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Use of Ultrasound Guided Subcostal TAP Block Along with Bilateral Rectus Sheath Block – A Novel Way to Aid on Table Extubation of Pediatric Liver Recipients

Chatterjee C, Vijay Shankar, Purnima Dhar and Anupam Raj*

Department of Anesthesiology and Intensive Care, Apollo Hospital, Indraprastha, India

Abstract

Unlike in the case of adults, the usual practice was to electively ventilate pediatric liver recipients due to the high incidence of postoperative complications. Inspired by the success of early Extubation and fast-tracking in adult recipients many pediatric transplant centers have started practicing early Extubation in children. The use of high dose of sedatives and opioids in the post-operative period significantly delays and complicates early extubation. We performed Subcostal TAP block and bilateral rectus sheath blocks at the end of surgery on 16 pediatric liver recipients below 2 years of age and successfully extubated them on table. In our short experience performing blocks under ultrasound guidance was safe and significantly alleviated need of opioids during the post-operative period.

Keywords: Transversus abdominis plane block; Pediatric liver transplantation; Early Extubation

Introduction

Traditionally pediatric liver recipients were sedated using opioids and electively ventilated during the early postoperative period because of the high rate of re explorations, the requirement of multiple imaging & the occurrence of abdominal compartment syndrome [1]. However, inspired by the success of early extubation and fast-tracking in adult liver transplant programs, many pediatric transplant centers of late practice fast tracking [2]. One of the hindrances for early Extubation would be the use of a high dose of sedatives and opioids in the early postoperative period. Use of regional anesthesia has significantly decreased the requirement of post-operative opioids, reduced complications and has aided in enhanced recovery in the general surgical population [3].

Even though coagulopathy is a concern, there have been reports encouraging use of regional anesthesia in liver transplant recipients. Milan et al. [4] performed Subcostal TAP blocks in 17 adult recipients and demonstrated a reduction in the time required for extubation as well as post-operative opioids requirements. Trzebicki et al. [5] performed thoracic epidural anesthesia in a select group of 67 patients and demonstrated on table extubation on 84% of patients. Inspired by the fact that there haven't been any reports on the application of regional anesthesia in pediatric liver recipients, we decided to perform right Subcostal TAP block along with bilateral rectus sheath block in pediatric liver recipients below 2 years of age. As the trends are changing in pediatric liver transplantation towards early extubation and fast tracking, TAP block with its proven effectiveness in post-surgical pain & enhanced recovery protocols along with very limited side effects, has the potential to further improve outcomes in pediatric liver transplantation towards early extubation & fast tracking.

Description of Cases

We did on table Extubation aided by TAP block on 16 children under the age of 2 years. The anesthesia protocol is briefly described as follows. Anesthesia was induced using fentanyl 2 mcg/kg, propofol 2 mg/kg and succinylcholine 2 mg/kg. Following endotracheal intubation and securing adequate venous and arterial access, maintenance of anesthesia was done using sevoflurane + oxygen & air, along with fentanyl at 1 mcg/kg/h & atracurium at 0.3 mg/kg/h. All patients were monitored using ECG, pulse oximetry invasive arterial line, central venous line, EtCO2 along with core temperature and urine output. Blood samples were taken as per need to guide therapy on pH, lactates, potassium, calcium & hemoglobin. Blood component therapy administration was guided by clinical bleeding and TEG.

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Correspondence:
Vijay Shankar, Department of Anesthesiology and Intensive Care, Apollo Hospital, Indraprastha, New Delhi, India, Tel: +91-8130556353; E-mail: vijaysnair95@gmail.com

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Table: Demographics and Intraoperative variables.

Age in months (mean ± sd)	14 ± 6.32
Weight in kg (mean ± sd)	8.48 ± 2.30
Aetiology (Cholestatic:Metabolic)	14:02
PELD (mean ± sd)	23 ± 7.04
GRWR (mean ± sd)	3.01 ± 0.93
Anhepatic Time in minutes (mean ± sd)	37.50 ± 7.12
Duration in hours	10.8
Crystalloid in ml/kg	63.8
Albumin in ml/kg	30
PRC in ml/kg	34.5
FFP in ml/kg	22.8
Platelets in ml/kg	5

PELD: Pediatric End Stage Liver Disease; GRWR: Graft to Recipient Weight Ratio; PRC: Packed Red Cells; FFP: Fresh Frozen Plasma

After successful completion of vascular anastomosis and confirmation by means of Doppler a decision was made to extubate the patient based on preoperative sensorium, nutritional status, hemodynamic stability, correction of acidosis, normothermia & absence of abdominal compartment syndrome on closure. Once the decision was made to extubate the patient's, fentanyl & atracurium infusions were discontinued. After the application of skin sutures, right sided Subcostal TAP along with bilateral Rectus sheath block was performed using a 9.4 MHz Linear array probe and 24 G hypodermic needle. The drug used was 0.2% Ropivacaine, the dose of which was calculated to a maximum dose of 3 mg/kg and injected in the 3 areas. The preoperative clinical features and intraoperative features of the cases are described in Table 1.

