

## PERIOPERATIVE ANAESTHETIC MANAGEMENT OF CLASSIC BLADDER EXSTROPHY IN INFANTS- A CASE SERIES

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Received : 31/05/2023  
Received in revised form : 14/07/2023  
Accepted : 28/07/2023

### Keywords:

Bladder exstrophy, pain management, lumbar epidural analgesia.

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DOI: 10.47009/jamp.2023.5.4.242

Source of Support: Nil,  
Conflict of Interest: None declared

*Int J Acad Med Pharm*  
2023; 5 (4); 1202-1205



### Abstract

**Background:** Bladder exstrophy is an uncommon congenital genitourinary system abnormality. Challenges in management of perioperative anaesthesia for repair of bladder exstrophy in infants requires maintenance of normothermia, normovolemia, hemodynamic stability and acid-base, electrolytes balance. We are presenting a case series of 5 infants who underwent surgery for bladder exstrophy. **Materials and Methods:** All patients were induced with routine general anaesthesia after premedication with 4mcg/kg IV injection of Glycopyrrolate, 0.03mg/kg IV midazolam and 2 mcg/kg IV Fentanyl. Induction done with 3mg/kg IV propofol, 0.75mg/kg IV atracurium injection and intubated with conventional direct laryngoscopy with uncuffed ET tube. After GA, 19G Lumbar epidural catheter is inserted at L2-L3 level under all aseptic precautions. Epidural infusion was started with injection Bupivacaine plain 0.125% at 0.1- 0.2ml/kg/hr body weight. All 5 patients underwent the surgery with combined general and epidural anaesthesia. All patients were extubated and shifted to PICU with epidural infusion of Inj. Bupivacaine plain 0.0625% @ 0.5 ml/kg/hr for 72hrs post operatively. **Result:** Continuous lumbar epidural analgesia is a simple and safe technique. No difficulty was faced while threading the catheter. The average duration of surgery was 6.4 hours, and all patients required intra-operative blood transfusions. **Conclusion:** Combining general anaesthesia with epidural anaesthesia provides intraoperative hemodynamic stability and good postoperative pain relief in children.

## INTRODUCTION

Bladder exstrophy is an uncommon congenital genitourinary system abnormality with an estimated frequency of roughly 1 in every 50,000 live births.<sup>[1]</sup> The anterior wall of the urinary bladder and the lower abdominal wall both are found to be defective. Everted bladder wall with varied pelvic diastasis can be seen on the posterior wall.<sup>[2-5]</sup> Bladder exstrophy with epispadias (in males) is classified as classic bladder exstrophy, while cloacal exstrophy which exposes the entire hindgut as well as the bladder, is classified as more complex. In most cases of bladder exstrophy repair, the abdominal and bladder walls are closed and the pelvic rami are approximated. The majority of individuals with this disease will require many corrective surgical procedures to attain functional and cosmetic outcomes. Pelvic osteotomies along with bladder, posterior urethral, and abdominal wall closure are all part of surgical reconstruction.<sup>[2,4,5]</sup> Children are immobilized for a

period of time following surgery in order to aid recovery and preserve the integrity of the pelvic ring.

It is a rare defect but challenging condition that causes significant physical, functional, social, sexual and psychological problems later in life. There have been reports of it occurring as an only anomaly or in conjunction with other anomalies including omphaloceles, anal defects, neural tube defects, cleft lip/palate, preterm birth, and so on.<sup>[1,6]</sup> Inguinal hernia is a common symptom of this condition males are more likely to suffer from a hernia.<sup>[7]</sup>

Prenatal diagnosis through ultrasound can be done which shows lower abdominal mass, non-visualization of the bladder, and tiny genitalia.<sup>[1]</sup> MRI scans of the developing fetus can reveal more about the defect's anatomy and help in the process of sexual differentiation.<sup>[8,9]</sup>

Perioperative anaesthesia challenges for repair of bladder exstrophy in infants are maintenance of normothermia, normovolemia, hemodynamic stability and acid-base, electrolytes balance. This

case study describes our experience of a series of 5 infants operated for bladder exstrophy.

