ORIGINAL ARTICLE

Comparison of preventive analgesia techniques in circumcision cases: Dorsal penile nerve block, caudal block, or subcutaneous morphine?

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Abstract

Objective: To compare 3 different techniques of preventive analgesia before circumcision operations in male children between 6-12 years of age. Our objective was to investigate the duration and quality of postoperative analgesia in patients, who were subject to caudal block technique, dorsal penile nerve block or who were administered subcutaneous morphine.

Methods: The prospective, randomised, single-blind study was conducted at Ordu University Training and Research Hospital, Ordu, Turkey, from January 1 to June 30, 2015, and comprised boys aged 6-12 years, who were scheduled to undergo circumcision operation. All patients were under general anaesthesia by means of laryngeal masks. The patients were randomised into 3 equal groups. The patients in Group C received caudal block with bupivacaine 0.25% in a total volume of 0.50 ml/kg in lateral position. Those in Group M received injections of 100 mcg/kg of subcutaneous morphine into the deltoid muscle. Patients in Group DP were subjected to dorsal penile nerve block with 1 mg/kg of bupivacaine 0.25%. Intraoperative haemodynamic data, pain and sedation scores, according to Children's Hospital of Eastern Ontorio Pain Scale and Ramsay Sedation Scale, were recorded at postoperative 1st, 6th and 24th hours in all cases.

Results: The 60 subjects in the study were divided into 3 groups of 20(33.3%) each. The overall mean age was 7.75±8.12 years. At 1 hour after surgery; 8(40%) cases in Group M, 5(25%) cases in Group DP, and all the 20(100%) cases in Group C had a pain score <6 ($p<0.05$). When the scores were analysed 12 hours post-operatively, 5(25%) cases in Group M and 10(50%) cases in Group DP had a pain score >6, while the pain scores of all the 20(100%) cases in Group C were <6 ($p<0.01$). Among the groups, there was no statistically significant difference regarding the sedation scores ($p>0.05$).

Conclusion: Using the three methods, analgesia lasted until 12 hours postoperatively, being more evident in the caudal block group, minimising postoperative stress in children and parents.

Keywords: Preventive analgesia, Caudal block, Dorsal penile nerve block, Morphine. (JPMA 67: 159; 2017)

Introduction

Circumcision is a procedure to uncover the tip of the penis by means of surgical incision of the prepuce, which is called the foreskin, covering the glans penis in a certain form and length. It is not only a longstanding tradition practised, but also the most frequently performed surgical procedure in the world.[1,2]

Children are ideal patients for same-day surgeries. Same-day surgical procedures provide great advantage to paediatric patients as they are not taken away from their families and their usual environment for a long time. Many surgical procedures can be performed on a same-day basis in paediatric patients of any age under categories I and II of the American Anaesthesiology Association (ASA) at anaesthesia clinics affiliated to hospitals as well as fully-equipped office-based surgery units.[3]

The purpose of an ideal anaesthesia is to ensure loss of consciousness and reflex deep enough, and motor block and analgesia throughout the surgery under conditions that would cause minimum damage to the physiology and metabolism of the organism as well as to ensure a safe and high quality wake-up period, fast recovery and normalisation of activities in the post-recovery period, and to minimise the side effects such as nausea, vomiting, pain, and vertigo etc. that would delay the discharge of the patient.[4,5]

Circumcision in paediatric patients is done under sedation-analgesia, local anaesthesia, general anaesthesia or regional anaesthesia.[4] The options of anaesthesia methods for circumcision depend on the status of the patient, conditions available at the hospital, professional skills and attitude of the anaesthesiologist.[5]

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The concept of preventive analgesia is a pharmacological strategy based on the administration of analgesic treatment before the surgical stimulus is induced in order to prevent postoperative pain.[6,7] Recent studies have shown that it is more effective to start postoperative pain treatment before surgery.[6] An effective analgesia to be ensured in the postoperative period will not only reduce complications but also bring along a fast recovery.[6]

Today, it is known that children feel pain as much as adults do, that they develop stress response to surgery, and it is necessary to address pain without affecting the respiratory centre. For that reason, regional anaesthesia techniques added to anaesthesia for the purpose of postoperative analgesia are commonly used as they allow children to have a pain and problem-free postoperative period.[8-10]

In ambulatory cases, a child who has consistent pain in the postoperative period will be deprived of his chance to recover and be discharged in a short period of time. Apart from conventional methods, caudal block technique, which has recently gained importance in postoperative analgesia, is preferred as it is easily implemented and has a high chance of success. Furthermore, the trauma of separation from family in children is also avoided in addition to the benefit of analgesia.[11-14]

The current study was planned to investigate the side effects and effects of caudal epidural bupivacaine, subcutaneous morphine and dorsal penile nerve block performed with bupivacaine on postoperative analgesia in paediatric cases.

