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ORIGINAL ARTICLE

Perioperative Analgesic Modality and Effectiveness in Paediatric Patients Who Have Undergone Common Major Urology Surgery - A Two-Year Retrospective Study

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ABSTRAK

Pengurusan kesakitan dalam golongan pediatrik yang menjalani pembedahan urologi major adalah mencabar. Pembedahan ini memerlukan pembiusan penuh (GA) beserta pemberian pembiusan setempat atau infusi morfin. Kajian ini bertujuan untuk membanding dan menilai keberkesanan kedua-dua teknik pengendalian kesakitan. Kajian retrospektif deskriptif di sebuah pusat yang melibatkan 88 orang pesakit berumur antara 3 bulan hingga 12 tahun dengan status fizikal American Society of Anaesthesiologists (ASA) I atau II yang memerlukan GA untuk pembedahan major urologi. Kumpulan A menerima morfin sistemik semasa pembedahan manakala Kumpulan B menerima pembiusan setempat (samada infusi caudal epidural, pembiusan setempat caudal atau pembiusan setempat erector spinae). Kami mengkaji keperluan intravena (IV) fentanyl semasa dan selepas pembedahan, skor kesakitan menggunakan skala Face, Leg, Activity, Cry, Consolability (FLACC), penggunaan IV non-opioid dan komplikasi yang berkaitan. Keperluan 'rescue' fentanyl semasa pembedahan tiada perbezaan antara kedua-dua kumpulan. Keperluan non-opioid dan 'rescue' fentanyl adalah bereerti dan lebih tinggi untuk Kumpulan A berbanding dengan Kumpulan B ($p<0.001$). Median skala FLACC Kumpulan A lebih tinggi daripada Kumpulan B dan bererti ($p<0.001$) untuk 12 jam pertama selepas pembedahan. Komplikasi paling kerap untuk kumpulan morfin adalah muntah (38.6%) dan kebocoran peri-kateter untuk kumpulan B (6.81%). Teknik pembiusan setempat adalah lebih bagus berbanding

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dengan morfin sistemik untuk pengendalian kesakitan 12 jam yang pertama selepas pembedahan major urologi pediatrik dan teknik ini tidak memberi kesan sampingan opioid.

Kata kunci: morfin sistemik, pediatrik, pembedahahan urologi, pembiusan setempat

ABSTRACT

Perioperative paediatric major urology surgery pain management remains challenging. These surgeries require general anaesthesia (GA) combined with either regional analgesia technique or systemic morphine infusion for optimal pain relief. We aimed to compare and evaluate the effectiveness of both analgesic techniques. This single centre retrospective descriptive study involved 88 patients, aged 3 months to 12 years old with American Society of Anaesthesiologists (ASA) I or II status, who underwent major urology surgery under GA. Group A patients received perioperative systemic morphine while Group B received regional anaesthesia blocks (continuous caudal epidural infusion, single-shot caudal blocks or single-shot erector spinae blocks). We measured requirements of perioperative rescue intravenous (IV) fentanyl, pain scores using Face, Leg, Activity, Cry, Consolability (FLACC) scale, perioperative non-opioid IV analgesia usage and associated complications. Intraoperative rescue fentanyl in both groups was comparable. Intraoperative non-opioid analgesia and postoperative rescue fentanyl requirement were significantly higher in Group A compared to Group B ($p<0.001$). Median FLACC scores in Group A were higher than Group B ($p<0.001$) for first 12 hours post-surgery. Commonest complications in Group A was vomiting (38.6%) and peri-catheter leak in Group B (6.81%). Regional anaesthesia technique is superior to systemic morphine in providing analgesia in the first 12 hours post paediatric major urology surgery and is devoid of opioid side effects.

Keywords: paediatric, regional anaesthesia, systemic morphine, urology surgery

INTRODUCTION

Majority of urological problems in children are congenital in nature and distinct from those in adult. Paediatric urology surgery covers a wide spectrum of procedures ranging from simple day-case operations such as circumcision to complex operation such as correction of bladder exstrophy. Common major urology surgeries performed includes nephrectomy, pyeloplasty, ureteric implantation and hypospadias repair surgery (Kattail et al. 2018). Perioperative paediatric pain management for major urology surgery has always been a challenge. In major urology operations, general anaesthesia is commonly used in combination with either regional anaesthesia technique

or systemic morphine infusion for optimal perioperative pain relief.

