Evaluation of caudal epidural analgesia for relieving post-operative pain in perianal, inguinoscrotal and urethral surgery in paediatric age group

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Abstract

Background: Post-operative pain poses special problems in children. The use of caudal epidural analgesia for post-operative pain relief, either completely eliminates or appreciably reduces the hazards of narcotic analgesics. So, this study was planned to clinically evaluate the efficacy, safety and duration of pain relief following caudal epidural analgesia in children.

Materials & Methods: This prospective study was conducted in children from age group 0 to 12 years undergoing perianal and genital surgery after taking permission from institutional ethics committee. Patients with sacral anomalies, skin infection, poor bony land marks, movements and previous operation were not included in study. 1% lignocaine hydrochloride was used with adrenaline in concentration of 1:2000000 for caudal analgesia Children were observed for pain as well as for any untoward effects in post-operative period.

Results: In this study caudal block was successful in 48 (96%) cases out of total 50 surgical patients who were recruited during the study period. The duration of pain relief ranged from 265 minutes to 500 minutes. The average duration was 394 minutes. Haematoma and Blood in epidural tap were observed in 4% and 8% cases respectively. Retention of urine was recorded in 4% cases. Pain at injection site was complained by 12% cases. Nausea and vomiting was recorded in 20% cases.

Conclusion: It is concluded that caudal block is an efficient and safe method for achieving pain relief of reasonable duration during post-operative period in children.

Key Words: Post-operative pain, perianal and genital surgery, caudal epidural analgesia, narcotic analgesics, lignocaine

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Introduction

Post-operative pain poses special problems in paediatric age group. Very few children presenting for surgery are in pain preoperatively. Many of the younger ones are unaware that there is anything the matter with them, they therefore naturally regard post-operative pain unnecessary and unjust and are uncooperative.[1] This leads to differentiation in nursing during the immediate post-operative period. This also causes undue anxiety to the patients. Conventionally pain relief during the post-operative period is achieved by the use of narcotic analgesics, which are not without hazards, such as prolonged somnolence, respiratory depression and vomiting etc.[2,3] It is also not uncommon to see the children immobilized with splints as they don't pull out the dressings or disturb the operation wound which is not a very pleasant sight. The use of caudal epidural analgesia for post-operative pain relief, either completely eliminates or appreciably reduces the above mentioned hazards of narcotic analgesics. Caudal analgesia, introduced by Sicard in 1901, is a form of regional analgesia affected by injecting the anaesthetic solution in the sacral canal to block coccygeal, sacral and lumber nerves outside the duramater.[4]

In adults it has not gained much popularity since it is time consuming, technically difficult, and has high incidence of failure. It has however been found valuable in children since it is free from the disadvantages which limit its use in adults.[5,6] According to Armitage 1979, in children, a caudal block performed under light general anaesthesia, is successful in over 98% of cases, is effective for the operations performed from the umbilicus downwards, and takes less than 1 minute to perform.[3,7]

With this technique there is unique combination of complete analgesia with undisturbed motor power. It has all the advantages of low spinal and yet is outside the theca. Certain disadvantages of spinal analgesia, like troublesome post spinal headache and life threatening meningitis are virtually eliminated.

There are however certain disadvantages in the use of caudal analgesia, e.g. Anatomical abnormalities of sacrum which make it unpredictable and greater chances of sepsis as the area is close to the anus. These can however be minimized by proper selection of cases and by observing strict aseptic measures.

The use of caudal analgesia during the immediate post-operative period in children, needs due consideration, since beside relieving pain, it will also keep the patients awake, enable resumption of oral feeds, avoid restlessness and the accompanied neurohumoral responses. Last but not the least it will also enable the

children to communicate with parents, which is important in building up of confidence and morale in them as well as in their parents. This study was planned to clinically evaluate the efficacy, safety and duration of pain relief, following caudal epidural analgesia in children.