Subjects and Methods

The prospective, randomised, single-blind study was conducted at Ordu University Training and Research Hospital, Ordu, Turkey, from January 1 to June 30, 2015, and comprised boys aged 6-12 years, who were scheduled to undergo circumcision operation. After approval was obtained from the ethics committee of Samsun Ondokuz Mayis University, Turkey, the subjects were selected who were in ASA I physical status without any additional disorders. Informed consent was collected both from the subjects and their parents.

Children or parents who did not accept our analgesia techniques when explained to them were excluded. Likewise, those who also had some additional urological problems such as paraphimosis reduction, hypospadias repair, epispadias repair, undescended testicles surgery; and who were planned to be operated for those reasons and to be circumcised at the same time were also excluded. And so were patients who had allergy against local anaesthetics or opioids or those with a tendency to have allergies. Also excluded were children in ASA II/III physical status suffering from additional disorders such as childhood asthma, diabetes, epilepsy, liver disease, congenital heart disease etc.; children who had bleeding, coagulation disorders or haematological problems such as anaemia; morbidly obese children with body weight above the 90th percentile according to the percentile curves; children diagnosed with growth development retardation under the 3rd percentile according to the percentile curves; children diagnosed with some additional endocrinological problems; children who were followed by a paediatric psychiatrist and taking medication for any mental health problem like attention deficit hyperactivity syndrome, depression etc.; children with neurological, neuromuscular disorders; and children outside the 6-12 age bracket.

Considering an earlier study as the basis, power analysis and sample size test made at α=0.05 and 80% power, the sample size was determined.

The selected sample was randomised into 3 equal groups: DP, C and M. All the patients were premedicated with 0.5 mg/kg of oral midazolam as they entered the operating room, and when they were put on the operating table following routine monitoring procedures, each patient went through the same standard general anaesthesia method using laryngeal mask. First of all, an intravenous (IV) line was started with 22-gauge intracath, and then induction was done with 2.5 mg/kg of propofol. For the maintenance of anaesthesia, sevoflurane with 2% concentration and 50% nitrous oxide (N2O) - 50% oxygen (O2) was used. In the penile block Group DP, following the necessary sterilisation and covering procedures in supine position, dorsal penile nerve block was performed on the dorsal penile root by the urologist with a 27-gauge dental needle by means of injecting bupivacaine 0.25% in 1 mg/kg dose (maximum upper limit is 50mg). In the caudal block Group C, on the other hand, after anaesthetising the patient by the standard general anaesthesia method, the patient was put in lateral decubitus position, and following the necessary sterilisation and covering procedures, in line with the absolute asepsis and antisepsis conditions in surgery, sacral cornua was palpated, sacral hiatus was located, and bupivacaine 0.25% of 0.5 ml/kg volume in 1 mg/kg dose (maximum 50mg, 20cc volume) was administered by the anaesthesiologist into the sacral hiatus by means of a 22-gauge caudal needle (B Braun®, Melsungen, Germany). Once the caudal needle was inserted, as we were in the sacral epidural space and assured that there was no blood or Cerebrospinal Fluid (CSF) coming through, the local

anaesthetic solution prepared for the case (bupivacaine 0.25%) was administered into the caudal space. Finally, in the subcutaneous morphine Group M), following standard general anaesthesia, 100 mcg/kg of subcutaneous morphine was injected into the deltoid muscle by means of a 26-gauge insulin needle. For dosage, recommended guidelines of the World Health Organisation (WHO) were taken as the basis, without exceeding a total dose of 2.5 mg.[15]

Non-invasive arterial pressure measurements and heart rates (HR) at the post-induction intraoperative 5th, 10th, 15th and 20th minutes were recorded; pain and sedation scores at 1, 6, 12 and 24 postoperative hours were recorded separately for each case. Children's Hospital of Eastern Ontario Pain Scale (CHEOPS)[16] (Figure-1) for children aged 6 months to 12 years was used for the assessment of pain in children. For sedation, the Ramsay Sedation Scoring System (RSS)[17] (Figure-2) was used.