In many centres, perioperative opioid administration is still the mainstay of analgesia in paediatric urology surgery and morphine remains the standard of choice. Systemic morphine infusion is given to paediatric patients who have contraindications for neuraxial block such as sacrococcygeal abnormality, coagulopathy and known allergy to local anesthetic agent. It is also the obvious choice of analgesia in condition of failed nerve blocks or parental refusal. For successful analgesia, constant blood concentration of morphine is required (Dahlstrom et al. 1978; Berkowitz et al. 1975). Blood concentration depends on the morphine concentration in the brain (Dahlstrom et al. 1978), the degree of receptor occupancy and finally the analgesic effect produced (Berkowitz et al. 1975). Longer term analgesia would require frequent administration of morphine by intermittent IV injection. The metabolism of morphine appears to conform reliably to an adult pattern from an age of 5-6 months old (Koren et al. 1985; Olkkola et al. 1988). Infants under 6 months of age have an increased sensitivity to morphine. Since metabolites of morphine are excreted in kidneys, there is a potential for accumulation of active metabolites in renal impairment following major urology surgery (Amanda et al. 2018). Morphine is well known to cause side effects such as drowsiness, respiratory depression, euphoria, nausea, vomiting and constipation (Peck et al. 2008). The use of non-opioid medications to avoid opioid side effects and as part of the multimodal analgesia technique was also suggested in the management of enhanced recovery after surgery (ERAS) (Rove et al. 2018).

Regional anaesthesia as a supplement to general anaesthesia is a popular, alternative and effective form of pain management postoperative (Lonqvist & Morton 2005). Regional anaesthesia for major urology surgery includes neuraxial techniques as well as peripheral nerve blocks such as erector spinae plane (ESP) block. An effective regional anaesthesia decreases the need for perioperative opioid and opioid-related side effects (Kattail et al. 2018). Sympathetic innervation in the pelvis is supplied by T11-T12 from hypogastric plexus while parasympathetic innervation in the pelvis arise from S2-S4 via the pelvic splanchnic plexus. Surgery to the kidneys requires nerve blocks up to T10-L1; surgery to prostate and bladder requires S2-S4 blocks but if bladder distention is anticipated, blocks up to T10-T11 may be required and procedure on ureters requires blocks up to T10 (Dario 2004). Caudal epidural block is one of the commonnest used regional blocks for infraumbilical urological operations such as hypospadias repair. However, this block only lasts for 6 to 8 hours unless an indwelling caudal catheter is inserted for continuous local anaesthesia infusion (Silvani et al. 2006). An epidural catheter may be successfully placed via the caudal approach and advanced cephalad up to the lumbar or thoracic level. Alternatively epidural can be inserted in lumbar region and used for surgeries such as cystectomy or nephrectomy.

After successful placement, an initial bolus dose of local anaesthetic is injected into the epidural catheter. Analgesia is maintained with a continuous infusion which has also been proven safe and effective in children (Dario 2004). However, having an indwelling caudal or lumbar epidural catheter in place often limits patient's mobility and requires prolonged hospital stay after surgery.

With the popularity of ultrasonography, peripheral nerve blocks have become more common. Erector spinae plane block was first described in 2016 and had since become a trending topic among clinicians (Forero et al. 2016). The ESP block at the level of T9-T10 has been commonly performed under ultrasonography view in patients planned for nephrectomy and open pyeloplasty in our centre. This is a relatively safe yet effective technique to achieve opioid-free analgesia perioperatively (Aksu & Gurkan 2019).

Provision of optimal pain management is paramount to improving patient's postoperative recovery, mobility, compliance to planned interventions, attenuating hemodynamic alterations due to stress response and potentially improving wound healing apart from increasing parental satisfaction (Morrison et al. 2014). Systemic morphine and regional anaesthesia techniques are two commonly practiced postoperative pain management in our centre but there is currently no clear consensus due to their risks and benefits. This retrospective study aimed to compare and evaluate the effectiveness of systemic morphine versus regional anaesthesia technique in paediatric major urology surgery in our institution.

