Case Series

Single-centre case series report of regional anaesthesia for pain management in vaso-occlusive crisis

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ABSTRACT

Sickle cell disease is characterised by episodes of vaso-occlusive crisis, a painful complication. Regional anaesthesia has shown promising results in reducing opioid consumption and pain scores. Patients with vaso-occlusive crises who underwent regional anaesthesia in the paediatric intensive care unit were studied. Data regarding pain location, regional analgesia technique, the local anaesthetic used and dose, daily opioid consumption, daily pain scores, use of adjuvants and complications were recorded. The primary outcome was to evaluate the effect of regional anaesthesia on opioid consumption. In this study, we describe 10 cases, referring to six paediatric patients with the vaso-occlusive crisis who underwent regional anaesthesia for severe pain and were unresponsive to increasing doses of opioids. Six cases received epidural analgesia, three continuous peripheral nerve blocks and one received both techniques. Opioid consumption was reduced (58%), and pain scores decreased (72%), both statistically significant reductions.

Keywords: Children, pain management, regional anaesthesia, sickle cell disease, vaso-occlusive crisis

INTRODUCTION

A vaso-occlusive crisis (VOC) is a painful and severe complication that can occur in children with sickle cell disease (SCD). Its treatment is challenging, and patients often require aggressive multimodal pain management with escalating doses of opioids.[1] There is increasing evidence that regional analgesia (RA) can be effective in reducing pain and opioid use in SCD patients experiencing VOCs.[2-5]

This study aimed to assess the analgesic efficacy of RA in SCD paediatric patients with severe pain related to VOC.

METHODS

This case series was conducted in a paediatric intensive care unit (PICU) between 2020 and July 2022. All SCD patients with severe pain despite multimodal analgesia due to VOC who were admitted to PICU were approached for enrolment. The hospital's ethics committee approved data collection and analysis (vide registration ID 72/2020, dated 29 July 2020). Written informed consent was obtained for participation in the study and use of the patient data for research and educational purposes from the patient's parent(s)/legal guardian. The study was carried out in accordance with the principles of the Declaration of Helsinki, 2013.

Data was collected with a specifically designed data chart and completed by clinical records consultation. Registered data included pain location, RA technique, local anaesthetic used and dose, total opioid consumption, daily opioid consumption, pain scores, use of adjuvants, adverse events, time for discharge and

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Table 1: Patient demographics and clinical course

Case	Patient	Age (years)	Pain location	RA technique	Perfusion scheme	Reduction in opioid consumption (%)	Reduction in VAS score (%)	Days with catheter-infused RA	LOS	Notes
1	A	17	Left thigh, left arm	Epidural catheter L3–4 Continuous infraclavicular brachial plexus block (left)	Ropivacaine 0.1%–0.15% at 4–6 ml/h Ropivacaine 0.1% at 4–6 ml/h	37	82	6	6	Two RA techniques were performed on admission
2	B	17	Right shoulder blade, anterior thorax	Continuous erector spinae plane block (right)	Ropivacaine 0.1%–0.2% 30 ml every 6 h	65	65	5	6	
3	B	17	Right leg	Epidural catheter, L3–4	Ropivacaine 0.1%–0.2% at 7 ml/h	75	85	6	6	
4	C	15	Bilateral thigh, left shoulder, right rib cage, interscapular region	Epidural catheter, L4–5	Ropivacaine 0.1% at 3–5 ml/h	59	84	4	4	
5	D	17	Right shoulder	Continuous interscalene brachial plexus block (right)	Ropivacaine 0.2% at 4 ml/h	−4	50	3	9	Patients with recurrent episodes and significant anxiety showed increased opioid requirements after RA despite experiencing a significant reduction in pain scores
6	E	13	Left thigh, left arm > right arm	Continuous axillary brachial plexus block (left)	Ropivacaine 0.2% at 5 ml/h	52	97	3	9	
7	E	14	Right leg	Epidural catheter, L3–4. A second epidural catheter was placed in L2–3 due to an ineffective technique	Ropivacaine 0.2% at 6 ml/h	89	70	4	4	
8	E	15	Right leg, left arm	Epidural catheter, L2–3	Ropivacaine 0.1%–0.2% at 7 ml/h	59	79	8	9	
9	F	18	Right costal grid, right dorsal column	Epidural catheter, D11–12. A second epidural catheter was placed in T7–8 due to inadvertent catheter removal	Ropivacaine 0.2% at 6 ml/h	42	51	6	12	
10	F	18	Left leg, lumbar column	Epidural catheter, L1–2. The second technique was performed due to ineffective technique – combined spinal–epidural L4–5	Ropivacaine 0.1%–0.2% at 6–7 ml/h	97	50	11	19	

LOS=length of stay, RA=regional anaesthesia, VAS=visual analogue scale

30-day readmission rate. Pain scores were evaluated daily using the visual analogue scale (VAS). Intravenous (IV) opioid consumption was converted to oral morphine equivalents using an online calculator (https://www.eviq.org.au/clinical-resources/eviq-calculators/3201-opioid-conversion-calculator). Daily average opioid consumption was determined by calculating the daily mean dose of oral morphine equivalents before and after an RA technique was implemented.

The primary outcome was to evaluate the effect of RA techniques on opioid consumption, and the secondary outcome was to assess RA's impact on pain scores. Statistical analysis was performed using the Wilcoxon signed-rank test, and statistical significance was set at $P < 0.05$.

RESULTS

We enroled six patients who were admitted to PICU. Of these, three patients were admitted more than once, with severe pain related to VOC. So, ten episodes of VOC underwent an RA technique for severe pain [Table 1]. All patients received concomitant opioid IV therapy. Opioid-related side effects occurred in 60% of cases and were only reported before RA. RA-related side effects were reported in 20% and resolved with catheter exteriorisation, and there were no vascular or permanent neurological injuries noted in all cases. In some cases, IV ketamine, as a rescue analgesic, and dexmedetomidine, for sedation, were co-administered. All patients were receiving acetaminophen and ketorolac or dipyrone in a fixed regimen.

The median (interquartile range [IQR]) daily opioid consumption decreased from 506 (182–829) to 240 (109–370) mg after RA ($P = 0.02$). The median (IQR) daily maximum VAS score decreased from 10 (9–10) to 3 (2–4) after RA ($P = 0.005$).

DISCUSSION

RA in paediatric patients has been widely used for postoperative analgesia with sound scientific evidence. In the 2020 guidelines of the American Society of Hematology, RA was suggested for the analgesic treatment approach of VOC in adults and children when pain is localised and refractory to treatment with opioids alone.[6] Only a few case reports of VOC in children and adolescents have been published.[2-5] However, these studies focus on either neuraxial or peripheral nerve block used alone, and most report less than 10 cases. In our case series, we investigated the impact of neuraxial and peripheral nerve blocks in patients admitted with VOC. We found a statistically significant reduction in opioid consumption (58%) and pain scores (72%) without significant side effects. These results are in agreement with the published data and reinforce the possible role of RA in pain management for VOC.

CONCLUSION

For paediatric patients with VOC, a multimodal analgesic approach, using RA techniques such as epidural analgesia and peripheral nerve blocks, demonstrated an overall decrease of 58% in opioid consumption as well as a 72% decrease in pain scores without significant side effects.

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Conflicts of interest

There are no conflicts of interest.

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