COMPARISON OF POST-OPERATIVE ANALGESIC EFFICACY OF CAUDAL BLOCK VERSUS DORSAL PENILE NERVE BLOCK WITH BUPIVACAINE AND TRAMADOL FOR CIRCUMCISION IN CHILDREN

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ABSTRACT

BACKGROUND

Circumcision is a painful intervention, frequently performed in paediatric surgery. We aim to compare the effects of penile block versus caudal block using bupivacaine with tramadol for circumcision to evaluate post-operative analgesia.

MATERIALS AND METHODS

This randomised controlled trial study was conducted on 60 healthy boys aged 1 - 7 years of American Society of Anaesthesiologist (ASA) class-1, scheduled for circumcision under general anaesthesia. The patients were randomly divided into two equal groups: Group P (penile block, 0.25% bupivacaine with tramadol 1 mg/kg, 0.5 mL/kg, n= 30) and Group C (caudal block, 0.25% bupivacaine with tramadol 1 mg/kg, 0.5 mg/kg, n= 30). Post-operative pain is evaluated by the FLACC pain score and time to first rescue analgesic request as well as total doses of analgesic requirements were recorded.

RESULTS

The mean duration of analgesia was 22 +/- 4.45 hrs. in Group P, while in Group C it was 11 +/- 2.75 hrs. (p= 0.0001). No significant difference was observed in incidence of haemodynamic changes or no side effect observed. Total analgesic requirement was also significantly low in Group P than Group C.

CONCLUSION

DPNB (bupivacaine with tramadol) for circumcision provides longer post-operative analgesia than caudal (bupivacaine with tramadol) without significant increase in rate of adverse effect.

KEY WORDS

Post-Operative Analgesia, Circumcision, DPNB, Caudal Block, Tramadol.

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BACKGROUND

Pain relief after surgery continues to be a major medical challenge despite a significant improvement over the last decade in our understanding of acute pain mechanism.[1] Although, pain is a predictable part of the post-operative experience, inadequate management of pain is common and have profound implications.[2]

The greatest advance in paediatric pain medicine is the recognition that untreated pain is a significant cause of morbidity and mortality after surgical trauma.[3] Accurate assessment of pain in different age groups and effective treatment of post-operative pain is constantly refined with newer drugs being used alone or in combination with other drugs continues to be explored.

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Pain free post-operative period will decrease the stress to parents as well as the treating doctor, hastens ambulation and quick discharge of patients.

Circumcision is the most common surgical procedure carried out in young male patients globally.[4,5] It is generally performed under general anaesthesia in order to eliminate fear and anxiety.

Regional anaesthesia like caudal block and dorsal penile nerve block in combination with general anaesthesia is frequently used for children undergoing surgical procedures. Advantages of the technique are a smoother intra-operative course and decreased requirement of general anaesthesia, often leading to faster and smoother wakeup, decreased stress response and excellent pain relief in immediate post-operative period.

Different adjuvants have been added in regional nerve blocks to prolong the post-operative analgesia like clonidine, dexamethasone[6], morphine etc. Tramadol have been used as an adjuvant in axillary brachial plexus nerve block,[7] caudal anaesthesia[8,9] and also in dorsal penile nerve block[10] to extend the duration of post-operative analgesia.

In this study our aim is to compare post-operative analgesia, sedation status and complication between caudal block and DPNB with bupivacaine and tramadol in elective circumcision cases.

MATERIALS AND METHODS

After obtaining parental written consent, a randomised controlled trial study was conducted on 60 ASA grade-1 male children aged 1 - 7 years, scheduled for elective circumcision. The patients were randomly divided into two equal groups: Group P (penile block, 0.25% bupivacaine with tramadol 1mg/kg, 0.5 mL/kg, n= 30) and Group C (Caudal block, 0.25% bupivacaine with tramadol 1 mg/kg, 0.5 mg/kg, n= 30) according to computer generated numbers. Post-operative pain is evaluated by the FLACC pain score and time to first rescue analgesic request as well as total doses of analgesic requirements were recorded.

Children with a history of pre-existing neurological or spinal disease, allergic reaction to local anaesthetics, bleeding diathesis, infection at injection site or parent's refusal were excluded from the study.

Procedure

Pre-operatively, patients were randomised into two groups. Group P (n= 30) included patients who received penile block and Group C (n= 30) included patients who received caudal block.

Children were monitored with an ECG, NIBP, and Pulse oximetry and then induction of general anaesthesia was performed with a face mask using 8% sevoflurane in 100% O2. IV line secured. After induction appropriate size of laryngeal mask airway was placed according to children's age and weight without muscle relaxant. Inj. Atropine Sulphate according to patient's weight was given intravenously. Anaesthesia was maintained with O_2, Nitrous Oxide and 1% of Sevoflurane.