When analysing the data, in addition to descriptive statistical methods of mean and standard deviation (SD), one-way analysis of variance (ANOVA) test and Tukey honest significant difference (HSD) test were also used for the comparison of quantitative data for the intergroup comparison of the parameters with normal distribution. For intergroup comparison of parameters without normal distribution, on the other hand, Kruskal Wallis test was used. As regards the intragroup analysis of parameters with normal distribution, repeated measure ANOVA with paired samples -t test was used. The level of significance was $p<0.05$.

Results

The 60 subjects in the study were divided into 3 groups of 20(33.3%) each. The overall mean age was 7.75±8.12 years. There was no statistically significant difference among the demographic data of the groups ($p>0.05$) (Table-1).

Intraoperative mean arterial pressure (MAP) values were noted (Table-2). There was no statistically significant difference among the groups in terms of MAP values measured at the 1st, 5th, 10th, 15th and 20th intraoperative minutes ($p>0.05$).

Table-1: Demographic characteristics and duration of surgery.

	Group M	Group DP	Group C	P
Age (years)	6.05±13.1	9.62±11.6	8.82±7.6	0.578
Weight (kg)	18.2±2.1	19.4±3.4	20.5±3.7	0.621
Height (cm)	80.9±10.3	90.8±9.5	91.5±8.5	0.543
Duration of surgery (min)	20.7±3,5	19.5±2.5	19.8±3.1	0.539

Table-2: Intraoperative mean arterial pressure (MAP).

	Group M	Group DP	Gr0up C	p
MAP(mmHg)	Mean±SD	Mean±SD	Mean±SD	
5th min	93.36±16.61	88.16±17.09	90.36±15.60	0.387
10th min	91.15±13.86	87.05±12.78	89.16±13.45	0.354
15th min	88.56±12.79	85.25±11.45	86.05±11.40	0.354
20th min	91.15±16.03	82.35±12.58	86.91±13.82	0.141

One-way analysis of variance (ANOVA) test.

Table-3: Intragroup Analysis of Mean Arterial Pressure (MAP) Values.

MAP(mmHg)	Group M	Group DP	Group C
5th min	0.06	0.048*	0.06
10th min	0.08	0.039*	0.01**
15th min	0.04*	0.036*	0.01**
20th min	0.04*	0.025*	0.01**

Paired Samples t test *p<0.05 **p<0.01.

Table-4: Heart Rates (HR).

	Group M	Group DP	Group C	p
HR(Beat/min)	Mean±SD	Mean±SD	Mean±SD	
5th min	120.50±19.30	114.50±13.23	103.90±12.76	0.337
10th min	116.05±19.59	109.25±16.42	105.20±14.16	0.256
15th min	103.30±11.02	102.20±10.45	97.16±15.19	0.04*
20th min	111.62±15.13	108.06±9.13	101.80±16.57	0.399

Oneway ANOVA test *p<0.05.

In Group C, according to the MAP levels before caudal block, significantly low values were observed at the 10th, 15th and 20th minutes following the caudal block ($p<0.01$) In Group DP, statistically significant MAP values were recorded at 5th, 10th, 15th and 20th minutes intraoperatively ($p<0.05$). In Group M, however, statistically significant MAP changes were observed only at 15th and 20th minutes intraoperatively ($p<0.05$) (Table-3).

While there was no statistically significant difference in the HRs recorded at the 5th, 10th and 20th minutes among the groups ($p>0.05$), significant differences were observed in the HRs recorded at the 15th minute after the caudal block in Group C ($p<0.05$). It was determined that the heart rates of Group M were significantly higher than Group C ($p=0.012$) (Table-4).

Highly significantly low values were observed in the HR at all intraoperative measurement times in all the groups (Table-5).