MATERIALS AND METHODS

This retrospective, single centre, descriptive study was conducted after having obtained approval from the Research Committee of Department of Anaesthesiology & Intensive Care, Universiti Kebangsaan Malaysia Medical Centre (UKMMC) (Research code: FF-2020-233) and the National Medical Research & Ethics Committee (NMRR-21-468-58682) of Malaysia. Records of operation from January 2018 to December 2019 were traced electronically from the operating schedule after having obtained consent and approval from the Head of Department of Anaesthesiology& Intensive Care, Hospital Sultanah Bahiyah. A total of 128 patients were screened from operating lists. Patients were of ages between 3 months to 12 years old, with American Society of Anaesthesiologists (ASA) physical status I or II and had undergone common major urology surgery under general anaesthesia. We excluded patients who had undergone multiple surgical procedures, repeated operation due to surgical complication, patients with developmental delay or psychosocial disorder, a past history of chronic pain on regular analgesic usage, required preoperative sedation or perioperative ventilation and patients with documented failed regional anaesthesia requiring systemic morphine perioperatively. Data that were incomplete or could not be

traced were considered drop out. A final total of 88 patients who fulfilled the inclusion and exclusion criteria were recruited into this study.

We noted that all patients had received general anaesthesia with inhalation induction of sevoflurane 8% in oxygen, intravenous (IV) fentanyl 2 mcg/kg and muscle relaxant prior to intubation. Anaesthesia was maintained with sevoflurane in oxygen and air with a minimum alveolar concentration of 1.0-1.2. All patients had received routine antiemetic prophylaxis with IV dexamethasone 0.2 mg/kg at the start of surgery. From the records, we grouped patients as Group A if they received IV morphine intraoperatively with postoperative IV morphine infusion while Group B were patients who received regional anaesthesia technique (either single-shot caudal block, caudal epidural, lumbar epidural or single-shot erector spinae blocks) using landmark or ultrasonography-guided technique.

In our centre, standard protocol for patients planned for IV morphine is 0.1 mg/kg to be administered before surgical incision with additional IV morphine 10-15 mcg/kg given every hour during the surgery. Postoperatively, IV morphine infusion was continued at 1-2 ml/hr (1 ml = 10 ug/kg/hr) in a setting of appropriate monitoring in paediatric patients following major urology surgery. Any supplemental analgesia such as IV fentanyl bolus, IV paracetamol, IV ketamine, or IV ketorolac that had been given intraoperative based on the attending anaesthetist's discretion were recorded.

The protocols for nerve block vary according to the type of blocks performed. All blocks were conducted in lateral decubitus position under aseptic techniques. Single-shot caudal block was performed using landmark technique using a 25-gauge caudal needle inserted via the sacral hiatus and 0.5-1.0 ml/kg levobupivacaine 0.25% injected into the caudal epidural space. For planned caudal epidural infusion, an 18-G Tuohy needle (5 cm with 0.5 mm markings) was inserted into sacral hiatus and epidural catheter advanced cephalad to desired level. For planned lumbar epidural, the 18-G Tuohy needle (5 cm with 0.5 mm markings) was inserted at midline position using loss of resistance to saline technique followed by epidural catheter advancement. Bolus administration of 0.5-1.0 ml/kg levobupivacaine 0.25% was given following caudal or epidural insertions. Postoperatively caudal or lumbar epidural infusions were continued with levobupivacaine 0.1% + fentanyl 1-2 mcg/ml at 0.2-0.4 ml/kg/hr. For erector spinae block, infiltration was done as single-shot using 22G Vygon® locoplex needle, lateral to the spinous process by depositing 0.2-0.3 ml/kg/site of levobupivacaine 0.25% between transverse process and erector spinae muscles under ultrasonography guidance. Levobupivacaine dose was calculated routinely to avoid exceeding 2 mg/kg of body weight. Despite having received nerve blocks, any supplemental analgesia given based on the discretion of the attending anaesthetists were recorded.

In post-anaesthesia recovery unit, pain score assessment was routinely

done using the Face, Legs, Activity, Cry, Consolability (FLACC) pain scale (Merkel et al. 1997), of which, scale of 0 = relaxed and comfortable, 1-3 = mild discomfort, 4-6 = moderate pain, 7-10 = severe discomfort/pain. Any additional IV fentanyl given in recovery unit were also recorded for both groups.

In the ward, we reviewed the charted pain scores at 2-, 6-, 12- and 24-hours post-surgery obtained from nursing observation chart and acute pain service (APS) folders. Any complications related to the analgesic modality used were also recorded. Once allowed orally, patients were routinely prescribed syrup paracetamol as postoperative analgesia while prophylactic antiemetic in postoperative period was not routinely given.