After induction Group P (penile block) (n= 30) received DNPB in supine position with 0.25% bupivacaine and Inj. tramadol 1 mg/kg with total volume of 0.5 mL/kg. After all aseptic precautions, a 30 mm long, 23G needle was inserted in the midline after gently pulling down the base of penis by the index finger and directed below the symphysis pubis through the Scarpa's fascia and into the subpubic space till give in feeling is appreciated. After a negative aspiration for blood, 25% of the calculated volume of drug is injected. The needle was withdrawn by 1 - 2 mm and redirected to 10:00 o'clock and 2:00 o'clock position and 25% of calculated volume of drug was injected on either side of midline to block the two dorsal nerves. An additional puncture was made on raphe line at the borderline between the penis and scrotum and the remaining 25% of the calculated drug volume was injected to alleviate possible pain arising from the skin innervated by the perineal nerves.

Group C (Caudal block) (n= 30) received caudal epidural block using 22G needle in lateral decubitus position. The needle was inserted into the caudal epidural space through sacral hiatus with loss of resistance technique and Inj. bupivacaine 0.25% and tramadol 1 mg/kg with total volume of 0.5 mL/kg injected into the caudal epidural space.

Skin incision was performed after 20 mins of block in each group. If heart rate or blood pressure increases by more than 20% of the baseline after skin incision, means the block is unsuccessful and patient needs to receive analgesics in the form of 1 mg/kg ketamine for pain relief intraoperative and this patient was excluded from the study.

After emergence from anaesthesia, patients were shifted to recovery room where they were observed for pain, sedation and side effect (Nausea, vomiting, agitation, bleeding, penile haematoma, urinary retention, motor block) at 0, 5 mins, 15 mins, 30 mins, 1 hour and then every 2 hourly for next 24 hours.

Statistical Analysis

The observations were analysed using Epi Info software. Unpaired t-test was applied for demographic data, haemodynamic parameters, onset and duration of sensory/motor blockade and duration of analgesia, Chi-square test was applied for age, sex and ASA grades. P value <0.05 was considered as significant. Raw data were entered into an MS Excel spreadsheet and analysed using standard statistical software SPSS® statistical package version 18.0 (SPSS Inc., Chicago, IL, USA).

RESULTS

Post-operative pain was assessed and evaluated by the FLACC pain score. This is a behavioural score for scoring post-operative pain in young children composed of five categories: (F) Face, (L) Leg, (A) Activity, (C) Cry, (C) Consolability [Table 1]. If the degree of pain scores (0-10) was >/= 4, Ibuprofen was given as rescue analgesic in dose of 10 mg/kg in repeated doses every six hours orally (with a maximum daily dose of 40 mg/kg). The time of first analgesia, total analgesic requirement, any complication or side effect due to block or general anaesthesia were observed and recorded. For sedation, Ramsay sedation score (Table 2) was used.

The randomised controlled trial study included 60 ASA grade 1 young boys undergoing circumcision. One patient in Group P and two patients in Group C were excluded from the study because of unsuccessful blocks. The remaining 57 patients were divided into Group P (n=29) and Group C (n=28). There were no significant difference between the two groups with regard to age, weight, duration of surgery or duration of anaesthesia (Table 2 and 3).

On evaluation of FLACC pain score at different time interval (after surgery 0, 5, 15, 30 mins, 1, 2, 4, 6, 8, 10, 12, 18, 24 hours) in the two groups, a total of 8 out of 29 patients in Group P and 18 out of 28 patients in Group C received analgesia in the first 24 hours post-operatively and the difference between two groups was significant.

The rescue analgesic requirements were significantly higher in the caudal group than in the penile group. The average time to first analgesia was significantly shorter in Group C (caudal group) (11 ± 2.75 hours) than in penile group (22 ± 4.45 hours) ($p < 0.0001$) and time for ambulation was significantly longer in caudal group (6.95 ± 3.22 hours) than penile group (4.36 ± 1.99 hours) ($p < 0.0006$). There were no cardiovascular, respiratory or neurovascular complications recorded in either groups and also no patients developed nausea, vomiting or urinary retention.

Categories	Scoring		
	0	1	2
Face	No particular expression or smile	Occasional grimace or frown, withdrawn, disinterested	Frequent to constant quivering chin, clenched jaw
Legs	Normal position or relaxed	Uneasy, restless, tense	Kicking or legs drawn up
Activity	Lying quietly, normal position, moves easily	Squirming, shifting back and forth, tense	Arched, rigid or jerking
Cry	No cry (awake or asleep)	Moans or whimpers, occasional complaint	Crying steadily, screams or sobs, frequent complaints
Consolability	Content, relaxed	Reassured by occasional touching, hugging or being talked to, distractible	Difficult to console or comfort

Table 1. FLACC Pain Score

1	Fully awake and oriented
2	Awake, sleepy
3	Asleep, but easily awaken by verbal stimulation
4	Asleep, but easily awaken by motor stimulation
5	Asleep and cannot be awaken by verbal or motor stimulation

Table 2. Ramsay Sedation Score

	Group P	Group C	P value
Age (years)	3.47 ± 2.56	3.67 ± 2.16	0.75
Weight (kg)	12.82 ± 2.87	13.91 ± 2.32	0.12
Duration of surgery (min)	40 ± 5.3	42 ± 5.1	0.15
Duration of analgesia (hours)	22 ± 4.45	11 ± 2.75	0.0001