Statistically significant differences were observed among

Table-5: Intragroup Analysis of Heart Rates (HR).

HR (Beat/min)	Group M	Group DP	Group C
5th min	0.01**	0.01**	0.01**
10th min	0.01**	0.01**	0.01**
15th min	0.01**	0.01**	0.01**
20th min	0.01**	0.01**	0.01**

Paired Samples t test **p<0.01.

Table-6: CHEOPS Postoperative Pain Scale Analysis.

	Group M	Group DP	Group C	p
CHEOPS Scale	Mean±SD (Median)	Mean±SD (Median)	Mean±SD (Median)	
1st hour	4.88±1.22 (4)	4.76±0.82 (5)	3.30±0.36 (3)	0.018*
6th hour	4.19±0.76 (4)	4.19±0.27 (4)	3.13±0.24 (3)	0.059
12th hour	5.64±2.36(5)	4.68±1.11 (4)	3.12±0.10 (3)	0.017*
24th hour	5.37±1.11(5.5)	5.47±2.06 (4)	3.38±0.79 (3)	0.037*

CHEOPS: Children's Hospital of Eastern Ontorio Pain Scale.
Kruskal Wallis test *p<0.05.

Table-7: Postoperative Ramsay Sedation Scale (RSS) Analysis of the Groups.

Ramsay Sedation Scale	Group M Mean±SD (Median)	Group DP Mean±SD (Median)	Group C Mean±SD (Median)	P
1st hour	3.09±1,22(3)	3.05±1.17(3)	3.09±1,24 (3)	0.295
6th hour	2.91±1.02(3)	2.96±1.09(3)	2.66±0.87(2,5)	0.324
12th hour	2.05±0,2 (2)	2.13±0,39(2)	1.99±0,18 (2)	0.339
24th hour	2.16±0.48(2)	2.19±0.70(2)	1.98±0.19 (2)	0.759

Kruskal Wallis test.

Table-8: Side Effect Analysis of the Groups.

Possible side effects	Group M n (%)	Group DP n (%)	Group C n (%)	P
Nausea	4 (%20)	2 (%10)	1 (%5)	0.369
Vomiting	2 (%10)	1 (%5)	0 (%0)	0.105
Pruritus	2 (%10)	0 (%0)	0(%0)	0.387
Respiratory Depression	0(%0)	0(%0)	0(%0)	0
Other	0 (%0)	0 (%0)	1 (%5)	0.387

Kruskal Wallis test *p<0.05.

the groups in terms of the postoperative 1st, 12th, 24th hour CHEOPS pain scores (p<0.05), whereas there was no significant difference among the groups regarding the postoperative 6th hour CHEOPS pain scores (p>0.05) (Table-6).

There was no statistically significant difference among the

Cry	No cry	1
	Moaning, whimpering	2
	Sobbing	3
Facial	Smiling	0
	Neutral, composed	1
	Grimacing, definite negative facial expression	2
Verbal	No complaints, talks about other things	0
	None	1
	Complains about pain	2
Torso	Body is at rest	1
	Shuddering	2
Touch	No attempt to reach the wound	1
	Attempts to reach the wound	2
Legs	Legs relaxed or gentle movements	1
	Squirming, kicking	2
	Standing, crouching or kneeling	3

Figure-1: CHEOPS pain scale.

Awake, anxious and/or crying	1
Awake, tranquil, oriented	2
Tired, sleepy, immobile, indifferent	3
Asleep but easy to awaken	4
Asleep but difficult to awaken	5

Figure-2: Ramsay sedation scale.

postoperative 1st, 6th, 12th and 24th hour sedation scores of the groups (p>0.05) (Table-7). When the total of 24 hours was analysed, the mean sedation score of Group M was 2.5±0.45; 2.61±0.62 for Group DP; and 2.41±0.22 for Group C.

Incidences of nausea, vomiting, pruritus, respiratory depression and other side effects did not indicate any statistically significant difference among the groups (p>0.05) (Table-8). One (5%) patient developed urinary retention 4 hours after the caudal block in Group C and bladder catheterisation was required. Urination was achieved in a short period of time.