Sample size was calculated using two population proportions formula (Lemeshow et al. 1990). With a significance level of 0.05, power of study set at 80%, and anticipating a 20% dropout rate, a sample size of 88 patients were needed. Data was analysed using the SPSS version 23.0 (IBM Corp, Armonk, NY, USA). Results were presented as mean ± standard deviation, median (interquartile range) or frequency (percentages) as appropriate. For between-group analysis, independent t-tests or Mann-Whitney U tests were used for normally distributed continuous data and not normally distributed data, respectively. The qualitative data analysis was done using Chi-square or Fisher's exact test. A *p*-value of less than 0.05 was considered as statistically significant.

RESULTS

A total of 88 patients were recruited with equal number in each group and no drop-out. In Group B, 17 patients had received continuous caudal epidural analgesia, 14 patients had continuous lumbar epidural analgesia, 7 patients received single-shot ESP and 6 patients received single-shot caudal epidural blocks. Table 1 showed the demographic and surgical data which were comparable between both groups.

Table 2 showed the intraoperative analgesia data for both groups. The number of patients who received intraoperative IV fentanyl in group A were more than group B although it was not statistically significant. A higher proportion of patients from Group A received at least one or more additional non-opioid IV analgesia whereas, 45.5% of patients in Group B did not receive any additional non-opioid IV analgesia besides regional anaesthesia. The difference was statistically significant ($p<0.001$).

In the post-anaesthesia recovery unit, 44 patients in Group A were started on morphine infusion of 10-20 mcg/kg/hour. In Group B, 31 patients were started with epidural infusion postoperatively. The number of patients that received additional IV fentanyl in the immediate postoperative period in recovery unit were significantly higher in Group A compare to Group B ($p<0.001$) as shown in Table 3. None of the patients in Group B required IV fentanyl in recovery unit. There were no significant differences seen in additional non-opioid IV analgesia

Table 1: Demographic and surgical data. Values are expressed in mean ± SD or numbers (percentage)

Variables	Group A (n = 44)	Group B (n = 44)	p-value
Age (years)	4.1 ± 2.6	3.0 ± 3.1	0.093
Body mass index (kg/m^2)	13.2 ± 16.8	11.1 ± 35.5	0.055
ASA class			0.244
I	35 (79.5)	39 (88.6)	
II	9 (20.5)	5 (11.4)	
Procedure			0.121
Pyeloplasty	20 (45.5)	19 (43.2)	
Ureteric implantation	7 (15.9)	10 (22.7)	
Nephrectomy	10 (22.7)	4 (9.1)	
Hypospadias repair	3 (6.8)	6 (13.6)	
Closure of cloaca and bladder repair	3 (6.8)	1 (2.3)	
Ureteroplasty	1 (2.3)	2 (4.5)	
Hemi-nephroureterectomy	0 (0)	2 (4.5)	
Duration of surgery (minutes)	243.9 ± 67.8	223.6 ± 63.5	0.150

Table 2: Description of intraoperative analgesia requirement. Values are expressed in numbers (percentage) or median ± interquartile range where appropriate

Variables	Group A (n = 44)	Group B (n = 44)	p-value
Rescue IV fentanyl needed	33 (75.0)	12 (27.3)	0.093
Rescue Iv fentanyl dose (mcg/kg)	1.0 ± 0.5	1.0 ± 0.0	0.818
Non-opioid IV analgesia given			
Yes	43 (97.7)	24 (54.5)	<0.001
Paracetamol only	25 (56.8)	17 (38.6)	
Ketamine only	3 (6.8)	1 (2.3)	
Ketorolac only	0 (0)	1 (2.3)	
Two-drug combination	15 (34.1)	5 (11.4)	
None	1 (2.3)	20 (45.5)	

Table 3: Description of analgesia requirement post-surgery. Values expressed in mean ± SD or numbers (percentage).

Variables	Group A (n = 44)	Group B (n = 44)	p value
Rescue IV fentanyl given	24 (54.5)	0 (0)	<0.001
Rescue Iv fentanyl dose (mcg/kg)	0.5 ± 0.5	0.0 ± 0.0	<0.001
Non-opioid IV analgesia			
Yes	58 (4.5)	57 (2.3)	0.95
Paracetamol only	1 (2.3)	1 (2.3)	
Ketamine only	1 (2.3)	0 (0)	
None	42 (95.5)	43 (97.7)	

requirement postoperatively between the groups in the post-anaesthesia recovery unit.