Once in the ICU, oxygen therapy was tailored as per the clinical condition of the patient. Arterial blood gases were done as soon as the patient arrived, and subsequently as per the clinical condition. Post-operative analgesia was provided using intravenous paracetamol at 10 mg/kg thrice daily. Pain Scores were measured 2nd hourly using FLACC score by trained nursing staff. Pain score >3 were treated with intravenous fentanyl at a dose of 0.5 mcg/kg. Daily monitoring included routine blood counts, along with coagulation profile, liver and kidney function tests. Liver Doppler was done twice a day for the first post-transplant week. All the patients received a standard antibiotic, antifungal & immunosuppressive therapy.

The mean pain score as measured by FLACC scale was 2 till 14 h in the post-operative period. The mean pain score at the 14th and 16th h were 3.73 & 4 respectively. Two patients required a bolus of fentanyl to control the pain. However, the mean pain scores decreased to 3 after 18 h and remained stable after that. We didn't have any children needing opioids boluses after 16 h.

There were 4 reintubations in the post-operative period. Two patients were re intubated on the second post-operative day as they had to be re explored in view of secondary hemorrhage. One child developed pulmonary edema on day 5 due to fluid over load and had to be intubated following an unsuccessful trial of non-invasive ventilation. Another child was re-intubated on day 5 for drainage of an intra-abdominal collection and was immediately extubated after the laparotomy.

The mean ICU stay in our patients was 4.2 ± 1.2 days. All our patients showed satisfactory recovery of graft functions except one who had developed features of rejection on the 6th post-operative day. We had 2 instances of mortality one on day 14 and the other on day 28. The reasons for mortality in both the cases were multi organ dysfunction due to gram negative sepsis.

Discussion

In recent times, pediatric liver transplantation centers are becoming more liberal to the idea of early extubation. This is because of favourable experiences with on table extubation in pediatric liver recipients demonstrating, enhanced patient recovery, graft function & reduced requirement of ICU stay 1, 2. One of the factors causing an aversion towards early extubation is the use of high dose opioids intra-operatively and in the post-operative period making the children vulnerable to the depressant effects of these drugs. By performing a myofascial block at the end of the procedure, we attempted to decrease the need of post-operative analgesia in the form of opioids infusions.

We believe that the TAP block significantly reduced our post-operative opioids requirements. A single shot TAP block given with only local anesthetic agents is supposed to provide analgesia for 8 h to 10 h. This would have sufficed for the immediate post-operative period during which pain would have been most severe. The fact that none of our patient s in the TAP group required opioids infusions for analgesia could be attributed to the efficacy of ultrasound guided Subcostal TAP block and bilateral rectus sheath block. Avoidance of opioids helped in avoiding unnecessary sedation which would have led to respiratory complications.

Inspite of the pre-existing coagulopathy we did not encounter any complications in any of the 16 patients on whom we performed TAP & Rectus sheath blocks. This could be attributed to the fact that our anesthesia providers were sufficiently trained in ultrasound guided fascial plane blocks. It has to be emphasized that performance of Subcostal TAP and rectus sheath blocks in pediatric patients could be associated with significant complications if one is not careful. Care must be taken to ensure strict asepsis during the procedure. We do not recommend blind placement of TAP blocks in pediatric liver recipients, since injury to viscera, vasculature and pneumothorax are serious complications. Use of a 9.4 Mhz vascular ultrasound probe along with Doppler will aid in safe and effective deposition of the drug in the right plane.

We believe post-operative nociception in pediatric liver recipients is poorly understood and often overlooked. Most clinicians are reluctant to treat pain in pediatric patients owing to fear of causing sedation & respiratory depression. The use of myofascial blocks like the Subcostal TAP with a bilateral rectus sheath block would help significantly in controlling pain and reducing post-operative opioids requirements.

Conclusion

We were able to successfully perform ultrasound guided TAP block with bilateral rectus sheath block to aid on table extubation in pediatric liver transplants. We propose a study on similar lines on a much larger population of pediatric liver transplantation recipients.

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