Discussion

Caudal epidural block is a safe technique, which has recently been widely used in paediatric surgery, particularly in the operation of subumbilical and genitourinary regions, and it is routinely practised in many centres.[18-20]

Caudal block performed before surgical incision relieves intraoperative pain, reduces the need for general anaesthetics and muscle relaxants, facilitates faster restoration of airway reflexes and gastrointestinal motility, and contributes to a more comfortable recovery. As the duration of analgesia provided by the caudal block performed before surgery is much longer than the duration of the operation, the need for additional opioid and non-opioid analgesics in the postoperative period is reduced.[21,22] In our study as well, the group with pre-emptive analgesia through caudal block had the lowest scores (median value 3) on the CHEOPS scale according to the measurements recorded at 1st, 6th, 12th and 24th hours. In terms of clinical observations, similarly, the most comfortable postoperative period was in the same group.

We investigated the haemodynamic data of all our patients through intraoperative monitoring. As for the patients analysed for their MAP values, there was no difference in their results before the pre-emptive analgesia technique was performed. We observed that the MAP significantly went down at the 5th, 10th, 15th and 20th minutes in all groups.

When the HR were analysed, no difference among the groups was observed before the pre-emptive analgesia technique was performed. We identified significant decrease in the HRs at 5th, 10th, 15th and 20th minutes in all groups. We did not observe any differences among the groups in the decrease of HRs at 10th, 15th and 20th minutes. However, there was a difference among the groups regarding the HRs recorded at the 5th minute; the statistical analysis indicated that the low HR recorded at the 5th minute in the caudal block group (Group C) was significant when compared with the subcutaneous morphine Group M.

In general, when we analysed the MAP and HR, statistically significant but clinically insignificant low levels were observed until the 10th and 15th minutes compared to the period before preventive analgesia in all groups. Thereafter, at 15th and 20th minutes the decrease did not continue and the monitored parameters started to stabilise. We believe that these results stemmed from the reduction in the need for anaesthetics and in cardiovascular stress reaction. Therefore, we interpreted that this situation was in favour of the patients.

Locatelli et al.[23] compared levobupivacaine 0.25%, ropivacaine 0.25% and bupivacaine 0.25% in caudal block cases in a study in which they administered local anaesthetics of 0.5ml/kg to 99 children under age 10 for circumcision and a single dose of local anaesthetics of 1ml/kg for inguinal hernia repair and orchiopexy operations, and they could not identify any difference between the groups in terms of intraoperative efficacy of caudal block. They reported that the induction time of analgesia was similar among the groups, and they observed distinct residual motor blockade in bupivacaine at the end of anaesthesia when compared with levobupivacaine and ropivacaine. We did not observe motor block in any of our caudal block cases. In our study as well, the group with caudal block had the lowest scores (median value 3) on the CHEOPS scale according to the measurements recorded at 1st, 6th, 12th and 24th hours. In terms of clinical observations, similarly, the most comfortable postoperative period was observed in the same group.

Breschan et al. concluded that the time period until the first analgesia requirement was longer in levobupivacaine in their study, in which they compared 1 ml/kg of levobupivacaine 0.20%, ropivacaine 0.20%, and bupivacaine 0.20% in caudal block cases. They used the Children and Infants Postoperative Pain Scale (CHIPPS) for the evaluation of postoperative analgesia time and they reported that the time period until the first analgesics requirement was 11.4 hours in levobupivacaine, while it was 10 hours in bupivacaine and ropivacaine. Our study never needed additional analgesics in the caudal block patients.[24]

In a study conducted by Kazak et al., just like in our study, caudal block was done by an anaesthesiologist and dorsal penile nerve block was done by a urologist. In the study of Kazak et al.,[25] according to the comparison of caudal block and penile block for the management of postoperative pain, it was reported that caudal block provided longer postoperative analgesia, but there was a higher risk for motor block compared to the penile block because of the delay in time to first walking. It is also reported that many anaesthesiologists prefer dorsal penile nerve block due to this complication risk. We did not observe motor block in any of our caudal block cases.

