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Original Article

Opioid consumption after levobupivacaine scalp nerve block for craniosynostosis surgery☆

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ABSTRACT

Background and objectives: Craniosynostosis surgery is considered a very painful procedure due to extended scalp and periosteal detachment, and is associated with prolonged postoperative consumption of opioids and their side effects. In this observational descriptive case series study, we investigated perioperative opioid consumption in children undergoing craniosynostosis repair under general anesthesia when scalp nerve block with levobupivacaine was involved.
Methods: After standard anesthesia induction, scalp nerve block with levobupivacaine 2 mg/kg plus epinephrine 1:800,000 was performed. Hemodynamic parameters and opioid consumption were noted. Patients were monitored in the recovery room. Requirements of additional analgesia, indicated by the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS) pain score of >9, and incidence of side effects (sedation, nausea, and vomiting) were recorded during the first 24 hours.
Results: A total of 32 patients were recruited in this study; 88% of them needed morphine rescue in the recovery room because they had high CHEOPS scores. Trigonocephaly was the most frequent type of craniosynostosis (37.5%), requiring 50% more opioids in the postoperative period than other forms of craniosynostosis.
Conclusion: Scalp nerve block can be proposed as a complement to the routine craniosynostosis anesthetic protocol, because it is easy to perform, seems to reduce the need for supplementary opioids during the perioperative period, and can reduce the risk of developing acute opioid tolerance and chronic pain. In the event of trigonocephaly or craniofacial reconstruction, a complementary infraorbital nerve block can be added.

1. Introduction

Surgery for correction of premature fusing of cranial sutures (craniosynostosis) is considered a very painful procedure because of extended scalp and periosteal detachment, and is associated with prolonged postoperative opioid consumption and the resulting side effects.[1,2] A large number of studies have been conducted on craniosynostosis, but there are few papers concerning the postoperative pain associated with craniofacial syndromes.[3,4]

In our clinical practice, a remifentanil–sevoflurane anesthesia technique is used, to promote faster awakening and improve the evaluation of neurological status; however, there is the risk of inadequate postoperative analgesia.[1,5,6]

Prior to the introduction of the scalp nerve block (SNB) technique in our department, the postoperative pain management protocol for craniosynostosis surgery included a standard anesthesia protocol

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☆ This study was carried out at Hôpital neurologique et neurochirurgical Pierre Wertheimer, 69677 Bron, Lyon, France.

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(sevoflurane plus remifentanil infusion). The pain management protocol included administration of intravenous (IV) paracetamol at the end of surgery, followed by titration of morphine in the postanesthesia care unit (PACU) as needed, and then administration of IV nalbuphine hydrochloride in the surgical ward, if necessary, depending on pain scores. This standard approach is insufficient for controlling postoperative pain and is associated with opioid-related side effects (nausea, vomiting, and sleepiness).

To our knowledge, there are no papers on the use of SNB in craniosynostosis surgery; only the use of lidocaine or bupivacaine scalp infiltration has been reported.[7–9] In a previous letter, we reported the first three cases of levobupivacaine SNB for a different kind of cranial surgery in pediatric patients, with a long-lasting analgesic effect of levobupivacaine SNB associated with paracetamol and/or nonsteroidal anti-inflammatory drugs.[10]

The aim of the present study was to demonstrate a new clinical practice in our hospital and perioperative opioid consumption in children undergoing craniosynostosis surgery under general anesthesia with associated levobupivacaine/epinephrine SNB.

2. Methods

After obtaining parental consent, according to the Helsinki Declaration, the anesthesia data and postoperative pain reports of 32 patients (5–93 months old, American Society of Anesthesiologists status I–II, and scheduled for craniosynostosis repair) were prospectively evaluated. The exclusion criterion was previous scalp incisions or allergy to local anesthetics. Patients were premedicated with oral or intrarectal midazolam 0.5 mg/kg 30 minutes prior to anesthesia induction. The anesthesia protocol was standardized for all patients, consisting of sevoflurane ($FiO_2 = 1$) associated with IV remifentanil 0.5 μg/kg/minute (over 3 minutes) to facilitate orotracheal intubation. No muscle relaxant was administered. Anesthesia was maintained with sevoflurane (1 minimum alveolar concentration) in O_2/N_2O (50%/50%) and IV remifentanil (0.25 μg/kg/minute). The remifentanil infusion was titrated as required, to avoid hemodynamic variation greater than 20% during pain stimuli. Hemodynamic variables, such as heart rate, systolic blood pressure, diastolic blood pressure (DBP), and mean blood pressure, were continuously monitored and recorded at baseline, prior to, and after the SNB procedure, and prior to and after skin incision. The SNB procedure was performed by an anesthesiologist after orotracheal intubation and 10 minutes prior to skin incision at both sides of the head, using the modified Pinosky[10,11] technique (refer to the next subsection), according to the craniosynostosis type, with levobupivacaine 0.125% 2 mg/kg plus epinephrine 1:800,000 (1.25 μg/mL). Epinephrine concentration was chosen according to the patient's weight.[12] The neurosurgeon did not perform any skin infiltration to the scalp.