Materials & Methods

This prospective study was conducted in tertiary care teaching hospital after obtaining clearance from institutional ethical committee. Children from age group 0 to 12 yrs who were admitted to hospital for various surgical procedures on perianal and genital region were included in our study. Patients with sacral anomalies, skin infection, poor bony land marks, movements and previous operation were not included in study. 1% lignocaine hydrochloride was used with adrenaline in concentration of 1:2000000 to prolong duration of action. Total dose of lignocaine hydrochloride varied depending on the site of surgery. Prenaesthetic check-up was done in detail by the anaesthesiologist, a day prior to operation. Only patients with Grade I ASA classification were selected for study. Written informed consent was taken from parents of all patients after explaining the details of the procedure. Post-operative analgesia was avoided to obviate the confusion in evaluation of pain relief due to caudal block during the post-operative period. Caudal analgesia was given after taking all aseptic precautions.

Patients were observed in the recovery room till they were fully conscious and then shifted to post-operative ward. Children were observed for pain every half hour. The termination of analgesia was indicated by the following events a) Complaint of pain at the operation site by the older child b) Crying- persisting even after giving feeds and c) Restlessness- with no other obvious detectable cause. Patients were observed in post-operative period for any untowards effects.

Pulse, blood pressure and respiration were recorded half hourly for 24 hr. Headache, nausea, vomiting, hypotension, pain in the back, retention of urine, motor weakness, pain at the site of injection, and any evidence of meningitis were specifically looked for. All the data were recorded in percentage. Time was recorded in minutes.

Results

Total 50 surgical patients in paediatric age group were recruited during the study period. The operations were mainly on perianal and genital areas. (Table 1) All patients selected for study were in the age range of 7 months to 12 years. The mean age was 5.80 years, with majority of patients (64%) below 6 years of age. All patients were distributed in to 4 age groups. (Table 2) All the patients in the study were male.

In this study caudal block was successful in 48 (96%) cases. These include 3 infants who cried between 30 and 90 minutes of giving block but went off to sleep after being fed. In two patient block was not successful and required analgesic 25 minutes after the operation.

The time taken for surgery for all types of operations ranged from 15 to 95 minutes, with an average of 43.4 minutes. Dose of lignocaine hydrochloride 1% with adrenaline 1:2000000 was used. Minimum amount used was 1.25 ml and maximum was 7 ml. On weight basis dose ranged from 1.4 to 4 mg/kg.

The duration of post-operative analgesia was recorded from the time of injecting the drug into the epidural space to the onset of pain at operation site as evidenced by crying, restlessness, or complaint of pain by the patients. Onset of analgesia was taken as time of injection, since by the time patients came out of GA, the effects of caudal block invariably set in. The duration of pain relief ranged from 265 minutes to 500 minutes. The average duration was 394 minutes. Figure 1 and 2 show the average duration for different surgical groups and age groups.

Blood pressure was monitored during the post-operative period using appropriate size cuff. Any fall or rise in the BP was taken note of. None of the cases showed any rise in BP. Fall of BP was recorded in the range of 5-12 mm Hg. In all cases fall of BP if any was found to occur in the first hour following the caudal block. Table 3 shows the details of average fall of BP in different age group. The patients were observed carefully during injection and in the post-operative period. The records were maintained about their progress. The patients were visited and examined every day in the post-operative period, and complications if any were recorded. (Table 4)

Table 1: Surgical procedure undertaken in the present study

Sr. No.	Diagnosis	No of cases (%) n=50
1	Hypospadias/epispadias	24 (48)
2	Phimosis	12 (24)
3	Hydrocele	08 (16)
4	Rectal prolapse	04 (08)
5	Urethral fistula	02 (04)

Table 2: Demographic characteristics of patients

Sr. No.	Age groups	No of cases (%) n=50	Mean weight in kg
1	6 month to 3 yrs	14 (28)	11.0
2	3-6 yrs	18 (36)	14.4
3	6-9 yrs	08 (16)	20.75
4	9-12 yrs	10 (20)	24.4

Table 3: Average fall of BP in different age groups

Sr. No.	Age groups	No. of cases	No. of cases showing fall of BP	Average fall in BP (mm)
1	6 month to 3 yrs	14	8	4
2	3-6 yrs	18	12	5.4
3	6-9 yrs	8	8	8
4	9-12 yrs	10	8	6.2