In many studies, caudal and penile block were compared in terms of their efficacy with different local anaesthetics. Dorsal penile nerve block has been preferred more in post-circumcision pain management in children old enough to walk due to temporary weakness in the legs.[26] Vater and Demiraran concluded in their study that caudal block and penile block with bupivacaine were effective in the management of post-circumcision pain.[27,28] Demiraran et al. showed in their study with bupivacaine (0.25%) (0,2 ml/kg) that postoperative analgesia lasted 6-8 hours with a single epidural dose and 6 hours with dorsal penile nerve block.[28] Güçlü et al., on the other hand, used 1 ml/kg of ropivacaine 0,25 % and found no difference between caudal block and penile block in terms of postoperative analgesia.[29] Margetts et al. suggested that both methods were effective, but analgesia lasted longer with the caudal.[30] Our results are compatible with literature data. Beyaz et al. conducted a study on circumcision cases and used levobupivacaine 0,25% as local anaesthetic in caudal and dorsal penile blockade, and reported that analgesia duration and complication rates were similar in both methods.[31] Our results are comparable with the results of Margetts et al.'s study, but when it comes to the complication rates and side effects, our results are in line with that of Beyaz et al. In our study, as well, we experienced no serious complications in either the dorsal penile nerve block group or the caudal group. In the subcutaneous morphine Group M, on the other hand, we had side effects such as nausea, vomiting, pruritus in only a couple of cases.

Opioids are guaranteed medications to ensure quality analgesia; even morphine alone can provide postoperative analgesia.[32] Krane et al. compared the duration, quality and side effects of analgesia with caudal morphine, caudal bupivacaine and IV morphine. They used 100 mcg/kg caudal morphine administered through caudal route and it provided satisfactory postoperative analgesia for 8-24 hours. However, due to the high dose, nausea, vomiting and increase in urinary retention were reported. Drug combinations are recommended in order to decrease the dose of the morphine.[33] Kundra et al. indicated that preventive use of caudal bupivacaine and low-dose morphine (20 mcg/kg) was more advantageous in hernia repair in paediatric patients than the postoperative group.[34] In our study as well, effective analgesia was achieved in the subcutaneous morphine group in the early postoperative period. Ramsay Sedation Scores were not high in our morphine group; all the groups had similar scores. We believe that this favourable result stemmed from the fact that we administered morphine through subcutaneous route instead of IV, intramuscular (IM) or caudal routes. As the subcutaneous morphine is slowly released to the plasma, it does not cause an evident sedation.[35] Even low-dose morphine blocks the pituitary-adrenal response to surgical stress and inhibits the release of adrenocorticotropic hormone (ACTH), making it an effective prototype agent in postoperative analgesia.[35] In our study we used morphine subcutaneously and found it to be better short-term analgesia compared to the other two groups.

Subcutaneous morphine induces analgesic effect within 10 minutes, plasma levels reach the peak within 15-30 minutes, and it can be repeated every 4 hours.[34] Aschenbrenner et al. reported that its effect lasted 4-7 hours.[36] In their study conducted with mice, Gades et al. stated that subcutaneous morphine reached its highest analgesic effect within 2-3 hours and the dose interval was 2-3 hours.[37] Semple et al. stated that the peak serum morphine levels were recorded within 16±7 minutes after the subcutaneous injection.[38] Subcutaneous administration of morphine ensures earlier postoperative pain control compared with the IM route because with the IM administration of morphine, peak plasma concentration is reached within 17.5 to 27.8 minutes.[39] In addition to the same clinical effect and efficacy with IV and subcutaneous administration of morphine, Stuart-Harris et al. stated that morphine-6-glucuronide (M6G) and morphine-3-glucuronide (M3G), active metabolites of morphine, were revealed in large amounts after IV administration of morphine. One of these active metabolites, M3G, causes opioid hyperalgesia.[40] This rebound effect also increases more the side effects such as nausea and vomiting.[40] For this reason, in our study, we preferred to administer the morphine through the subcutaneous route to the children for pre-emptive analgesia purposes. When compared with the other two groups in terms of postoperative pain and sedation scores, we achieved similar results in the subcutaneous morphine group, only with the exception of a slightly higher incidence of side effects and lower painless postoperative period vis-a-vis the other groups.

Conclusion

All the three preventive analgesia techniques enabled early postoperative analgesia, but the caudal analgesia group had longer pain-free periods. Parent and child satisfaction was quite good in all the groups, but caudal analgesia group was the most comfortable of the three groups. Pain and anxiety experienced by children to be circumcised should be taken seriously by all physicians and one of the preventive analgesia techniques should be used.