2.1. SNB technique

Anesthetic infiltration was made with a 23-gauge needle. The supraorbital and supratrochlear nerves were blocked with 0.75–1 mL of the local anesthetic solution introduced 0.75–1 cm above the supraorbital notch, perpendicular to the skin and then parallel to the eyebrow. The auriculotemporal nerves were blocked bilaterally with 0.75–1 mL of solution injected 1 cm anterior and superior to the tragus, perpendicular to the skin and then parallel to the ear, avoiding the superficial temporal artery. Posterior branches of the greater auricular nerves were blocked with 0.75–1 mL of solution between the skin and bone, 1 cm posterior to the ear, at the level of the tragus. The greater and third occipital nerves were blocked at each side of the occipital artery with 1.5–2 mL of the local anesthetic solution; lesser occipital nerves were blocked with 1 mL of the local anesthetic solution (Figs. 1 and 2).[10–15]

2.2. Pain control

At the end of surgery, remifentanil infusion was stopped and the total intraoperative dose was recorded. All patients received 15 mg/kg of IV paracetamol 30–45 minutes prior to skin closure, and then every 6 hours. Postoperative pain scores, morphine/nalbuphine cumulate doses, and associated side effects (sedation, nausea, and vomiting) were assessed and recorded by nurses on arrival at the PACU immediately after orotracheal extubation, every hour for the

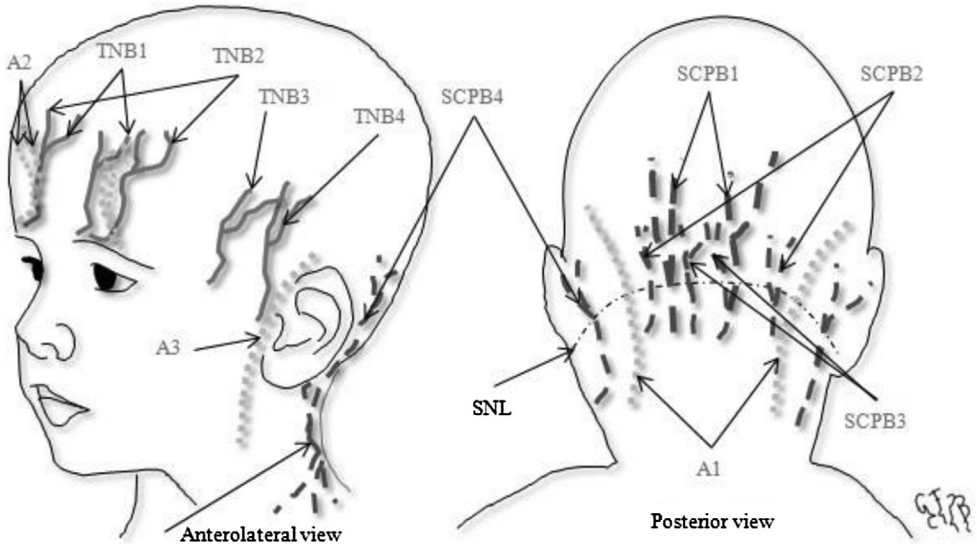

Fig. 1. Scalp neurovascular anatomy. A1 = occipital arteries (branch of external carotid artery); A2 = supratrochlear and supraorbital arteries (terminal branches of the ophthalmic artery, branch of internal carotid artery); A3 = superficial temporal artery; SCPB = superficial cervical plexus branches; SCPB1 = Arnold or great occipital nerve; SCPB2 = lesser occipital nerve; SCPB3 = third occipital nerve; SCPB4 = greater auricular nerve; SNL = superior nuchal line; TNB = trigeminal nerve branches; TNB1 = supratrochlear nerve; TNB2 = supraorbital nerve. *Note*. Adapted with permission from References 12 and 14.