Table 4 showed the FLACC scores at different time interval (in recovery, 2-, 6-, 12- and 24- hours post-surgery) between two groups. Group A patients had significantly higher pain scores from immediate post-surgery in recovery unit until 12 hours after surgery ($p<0.001$). At 24 hours postoperative, there was no statistical significance between both groups.

Commonest side effects in patients who received systemic morphine was vomiting (38.6%). Although 17 of these patients had vomited 1-3 times within 24 hours during the course of morphine infusion, none of them required rescue antiemetic in the postoperative period. Eleven patients (25%) had complained of constipation and were given ravin enema at day 3 to 5 post-surgery and these occurred in the absence of morphine infusion. On average, duration of morphine infusion was 32.79 hours and none of the infusion exceeded 48 hours. Serious side effects of morphine infusion such as respiratory depression, hypotension, bradycardia were not found in this study.

Commonest postoperative problem in regional anaesthesia group was epidural-catheter-related issues which occurred within 24 hours after surgery whereby 3 patients had peri-catheter leak. None of these leaks had affected pain relief. Epidural catheters were removed in all 3 cases and patients were monitored by APS team. None of the 3 patients required conversion to morphine infusion. Syrup paracetamol was the only analgesia given to these patients. Average epidural infusion duration was 33.77 hours and none of the epidural infusions exceeded 48 hours. None of the patients had vomiting. Two patients complained of constipation at day 3 to 5 postoperative, of which epidural infusions were no longer given. One of them had pyeloplasty done with lumbar epidural infusion post-surgery and another had nephrectomy done with caudal epidural infusion post-surgery. Other complications of regional analgesia blocks such as bradycardia, hypotension, nerve injury, hematoma or infection over the injection side as well as local anaesthesia toxicity were not found in our study.

Table 4: FLACC pain scores at different time postoperative. Value are expressed in median ± interquartile range.

FLACC pain scores at different time postoperative	Group A (n = 44)	Group B (n = 44)	p-value
0 hour (recovery unit)	2.0 ± 3.0	0.0 ± 0.0	< 0.001
2 hours	2.0 ± 1.0	0.0 ± 0.0	< 0.001
6 hours	2.0 ± 1.0	0.0 ± 1.0	< 0.001
2 hours	1.5 ± 1.0	0.0 ± 1.0	< 0.001
24 hours	0.0 ± 1.0	0.0 ± 0.0	0.169

Abbreviation: FLACC=Face, Legs, Activity, Cry, Consolability pain scale. (0 = relaxed and comfortable, 1-3 = mild discomfort, 4-6 = moderate pain, 7-10 = severe discomfort/pain)

DISCUSSION

Clinical trials in children are challenging and differs from adults in terms of ethical concerns, autonomy, justice and safety consideration. Currently there is limited studies that discussed on perioperative analgesic management in paediatric urology surgery. Effectiveness of systemic morphine depended on the morphine concentration and individual analgesia requirement but objective measurement of plasma concentration in the clinical setting is not feasible. Pain relief conferred by regional analgesia blocks depended on multiple factors such as dose and successful deposition of local anaesthesia at desired level. The reliability of blocks was made difficult in the paediatric population as majority of blocks were performed after patients were given general anaesthesia. Hence, inadequate pain relief in the postoperative period is possible for both modalities.

Intraoperative pain assessment in paediatric group is difficult and clinicians often depended on clinical signs. In our centre, IV fentanyl is commonly used as rescue analgesia. In the present study, the administration of additional IV fentanyl intraoperatively were found to be comparable between the morphine and regional anaesthesia group. About 75% of patients who received regular intraoperative morphine required additional IV fentanyl compared to 27.3% of patients who received regional analgesia blocks. This showed that despite giving morphine at 0.1 mg/kg bolus with regular hourly morphine administration, intraoperative pain relief may still be inadequate. After all, site of surgical procedures and the pain severity may not be the same for all patients. Some pain may be very stimulating and transient. Even a cystoscopy can be stimulating (Angus 2013). On the other hand, when administering regional anaesthesia, there are potential issues of patchy blocks, inadequate block cover, delayed block onset or even failed blocks. This would likely account for the small number of patients that still required IV fentanyl despite regional blocks administration.