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References

1. Koo HP, Duckett JW. Circumcision-QuoVadis. Pediatrik Cerrahi Dergisi 1995; 9: 149-54
2. Ellis DG, Mann CM. Abnormalities of the Urethra, Penis and Scrotum. In: O?NeillJA, Rowe MI, Grosfeld JL, Fonkalsrud EW, Coran AG, (eds). Pediatric Surgery. 5th ed. United States: St Louis Mosby-Year Book Inc; 1998, 1783-95
3. Yaster M, Sola JE, Pegoli W JR, Paidas CN. The night after surgery: Postoperative management of the pediatric outpatient-surgical and anesthetic aspects. Pediatr Clin North Am 1994; 41: 199-220
4. Rosow C, Manberg PJ. Bispectral index monitoring. Anesthesiol Clin North Am 2001; 19: 947-66
5. Kocamanoglu I, Sahinoglu S, Haydar A. TIVA ve inhalasyon anestezisinin hemodinamik kosullar, metabolik-endokrin ve kas gevsetici gereksinimine etkisinin karsilastirilmasi. Türk Anesteziyoloji ve Reanimasyon Cem Mecmuasi 2000; 28:452-5
6. Woolf CJ, Chong MS. Preemptive analgesia - treating post-operative pain by preventing the establishment of central sensitization. Anesth Analg 1993; 77: 362-79.
7. Kissin I. Preemptive analgesia. Why its effect is not always obvious. Anesthesiology 1996; 84:1015-9.
8. Kayhan Z. Pediatrik Anestezi. Hacettepe Tas Kitapcilik 1995, ss.193-206.
9. Eck JB, Ross AK. Pediatric regional anaesthesia-what makes a difference? Best Pract Res Clin Anaesthesiol 2002; 16: 159-74.
10. Bösenberg A. Pediatric regional anesthesia update. Paediatr Anaesth 2004; 14: 398-402.
11. Bhatt-Mehta V, Rosen DA. Management of acute pain in children. Clin Pharm 1991; 10: 667-85.
12. Berkowitz RA, McDonald TB. Postoperative pain management. Indian J Pediatr 1997; 64: 351-67.
13. Tobias JD. Postoperative pain management. Pediatr Ann 1997; 26: 490-500.
14. Uguralp S, Mutus M, Koroglu A, Gurbuz N, Koltuksuz U, Demircan M. Regional anesthesia is a good alternative to general anesthesia in pediatric surgery: Experience in 1,554 children. J Pediatr Surg 2002; 37: 610-3.
15. WHO Model List of Essential Medicines for Children 4th list. [online] October 2013 [cited 2015 May 25]. Available from: URL: http://www.who.int/medicines/publications/essentialmedicines/en/index.html.
16. Ramsay MA, Savege TM, Simpson BR, Goodwin R. Controlled sedation with alphaxalone-alphadolone. Br Med J 1974; 2: 656-9.
17. McGrath PJ, Johnson GG. Pain management in children. Can J Anaesth1988; 35: 107-10.
18. Peutrell JM, Lonnqvist PA. Neuroaxial blocks for anaesthesia and analgesia in children. Curr Opin Anaesthesiol 2003; 16: 461-70.
19. Hansen TG, Henneberg SW, Walther-Larsen S, Lund J, Hansen M. Caudal bupivacaine supplemented with caudal or intravenous clonidine in children undergo ing hypospadias repair: a double-blind study. Br J Anaesth 2004; 92: 223-7.
20. Kaabachi O, Zerelli Z, Methamem M, Abdelaziz AB, Moncer K, Toumi M. Clonidine administered as adjuvant for bupivacaine in ilioinguinal-iliohypogastric nerve block does not prolong postoperative analgesia. Pediatr Anaesth 2005; 15: 586-90.
21. Stoelting RK, Miller RD. Acute postoperative pain management. In: Tracy TM Ed. Basics of Anesthesia. 3rd ed. Philadelphia: Churchill Livingstone; 1994, 443- 52.
22. Wu CL. Acute postoperative pain. In: Miller RD (eds). Anesthesia. 6th ed. Philadelphia: Churchill Livingstone; 2005, 2729-2762.
