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RESEARCH ARTICLE

THE PARAVERAL BLOCK IN KIDNEY SURGERY PEDIATRICS: FOR OPIOID FREE ANESTHESIA

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Abstract

Introduction:-

Opioids are drugs commonly used during anesthetic induction. However, recent clinical observations clearly invite us to question this dogma because of the consequences of the use of opioids such as postoperative hyperalgesia and postoperative nausea. Paravertebral block (BPV) allows unilateral multi-stage anesthesia. Its effectiveness is well established regarding post-operative analgesia in kidney surgery of the child. However, its use as anesthetic technique to overcome the use of morphine intraoperatively is lacking. The main objective of our study was therefore to evaluate the efficacy of this block as anesthetic technique in kidney surgery of the child by lombotomy and thus reconsider the systematic use of opiates during this surgery.

Material and Methods:-

This prospective observationnel study was conducted over six months (September 2018 – Februrary 2019) in anesthesia department, Rabat Children's Hospital. Informed written consent was taken from the guardians of the children who were enrolled in the study. Exclusion criteria included contraindications to regional analgesic procedures, neurological/cardiac disease, developmental delay, spine or chest wall deformity, history of previous renal surgeries and history of sensitivity to drugs used in the study. All the children were followed up for 24 h post-operatively. The primary outcome was the time to first analgesic requirement intraoperatively. The secondary outcomes were the time required to perform the blocks, FLACC scores in the 24 h post-operative period, analgesic requirement, incidence of block-related complications.

The perioperative anesthetic management was standardised. The standard monitoring was placed (electrocardiogram, non invasive pressure and pulse oxymetry, capnography and curarization monitoring). The children were induced either inhalationally with sevoflurane and completed intravenously with propofol 2mg/kg sufentanyl 0,1 µg/kg and rocuronium 0.6 mg/kg. Airway was secured with an appropriate size endotracheal tube.

Thereafter, anesthesia was maintained with O2/Air (1:1) and sevoflurane. The baseline hemodynamic parameters were noted and the children were positioned for paravertebral block. Children were turned to lateral decubitus position for ultrasound-guided paravertebral block at T9 level. After cleaning and draping, a high-frequency 38 mm linear transducer was placed longitudinally to identify the spinous processes of T9-T10. The probe was then moved laterally till the respective transverse processes and the corresponding paravertebral spaces were seen. The probe was then turned obliquely, and using in-plane approach, 0.4 ml/kg of 0.25% bupivacaine was injected at the T9 paravertebral space with 19 G Tuohy needle. The time to perform the block was noted. The surgical incision was made after a minimum of 15 minutes, a period deemed acceptable for the installation of the anesthesia provided by

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BPV. The hemodynamic parameters (SBP, DBP, MAP, HR) were recorded every fifteen minutes during the duration of the operative gesture. Any change in the intra-operative hemodynamic parameters by>20% was considered as inadequate analgesia and treated with 0,1µg/kg Sufentanyl. The hemodynamic parameters and the number of sufentanyl injections were recorded.

Towards the end of the surgery, all the children received intravenous paracetamol 15 mg/kg, which was continued every each 6 hours post-operatively. All children were extubated under deep anesthesia in order to prevent coughing and agitation potentially worsening sore throat, which could have influenced the postoperative evaluation of analgesia by the behavioral Face, Legs, Activity, Cry, Consolability (FLACC) score. After the extubation, the hemodynamic parameters and FLACC scores were recorded at 0, 1⁄2, 1st, 2nd, 3rd, 6th and 12th hours. If FLACC score of > 3 was recorded, the child was first managed by non-pharmacologic means (tactile stimulation, change of position, warming/cooling, etc.) in order to make the child comfortable again. If the child did not settle down, rescue analgesia with morphine 20 µg/kg was administered. In cases where rescue analgesia was needed within the first 2 h, the block was considered a failure. The time to first rescue analgesia, number of morphine boluses, total amount of morphine required and the parental satisfaction scores were recorded. The duration of postoperative analgesia was defined as the time interval between the PVB and the first supplemental administration of an opioid. If there was no need for opioid administration during the postoperative observational period, the duration of the block was set as 12 h.

Results:-

Table 1:- Demographic and descriptive data are shown in

Number of patients	38
Age (months)	97[8-144]
Weight (kg)	24 [14-57]
Sex Male Female	 22 16
Type of Surgery Pyeloplasty Nephrectomy	 24 14
Time taken to administer the block	255.1 (CI: 217.4–328.3)
Duration of surgery (min)	84 [42-224]
Incidence of failed block	2 (5%)
Total dose of sufentanil administered intraoperatively	4,8µg

The variations in heart rate and SBP are shown in **FIG. 1** and **FIG. 2**

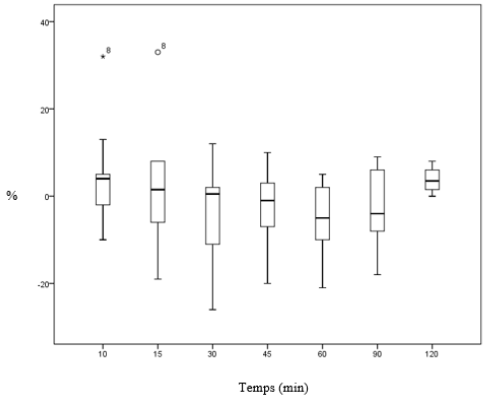

Fig. 1:- Relative changes in heart rate after BPV (percentage of baseline HR) over time. Values are expressed as means, quartiles and extreme values.