In this study, the use of intraoperative non-opioid analgesia was not limited to patients who received systemic morphine. In patients who received morphine as a sole analgesia, majority (97.7%) of them had received non-opioid medications while slightly more than half (54.5%) of regional anaesthesia group patients were given non-opioid medications. This difference was found to be statistically significant. This difference however did not indicate the efficiency of morphine versus regional anaesthesia technique. Prescription of non-opioid analgesia may be an individual's tendency and practice in utilising multimodal analgesia approach to minimise the dose of morphine, decrease their adverse effects, improve quality of analgesia and expedite recovery after surgery. Similarly, for patients who had received regional anaesthesia, decision on non-opioid IV analgesia administration depended on the clinical judgement of the attending anaesthetist in terms of block success,

preference and adequacy of the regional analgesia. Administration of non-opioid analgesia for the regional group would have likely covered any patchy blocks or delayed block onset, as evidenced by the lack of postoperative rescue IV fentanyl despite 27.3% of patients initially required intraoperative rescue IV fentanyl. This showed that multimodal analgesia is important regardless of the mode of analgesia given.

Median FLACC scores were significantly lower for regional analgesia group compared to morphine group for the first 12 hours post-surgery. In the immediate postoperative period, 54.5% of patients who received morphine required IV fentanyl in recovery unit compared to none from the regional group which was statistically significant. The FLACC score in the recovery unit was also significantly lower for regional analgesia group compared to morphine group. Despite this, we noted that pain scores in morphine group for first 12 hours were considered low. The administration of non-opioid analgesia in the intraoperative period had likely contributed to the reduced pain scores in the postoperative period in both groups (Dwivedi et al. 2019). While both modalities seemed to confer good analgesia, regional analgesia techniques significantly fared better in pain scores and required less IV fentanyl in the postoperative period. This reduction in opioid requirement and lower pain score for patients who received regional blocks were in line with findings by Kendall et al. (2018). In their 5 years review of randomised controlled trials, they concluded that the use of regional anaesthesia minimises postoperative pain and reduced opioid requirement (Kendall et al. 2018).

Increased opioid use has been found to increase risk of postoperative nausea and vomiting (PONV) in dose dependent manner (Robert et al. 2005). The incidence of vomiting was expectantly higher in the morphine group but none of these patients required any rescue antiemetic in the postoperative period. As all patients were given prophylactic dexamethasone at the onset of surgery, this may have likely reduced the severity of PONV. Despite having small dose of fentanyl infusion in the epidural cocktail, none of the patients in the regional group had PONV. It has been shown that regional anaesthesia in patients undergoing renal, bladder, or ureteral procedures had reduced PONV and was associated with lower use of opioids (Faasse et al. 2015). Constipation which was noted in this study occurred at day 3 to 5 postoperative in both groups when morphine or epidural infusions had ceased. Although constipation was noticeably higher in morphine group (11 patients) compared to regional group (2 patients), the cause of constipation can be multifactorial. Constipation after surgery is common and it can occur due to anxiety, uncontrolled pain, immobility, manipulation of bowels intraoperative, electrolyte imbalance, inadequate fluids intake or even inadequate fibre intake (Sevim et al. 2015).

The incidence of peri-catheter

leak in our study was 6.81%. Serious complications such as epidural hematoma, nerve injury and local anaesthesia toxicity or infections which may lead to permanent disability were not found in our study. While Kasanavesi et al. (2015) reported higher incidence of peri-catheter leak at 15.71%, they also found no major complications in epidural analgesia in children. Peri-catheter leak was a unique complication in their study with minimal soaking at the dressing site. Similar to our findings, they also found that these leaks did not result in increased requirement for rescue analgesia or risk for infection. Postulated mechanism behind peri-catheter leak was the discrepancy between the size of epidural needle and catheter, which was a manufacturing limitation. Hence we proposed that repeated multiple punctures at same site which may lead to greater needle-to-catheter size discrepancy should be avoided to minimise the risk of peri-catheter leak. The main limitation of our study was the retrospective design and the second limitation was the variable subset of regional analgesia techniques used. A prospective randomised controlled trial with larger sample size taking consideration of the different subsets of regional anaesthesia techniques used is recommended in future.

CONCLUSION

Regional anaesthesia technique is superior to systemic morphine in providing analgesia in the first 12 hours post paediatric major urology surgery and is devoid of opioid side effects.

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