## CASE SERIES

Our case series comprised of 5 cases (4 male and 1 female) with an average age of  $14.80 \pm 5.59$  months. The mean weight of the subjects was recorded to be  $9.7 \pm 1.48$ . All the cases were screened and evaluated for any past medical/surgical history or comorbidities like spine abnormality and anorectal anomaly. Birth history, mother's antenatal history and any cases of parents or siblings with bladder exstrophy was also enquired. A series of investigations such as complete hemogram, serum creatinine, serum electrolyte, liver function test and chest x-ray were done. Out of 5 cases, 2 cases showed no other anomalies, 1 case reported inguinal hernia, 1 case had history of pre-term birth and rest 1 was a re-do case with a history of pre-term birth [Table 1]. [Figure 1] represents pre-operative clinical examination pictures showing exposed bladder mucosa through a defect in abdominal wall.

A well-informed written consent was obtained from the parents followed by confirming the nil by mouth (NBM) status of the patients. All 5 patients were categorized as ASA grade II as per the American Society of Anesthesiologists Classification. The mean preoperative parameters such as pulse and  $SpO_2$  were recorded to be  $113.2 \pm 17.4$  bpm and  $99 \pm 0.7\%$  [Figure 2]. All the patients were premedicated in PAC room with 4 mcg/kg IV glycopyrrolate, 0.03 mg/kg IV midazolam and 2 mcg/kg IV fentanyl. Further on the operation theatre table, standard ASA monitors (pulse oximeter, Electrocardiogram, non-invasive blood pressure monitor, temperature probe and  $ETCO_2$ ) were attached. Patients were secured with two IV lines. Induction was done by 3 mg/kg propofol IV and 0.75 mg/kg atracurium IV injections. They were intubated with conventional direct laryngoscopy with an uncuffed endotracheal tube no 4/4.5 ID and maintained on 50% air, 50% oxygen and 2% sevoflurane and atracurium injection boluses of 0.2 mg/kg every 20mins. Patients were maintained on volume control ventilation with tidal volume (TV) 6-8 ml/kg, respiratory rate (RR) 20-22/min, positive end expiratory pressure (PEEP) 3cm of  $H_2O$ . After general anaesthesia, under aseptic precautions lumbar epidural catheter was inserted at L2-L3 interspace in left lateral position using 19G Touhy's epidural needle with loss of resistance technique and catheter was fixed at 6 cms. No difficulty was faced while threading the catheter. Epidural initial bolus of 0.5ml/kg body weight of 0.125% bupivacaine plain was given slowly in titrated doses with monitoring of vitals. Further intra-operative epidural infusion of 0.125% bupivacaine plain injection was started at 0.1-0.2 ml/kg/hr body weight. Intra-operative fluids like Ringer lactate by Holiday Segar formula were given considering blood loss and evaporative losses. Blood loss was replaced with packed cell volume

(PCV) 10-15ml/kg body weight over 4 hrs. The average duration of surgery was 6.4 hours. Intra-operative parameters such as pulse rate, systolic blood pressure (SBP), diastolic blood pressure (DBP),  $ETCO_2$  and  $SpO_2$  of the subjects were recorded after each hour till the 7<sup>th</sup> hour and represented in [Table 2].



Figure 1: Pre-operative clinical examination pictures showing exposed bladder mucosa through a defect in abdominal wall.