Table 4: Details of complications

Sr. No.	Complications	Number of cases (%)
A: Immediate		
1	Haematoma	2 (4)
2	Blood in epidural tap	4 (8)
3	Dural puncture	-
4	Convulsions	-
5	Total spinal	-
6	Total body caudal	-
7	Hypotension	-
B: Delayed		
8	Headache	-
9	Pain at the site of injection	6 (12)
10	Retention of urine	2 (4)
11	Nausea and vomiting	10 (20)
12	Motor weakness	-
13	Back pain	-
14	Miscellaneous	-

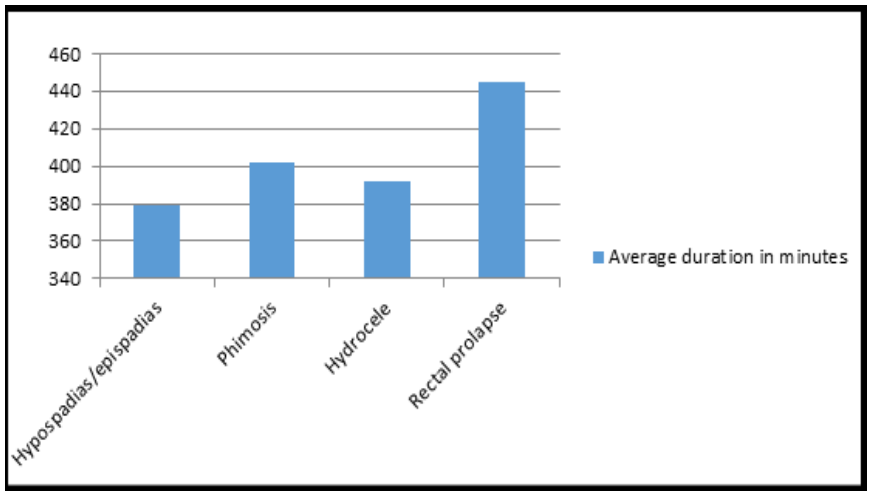

Fig. 1: Average duration of analgesia for different surgical group

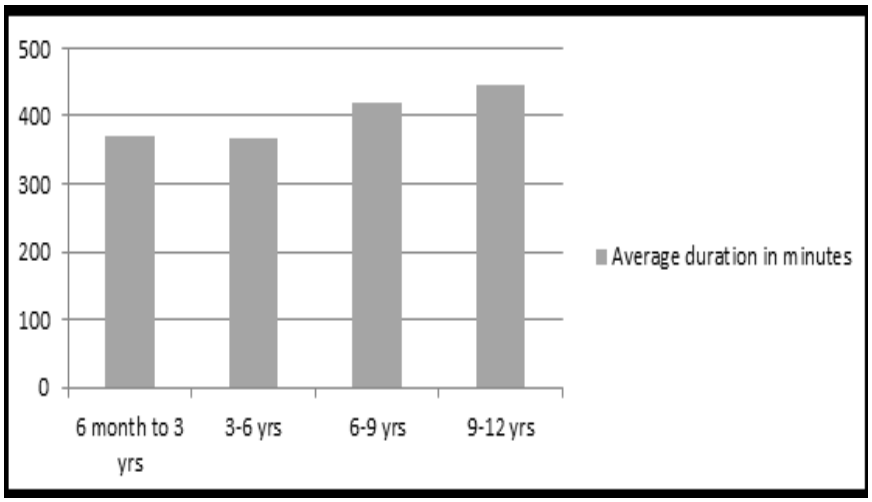

Fig. 2: Average duration of analgesia for different age groups

Discussion

Pain relief during post-operative period is an extremely important aspect of post-operative care. Conventionally this has been achieved by the use of narcotic analgesics which are not without hazards particularly in children. Now a day's caudal block is commonly used for post-operative and intraoperative pain relief in children.[8]

In our study caudal epidural analgesia was given for hypospadias correction 48%, phimosis 24%, hydrocele 16%, rectal prolapsed 8% and urethral fistula closure 4%. Surgery for all these conditions is known to cause some degree of pain in the post-operative period. All patients were male. This could be due to the fact that majority of operations performed during the study period were for those diseases/disabilities which are exclusively associated with male genital organs as it is evident in Table 1.