Table 3. Comparison of Groups according to Age, Weight, Duration of Analgesia

Variables	Group P (n=29)	Group C (n=28)	P value
No. of patients received	8/29	18/28	0.0001
Time of first analgesia (hours)	22 ± 4.45	11 ± 2.75	0.0001
Total doses of rescue analgesia (mg)	126 ± 22.69	523.8±124.1	0.0001
Time to ambulation (hours)	4.36 ± 1.99	6.95 ± 3.22	0.0006

Table 4. Post-operative Analgesic Requirement

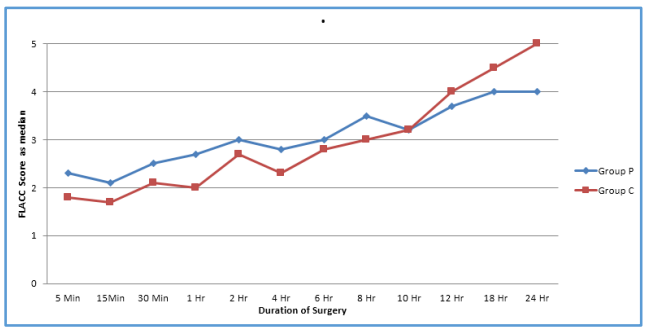

Figure 1. Comparison of Post-Operative Pain in Two Groups (FLACC Pain Score)

Comparison of Face, Legs, Activity, Cry, Consolability Score (FLACC) at different time intervals between the two groups. Data are presented as Median.

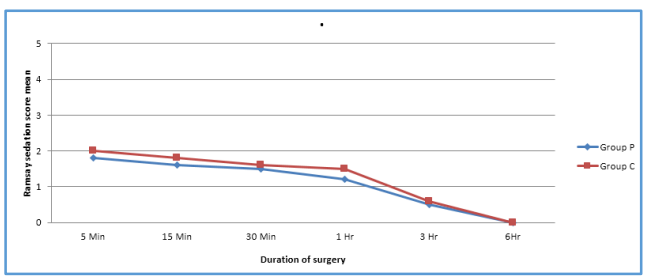

Figure 2. Comparison of Post-Operative Sedation in Two Groups

Fig. 2- Intergroup comparison of post-operative Ramsay sedation score versus time revealed that sedation score decreased significantly over time ($p < 0.001$), but there was no significant difference between groups. Data are expressed as mean +/- SD.

Ramsay sedation score was comparable in Group P and Group C. Comparing the score at all time intervals found no significant difference between two groups.

DISCUSSION

Circumcision is the most common surgical procedure carried out in the boys globally.[4,5] Minimising complication and pain management are important issues and various researches were done on different anaesthetic and analgesic techniques. In our study, we have compared post-operative analgesia of caudal block versus DPNB with Bupivacaine and tramadol for circumcision.

Tramadol is a unique opioid with two modes of action for inhibition of pain, i.e. an opioid action mediated by μ receptor and a non-opioid action mediated by alpha-2 adrenergic and serotonergic activity.[11,12] The monoaminergic activity of tramadol inhibits the descending pain pathway, resulting in suppression of nociceptive transmission at the spinal level.[13] Many studies have characterised the effects of tramadol as an adjuvant to local anaesthetics in brachial plexus block,[14,15,16] caudal epidural block[17,18] and also in DPNB.[10]

We observed that duration of analgesia (FLACC < 4) without the need of rescue analgesia was significantly longer in Group P (22 ± 4.4 hours). Total dose of rescue analgesic was significantly higher in Group C (523 ± 124.1 mg). Total number of patients who required rescue analgesia were also significantly high in Group C (18/28).

Our results are in agreement with Shrestha BR et al, who found that tramadol in injection with bupivacaine in DPNB can prolong the post-operative analgesia even up to 40 hours.[10]

Enas M Ashrey et al and Mohammad Alikhan et al found that FLACC pain score were significantly lower in Group P compared to Group C ($p < 0.05$). Also time to first need for analgesia was significantly ($p < 0.05$) lower in Group P compared to Group C. Total analgesic requirement was also significantly lower ($p < 0.05$) in Group P compared to Group C.[19]

Also, Kundra et al found that penile block provided better analgesia when compared with caudal epidural in children undergoing hypospadiasis repairs.[20]

In our study, time for ambulation is shorter in Group P (4.36 +/- 1.99 hrs.) than in Group C (6.95 +/- 3.22). According to some studies, penile block has advantage over caudal block in terms of sensory and motor block to lower extremity.[19,21]

The pre-operative, intra-operative and post-operative haemodynamic variables between two groups were comparable and were not statistically significant and therapeutic intervention were not required.

There were no complication recorded such as nausea or vomiting and also no retention of urine. However, penile bleeding was seen in one case in each group. Other studies have also demonstrated that penile block as well as caudal block is associated with fewer side effects.[19,22]

CONCLUSION

Tramadol as an adjunct to Bupivacaine in DPNB compared to caudal epidural block for circumcision provides longer analgesic duration and causes reduced requirement for rescue analgesic in the post-operative period.

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