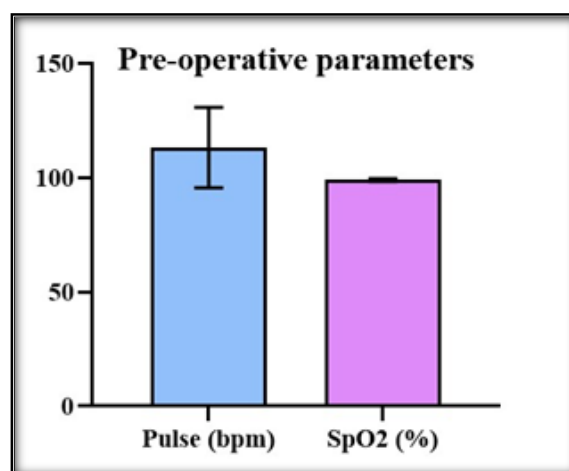


Figure 2: Pre-operative parameters of the subjects

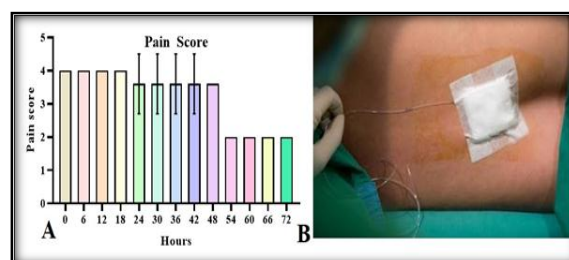


Figure 3: A-Mean pain score in all the subjects recorded post-operatively and B- Lumbar epidural catheter

Post-surgery, the patients were extubated and shifted to PICU with epidural catheter in-situ. A proper mermaid dressing was performed for immobilisation of the patients. Post operative hemodynamic parameters such as pulse rate, SBP, DBP and SpO<sub>2</sub> were monitored from 0 hr to 72 hrs at the interval of every 6 hr. The hemodynamic parameters were found to be stable and are expressed in [Table 3]. A continuous epidural infusion of 0.0625% plain bupivacaine injection at 0.1-0.2 ml/kg/hr body weight was given for 72hrs. As the patients were on continuous epidural infusion intra-operatively and post-operatively, they were comfortable and pain-free. A thorough post-operative pain score

assessment was done on basis of Wong-Baker faces pain scale,<sup>[10]</sup> and SOS paracetamol IV was used as an rescue analgesic. [Figure 3] represents mean pain score in all the subjects post-operatively and lumbar epidural catheter placement. Initially, the mean pain score was recorded to be 4, i.e., "Hurts little more" till 18<sup>th</sup> hr post-surgery as per the Wong-Baker faces pain scale. The mean pain score dropped to 3.6 ± 0.9 from 24<sup>th</sup> till 48<sup>th</sup> hr. From 54<sup>th</sup> hr onwards pain score reduced significantly to 2 that signifies the "Hurts little bit" pain status of the subjects. The epidural catheter was removed at the end of 3 days under all aseptic precautions.

**Table 1: Demographics of the subjects.**

Case	Age (months)	Gender	Weight (kgs)	Duration of surgery (hrs)	Fresh or redo case with any associated anomaly
1	24	Male	12	6	Fresh case with inguinal hernia
2	10	Female	8	6	Fresh case
3	12	Male	9.5	6.5	Fresh case with pre-term birth
4	16	Male	10	6.5	Fresh case
5	12	Male	9	7	Redo case with pre-term birth

**Table 2: Intra-operative parameters of the subjects**

Hours	Pulse	SBP	DBP	SpO <sub>2</sub>	ETCO <sub>2</sub>
1	117.2 ± 20	99.6 ± 7	62.4 ± 6	99.8 ± 0.4	31 ± 2.8
2	117.6 ± 15	98.8 ± 8	68.4 ± 7	99.8 ± 0.4	31 ± 1.4
3	116.2 ± 12	99.2 ± 8	64.8 ± 7	99.8 ± 0.4	31.6 ± 1.5
4	118.2 ± 14	104.4 ± 9	67.6 ± 2	100 ± 0	31 ± 3
5	113.6 ± 13	105.2 ± 11	67.2 ± 8	100 ± 0	31 ± 2.2
6	115.2 ± 4	109.6 ± 11	65.6 ± 6	100 ± 0	32 ± 1.2
7	119.5 ± 13	114 ± 4	66 ± 7	100 ± 0	33.25 ± 0.9