23. Locatelli B, Ingelmo P, Sonzogni V, Zanella A, Gatti V, Spotti A, et al. Randomized, double-blind, phase III, controlled trial comparing levobupivacaine % 0.25, ropivacaine % 0.25 and bupivacaine % 0.25 by the caudal route in children. Br J Anaesth 2005; 94: 366-71
24. Breschan C, Jost R, Krumpholz R, Schaumberger F, Stettner H, Marhofer P., et al. A prospective study comparing the analgesic efficacy of levobupivacaine, ropivacaine and bupivacaine in pediatric patients undergoing caudal blockade. Paediatr Anaesth 2005; 15: 301-6.
25. Kazak BZ, Ekmekci P, Hakan HA. Levobupivacaine for postoperative pain Management in circumcision: caudal blocks or dorsal penile nerve block. Agri 2012; 24: 180-6
26. Cyna AM, Middleton P. Caudal epidural block versus other methods of postoperative pain relief for circumcision in boys. Cochrane Database Syst Rev 2008; (4): CD003005.
27. Vater M, Wandless J. Caudal or dorsal nerve block? A comparison of two local anaesthetic techniques for postoperative analgesia following day case circumcision. Acta Anaesthesiol Scand 1985; 29: 175-9.
28. Demiraran Y, Akman Y, Tuce Z, Cam K, Erol A. A comparison of postoperative analgesic efficacy of dorsal penile nerve block versus single dose caudal epidural block for penile surgery in children. Med J Kocatepe 2005; 6: 47-52.
29. Güclü Y C, Meco BC, Yilmaz AA, Alanoglu Z, Alkis N. Comparison Between Penile Block and Caudal Block with Ropivacaine in Children Undergoing Circumcision. Anestezi Dergisi 2014; 22: 153 - 8
30. Matgetts L, Carr A, Mc Fadyen G, Lambert A. A comparison of caudal bupivacaine and ketamine with penile block for paediatric circumcision. Eur J Anaesthesiol 2008; 25: 1009-13.
31. Beyaz SG. Comparison of postoperative analgesic efficacy of caudal block versus dorsal penile nerve block with levobupivacaine for circumcision in children. Korean J Pain 2011; 24: 31-5.
32. Serlin S. Single-dose caudal epidural morphine in children: safe, effective, and easy. J Clin Anesth 1991; 3: 386-90.
33. Krane EJ, Jacobson LE, Lynn AM, Parrot C, Tyler DC. Caudal morphine for postoperative analgesia in children: a comparison with caudal bupivacaine and intravenous morphine. Anesth Analg 1987; 66: 647-53.
34. Kundra P, Deepalakshmi K, Ravishankar M. Preemptive caudal bupivacaine and morphine for postoperative analgesia in children. Anesth Analg 1998; 87: 52-6.
35. Bailey PL, Stanley TH. Intravenous opioid anesthetics. In: Miller RD ed. Anaesthesia. 4th ed. Philadelphia: Churchill Livingstone; 1994, 291-388.
36. Aschenbrenner DS, Venable SJ. Drugs Treating Severe Pain. Drug Therapy in Nursing. 3rd ed. Philadelphia: Lippincott Williams & Wilkins; 2009, 373-98.
37. Gades NM, Danneman PJ, Wixson SK, Tolley EA. The magnitude and duration of the analgesic effect of morphine, butorphanol, and buprenorphine in rats and mice. Contemp Top Lab Anim Sci 2000; 39: 8-13.
38. Semple TJ, Upton RN, Macintyre PE, Runciman WB, Mather LE. Morphine blood concentrations in elderly postoperative patient following administration via an indwelling subcutaneous cannula. Anaesthesia 1997; 52: 318-23.
39. Kirkpatrick T, Henderson PD, Nimmo WS. Plasma morphine concentrations after intramuscular injections into the deltoid or gluteal muscles. Anaesthesia 1988; 54: 293-5.
40. Stuart-Harris R, Joel SP, McDonald P, Currow D, Slevin ML. The pharmacokinetics of morphine and morphine glucuronide metabolites after subcutaneous bolus injection and subcutaneous infusion of morphine. Br J Clin Pharmacol 2000; 49: 207- 14.