All these patients were operated under general anaesthesia. Care was taken to avoid the use of analgesics as premedication, as well as during the operation, so that the evaluation of relief of post-operative pain is not prejudiced. The doses of drugs used in premedication and anaesthetic technique were standardised to ensure uniformity of results.

Patients were given caudal block while still under the effects of general anaesthesia. The failure rate with our technique was 4%. The failure rates reported by other workers in this age group are Armitage 1979 (2%), and McGown 1982 (2.8%). Our failure rate is similar to that reported by other workers.[7,9] We attribute our low failure rate to proper selection of cases. Great importance was attached to the detection of any sacral anomaly which is an important cause of failure. Correct placement of needle in the caudal epidural space was ensured in all the cases prior to injection of the drug.

The volume of drug to be injected in each case was calculated using the recommendations of Bromage 1969.[10] The maximum amount of drug injected was 4mg/kg on weight basis. This is well within the maximum of 7mg/kg recommended with adrenaline. Touloukian 1971 have used doses upto 8 mg/kg and Hassan 1977 has used upto 11 mg/kg in infants without untoward effects.[11,12] In our study of cases comparatively less amount of drug was used, as only 5 sacral segments were blocked to produce analgesia in desired area. This also resulted in negligible side effects directly attributable to the use of lignocaine. In our experience these doses were found to produce adequate degree of analgesia in all cases of successful block.

Duration of analgesia was measured from time of caudal block given, to onset of pain. The end point of analgesia was taken with the complaint of pain, restlessness without other cause or crying persisting in spite of feeding in case of infants and young children. The duration of pain relief ranged from 265 minutes to 500 minutes with an average of 394 minutes. Kay 1974 studied post-operative pain relief in children with Bupivacaine 0.5% and reported pain relief lasting till bed time in majority of patients.[13] Jensen 1981 studied caudal block for post-operative pain relief in children after genital operations, with Bupivacaine. He reported duration of pain relief ranging from 245 to 515 minutes.[14] There were no complications in his study. These results are comparable with our study. The quality of analgesia so obtained was good to excellent. The patients were wide awake during the period and were able to take oral feeds.

The duration of analgesia was also studied in relation to type and duration of surgery undertaken. No linear relationship was found to exist between duration of pain relief and type and duration of surgery. The duration of analgesia was also studied in relation to different age groups. In the age group of 6 months to 3 years and 3 to 6 years the average duration was 371 and 366 minutes respectively. In the age group of 6 to 9 yrs and 9 to 12 years the average duration was 420 and 445 minutes respectively. This difference in duration of pain relief in younger and older age group could perhaps be due to difference in behavioural response to pain in two

age groups. The younger children who reacted to pain by crying probably did so in the early stages when it was still felt as mild discomfort, whereas the older complained of it when it had increased in intensity.

In our study no rise in BP was recorded in any case. In 72% cases there was slight fall in BP in the range of 5-12 mm Hg. There was no notable difference in fall in BP in various age groups. None of the cases developed any signs or symptoms attributable to fall in BP. No active treatment was required for restoration of BP to normal, which returned to basal levels after some time. Hasan 1977 used lignocaine 1.5% in 50 infants for caudal block and reported no noteworthy change in pulse, blood pressure, respiration and ECG.[12] McGown 1982 reported hypotension in 2% cases in his study of 500 cases, using 1% lignocaine with 1:2000000 adrenaline. He however achieved blocks upto second to eight thoracic segments.[9] Our findings are in agreement with those of Hassan 1977.[12] The cardiovascular stability observed in our cases was due to the fact that we blocked only 5 sacral segments to achieve the desired analgesia, as dictated by the nature of surgery.