**Table 3: Post-operative parameters of the subjects**

Hours	Pulse	SBP	DBP	SpO <sub>2</sub>
0	121.2 ± 16	118 ± 5.2	70.0 ± 7.3	99.0 ± 1
6	116.8 ± 16	115 ± 8.9	65.2 ± 6.7	99.4 ± 0.9
12	109.2 ± 9.5	116 ± 7.6	68.0 ± 8.1	100 ± 0
18	100 ± 9.1	110 ± 10.9	66.8 ± 8.2	99.6 ± 0.9
24	96.8 ± 6.1	107.5 ± 13.9	66.4 ± 6.5	99.4 ± 0.9
30	94.4 ± 5.9	102 ± 8.3	64.8 ± 3.0	100 ± 0
36	96.4 ± 6.5	101 ± 6.6	63.2 ± 3.0	99.6 ± 0.9
42	94 ± 9.4	102.5 ± 4.4	65.2 ± 5.0	99.6 ± 0.5
48	89.6 ± 3.0	106 ± 4.1	65.8 ± 7.9	99.8 ± 0.4
54	91.6 ± 6.1	111 ± 7.0	63.2 ± 4.1	99.6 ± 0.5
60	91.6 ± 12.8	111 ± 8.4	60.8 ± 3.0	100 ± 0
66	93.2 ± 8.8	109 ± 8.1	64.4 ± 3.8	99.8 ± 0.4
72	85.3 ± 6.1	106 ± 4.2	66.7 ± 5.8	99.7 ± 0.6

## DISCUSSION

Five classic bladder exstrophy patients were operated in our study under general anaesthesia with epidural analgesia via epidural catheter. Complete primary repair of exstrophy with bilateral pelvic osteotomies were done in four patients, and a redo of complete primary repair of exstrophy was executed in one patient. The average duration of surgery was 6.4 hours, and all patients required intra-operative blood transfusions.

The dermatomes from bladder exstrophy surgery reach from the low thorax to the sacrum.<sup>[5]</sup> Catheters was placed in the lumbar region at L2-L3 level, which is a simple and safe technique. No difficulty

was faced while threading the catheter. GA with epidural analgesia has gained popularity in pediatric major abdominal surgeries. Good post-operative ICU and ward care is very important in enhancing the recovery of the patients with bladder exstrophy. A well-established interdisciplinary team comprised of surgeons, anesthesiologists, paediatricians, dietitians, pharmacologists, nurses, and child care specialists is critical for fostering a culture of success in functional and cosmetic surgeries.

In this case series in all the patients, bilateral pelvic osteotomies were done. Blood loss is a known complication of pelvic osteotomy which was replaced with equivalent amount of compatible PCV intraoperatively. Continuous low dose epidural infusion of 0.125% Bupivacaine is a safe technique

with good intraoperative hemodynamic stability. The use of intra-operative and post-operative epidural analgesia assists the child in enduring the painful procedures, maintaining hemodynamic stability, decreased need of inhalational agents, IV analgesics and opioids. It helps to eliminate complications related to IV opioids like respiratory depression, hypoxia and sedation. Pain relief facilitates immobilization after surgery, providing comfort. Epidural infusion of 0.0625% bupivacaine was continued during post operative period for 72hrs. Vital parameters were monitored in all the patients including pain scale. There were no complications noted related to epidural infusion in post operative period.

## CONCLUSION

Bladder exstrophy presents a challenge in the field of pediatric surgery as well as anaesthesia. There should be a protocol that includes the holistic care in the management of this anomaly. The perioperative pain management of bladder exstrophy patients with continuous epidural infusion provides haemodynamic stability. Thus, combining general anaesthesia with epidural analgesia provides balanced postoperative pain management solution and improves success rate without any complications.

### Acknowledgement

We wish to thank Dr. Bharati Kulkarni (HOD & Prof Paediatric surgery) and Dr. D Y Patil Hospital & Medical College, Navi Mumbai (Exstrophy Centre & Tertiary Hospital) for their support.

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