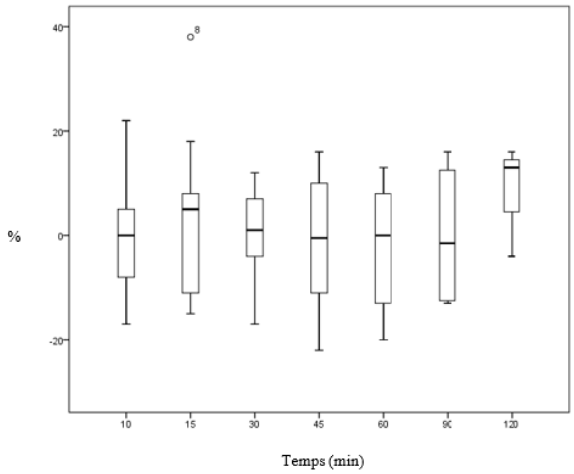

Fig. 2:- Relative variation of systolic blood pressure after BPV (percentage of base SBP) as a function of time: values are expressed in median, interquartile range and extreme values.

Successful BPV was observed in 94%. In 1 case intraoperative administration of opioid was necessary immediatly after incision and no more boluses was needed. One child needed rescue analgesia after 15 min of shifting to PACU. So the block was considered a failure in 2 cases (5%).

In 37/38, There was no statistically significant difference in the heart rate ($p = 0.13$) and mean arterial pressure ($p = 0.68$) between values before incison and intraoperatively .

The median duration of the PVB was found to be 660 min (range: 360–720 min). In 18 children no additional analgesia was needed during the first 12 postoperative hours. Mean FLACC score recorded at the predetermined time points was <2 throughout the study period. In 10 cases the children responded well to nonpharmacologic handling (FLACC score returning to 0–2). Thus, supplemental administration of analgesics was only necessary on 9 patients.

The median time between extubation and waking was 4 minutes.This delay was the most prolonged in the event that the failure of the block was noted. No patient presented complications.
POV occurred in one case of whom had received supplemental opioid administration prior to the episode of POV.

Discussion:-

Analgesia aims to provide the maximum comfort to the operated patients and to eradicate the postoperative pain (POP). This analgesia is provided by opioids and morphine remains the standard analgesic for treating POP. However, opiates have dose-dependent side effects that can be disabling for the patient, delay postoperative rehabilitation and increase the length of hospital stay. Moreover, recent clinical observations indicate that opioids induce dose-dependent hyperalgesia [1-2], a source of acute and chronic postoperative pain, and lead to marked immunosuppression [3]. These main reasons justify reducing or even eliminating opiates while maintaining anaesthesia.

Locoregional analgesia (ALR), by blocking peripheral nociceptive impulses, attenuates central perioperative sensitization. Depending on the surgery, different strategies may be proposed. Paravertebral block is one of these therapeutic strategies. It allows unilateral multi-stage anesthesia.

Renal surgery is largely performed in the pediatric population and the pain induced by these procedures is particularly suited to the use of analgesic blocks. [4]

The efficacy of BPV is well established for postoperative analgesia in pediatric renal surgery [5-6]. However, its use as anesthetic technique to overcome the use of opioid morphine intraoperatively is rarely reported. Berta et al. demonstrated in a sample of 24 children of median age 10.3 months that achieving a single injection paravertebral block by a loss-of-resistance technique provided effective postoperative analgesia in major renal surgery. [5]

However, this technique was systematically used at the end of the procedure and intraoperative analgesia was provided by sufentanyl (0.50 µg · kg-1 the first hour and then 0.25 µg · kg-1 · h-1). Lönnqvist et al. found the same finding using the same technique on 15 children but with insertion of a catheter [6]. The BPV was performed after anesthetic induction and the intraoperative analgesia was ensured by fentanyl (1.5-2µg · kg-1) associated intermittent boluses of 0.25% bupivacaine (0.5ml · kg-1).

The main finding of the present observational study was that adequate intraoperative analgesia can be achieved by a single injection PVB in children undergoing major renal surgery. The BPV seems reliable and clinically relevant in our study. The time to install the anesthesia was fast (judged by the minimal variations of the HR and the SBP at the incision) with a block efficiency noted in 95% of the patients. The block allowed us to avoid using opioid intraoperatively and thus avoid complications secondary to their use.

Hence, this study demonstrates that adequate postoperative analgesia can be achieved by a single injection PVB. The evaluation carried out after the end of intervention found the persistence of good analgesia during the stay in PACU. The observation of a median duration of 11 h following a single injection PVB corroborates previous findings of a prolonged analgesic effect associated with the PVB technique in adults and children. Duration of analgesia observed in the present study, combined with the finding that only 9 (24%) patients needed supplemental analgesia during the first 12 postoperative hours. In the Berta et al study 38% of patients required analgesic supplementation [5]. This study is however different from that of Berta. In our study the block was performed under ultrasound guidance contrary to that of berta which used loss-of-resistance technique. The use of ultrasound probably increases the chances of success of the block by controlling the injection site and ensuring the extension of the anesthetic product in under and overlying spaces. No complications were found in our study. A vascular puncture was reported in 8.3% of cases and PONV in 16.7% of cases in the Berta et al. The limited study size does not permit any predictions regarding safety. The main limitation of our study lies in its non-randomized character and its small size. A comparative and randomized study with a larger sample of patients would gain power.

Conclusion:-

The present study shows that single injection PVB can provide clinically relevant intra and post postoperative analgesia in children undergoing major renal surgery. These results are very promising and make it possible to advance the hypothesis that this block allows an effective anesthesia without opioids, which suggests interesting perspectives of use of this block in pediatric renal surgery but also in other types of surgery.

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