which includes over 100,000 regional anesthetics administered under general anesthesia. There were no reports of permanent neurological damage, and the rate of transient neurological deficits lasting less than 3 months was 2.4 per 10,000.

The costoclavicular infraclavicular block provides analgesia to the upper arm and elbow, in addition to decreasing the risk of pleural puncture compared to the supraclavicular or midline infraclavicular block. We present 2 clinical cases of pediatric patients with upper respiratory tract infection, which were stratified according to the COLDS Score scale proposed by Lee et al in 2014, in addition to a left elbow fracture. The anesthetic management of these patients was performed with costoclavicular brachial plexus block plus sedation. In case 1, inhalational sedation with minimal MAC was used, and in case 2, mild intravenous sedation was used. There was no need to invade the airway; the patients remained on spontaneous ventilation with stable vital signs. No complications were recorded, and postoperative pain control was optimal. Therefore, we believe this approach could be considered a management option for this type of patient.

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