Haematoma was seen in 4% cases. Blood in epidural tap was observed in 8% cases. McGown 1982 has reported incidence of sacral vein puncture in 10% of the cases in his study, which is comparable with our finding.[9] Retention of urine was recorded in 4% cases. The inability to pass urine after anorectal and genital surgery is not infrequent. The main causes for this are post-operative pain of injured tissue and drugs such as opiate. Both these factors are eliminated by the use of caudal block. Patients remain wide awake and have effective post-operative analgesia, thereby resulting in greatly reduced incidence of urine retention. Lunn 1979 and Jensen 1981 have reported the incidence of nausea and vomiting as 23% and 33% respectively following caudal block.[14,15] We encountered this complication in 20% cases. As 6 out of 10 of these cases vomited soon after recovery from GA, it was difficult to assess the contribution of caudal block alone to this complication. Vomiting in our study was not found to be related to fall in BP. Pain at injection site was complained by 12% cases. On examination there was no evidence of local sepsis. 4 of them were the same as those in whom more than one puncture had to be made due to blood in epidural tap. In all these cases pain subsided on administration of oral analgesics.

Other complications like dural puncture, convulsions, total spinal, headache and motor weakness of lower limbs were not encountered in our study.

Conclusion

From the study, it is concluded that caudal block, using lignocaine with adrenaline 1:2000000 is an efficient and safe method for achieving pain relief of reasonable duration during post-operative period in children. However to ensure efficacy and safety with this method it is recommended that all the precautions that go with this technique should be strictly observed. Finally, caudal epidural block though not necessarily an ideal method for post-operative pain relief, does definitely deserve to be considered as an alternative to other available methods.

References

1. Himabindu K, Venugopalarao T, Subramanyam PK. Acomparative study of caudal bupivacaine and midazolam for post-operative analgesia in pediatric patients. J Dr NTR Univ Health Sci 2012;1:17-20.
2. Gehdoo RP. Post-operative pain management in paediatric patients. Indian J Anaesth 2004;48:4016-14.
3. El Shamaa HA and Ibrahim M. A comparative study of the effect of caudal dexmedetomidine versus morphine added to bupivacaine in pediatric infra-umbilical surgery. Saudi J Anaesth 2014;8:155-60.
4. Sicard A. Lee injections medicamentenses extradural paroview sacro coccygienne. C R Soc Biol 1901;53:396.
5. Sanders JC. Paediatric regional anaesthesia, a survey of practice in the United Kingdom. Br J Anaesth 2002;89:707-10.
6. Lloyd-Thomas AR. Pain management in paediatric patients. Br J Anaesth 1990;64:85-104.
7. Armitage EN. Caudal block in children. Anaesthesia1979;34:396.
8. Ahuja S, Yadav S, Joshi N, Chaudhary S, Madhu SV. Efficacy of caudal fentanyl and ketamine on post-operative pain and neuroendocrine stress response in children undergoing infraumbilical and perineal surgery: A pilot study. J Anaesthesiol Clin Pharmacol 2014;30:104-9.
9. McGown RG. Caudal analgesia in children; 500 cases for procedure below the diaphragm. Anaesthesia 1982;37:806-18.
10. Bromage PR. Ageing and epidural dose requirements. Br J Anaesth 1969;41:1016–22.
11. Touloukian RJ, Wugmeister N, Pickett LK and Hehre FM. Caudal anaesthesia for neonatal anoperineal and rectal operations. Analg 1971;50:565-568.
12. Hassan SZ. Caudal anaesthesia in infants. Anaesth Analg 1977;56:686-9.
13. Kay B. Caudal block for post-operative pain relief in children. Anaesthesia 1974;29:610-11.
14. Jansen BH. Caudal block for post-operative pain relief in children after genital operations- a comparison between bupivacaine and morphine. Acta Anaesth Scand 1981;25:373-5.
15. Lunn JN. Post-operative analgesia after circumcision- a randomized comparison between caudal analgesia and intramuscular morphine in boys. Anaesthesia 1979;34:552-4.