

Olgu Sunumu

Spinal Anesthesia in Circumcision Operation in a Child with Bidirectional Superior Cavapulmonary Shunt

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SUMMARY

Bidirectional cavapulmonary shunt (BCPS) is performed for various cyanotic congenital heart defects, mainly those involving a single-ventricle repair (1). This shunt consisted of an anastomosis between the divided end of the superior vena cava to the side of the undivided right pulmonary artery. In patients with bidirectional superior cavapulmonary shunt anything causing high intrathoracic pressure such as coughing, intubation, postoperative agitation with increased mean airway pressure or breath-holding will cause a significant reduction of pulmonary blood flow (PBF), and therefore significant desaturation.

In BCPS patients who received general anesthesia, spontaneous breathing with smooth and early extubation is a safe procedure to maintain systemic oxygen levels in these patients. Spinal anesthesia can be an alternative technique to general anesthesia with adequate airway control without intubation.

In this case report, we represented a 6 year-old boy who received spinal anesthesia for circumcision operation.

Key words: *spinal anesthesia, pediatric surgery, bidirectional superior cavapulmonary anastomosis*

ÖZET

Bidireksiyonel Kavapulmoner Şanlı Çocukta Spinal Anestezi ile Sünnet Ameliyatı

Çift yönlü kavapulmoner şant (Glenn şantı), başta tek ventrikül patolojisinin onarımı olmak üzere, konjenital siyanotik kalp hastalıklarının tedavisinde uygulanan bir şanttır. Bu şant vena kava superiorun divize edilmeden sağ pulmoner artere uç yan anastomozu şeklinde tanımlanır. Çift yönlü kavapulmoner şanlı hastalarda öksürük, entübasyon, postoperatif ajitasyon gibi intratorasik basıncı artıran nedenler, ortalama havayolu basıncında da artışa neden olarak pulmoner kan akımını azaltır ve ciddi desatürasyona neden olur. Genel anestezi uygulanan çift yönlü kavapulmoner şanlı (Glenn) hastalarda yeterli sistemik oksijen düzeyinin devamlılığı için, spontan solunum korunarak erken ve yumuşak bir ekstübasyon yapılması güvenilir bir yöntemdir.

Bu nedenle spinal anestezi entübasyon olmaksızın güvenli havayolu kontrolünü sağlaması bakımından genel anesteziye alternatif olabilir. Biz bu vaka takdiminde spinal anestezi altında sünnet ameliyatı yapılan 6 yaşındaki hastayı sunuyoruz.

Anahtar kelimeler: *spinal anestezi, pediatrik cerrahi, çift yönlü kavapulmoner anastomoz*

INTRODUCTION

The physiologic rationale for a bidirectional cavapulmonary shunt (Glenn procedure) was presented clinically in 1950⁽¹⁾. In the classic Glenn procedure, flow from the superior vena cava (SVC) was directed into the right pulmonary artery, which was disconnected from the confluence.

Anesthetic management of patients presenting with BCPS is centered on the maintenance of the balance between pulmonary vascular (PVR) and systemic vascular resistance (SVR)⁽¹⁾. In these patients any factor that would increase intrathoracic pres-

sure (such as coughing, positive pressure ventilation, breath holding) or PVR (acidosis, sympathetic stimulation, intubation) can reduce flow through pulmonary circuit. Reduced pulmonary blood flow results in systemic hypotension and significant desaturation.

General anesthesia with endotracheal intubation and delayed extubation may adversely affect pulmonary vascular resistance in patients with BCPS.

Spinal anesthesia allowed preservation of spontaneous ventilation and may be suitable in children with BCPS which avoids tracheal intubation and adverse effects of mechanic ventilation.

We present a child with a history of BCPS who underwent successful circumcision operation under spinal anesthesia.

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CASE REPORT

A 6-year-old boy (weight 18 kg, height 115 cm) was admitted in the hospital and circumcision was planned. His health state was complicated with double-outlet right ventricle, situs inversus dextrocardia, tricuspid regurgitation (3-4 degree), pulmonary banding, and ventricular septal defect. He underwent a BCPS operation at 3 months old. Preoperatively, the child was active, with mild cyanosis and clubbing. Oxygen saturation (SpO₂) was 80 % in the room air. He was medicated with aspirin which was discontinued 3 days before the operation. In laboratory examination, the white blood cell count was 8000 mm³, platelet count was 285.000 mm⁻³, hemoglobin and hematocrit levels were 17.8 gr/L and 52.5 %, respectively. Blood chemistry and clotting screen test results were normal. Chest X-ray showed mild cardiomegaly and clear lung fields. Before the operation, patient was hospitalized and solid foods were not allowed for 8 h before anesthesia. After establishing peripheral intravenous access, intravenous fluids (0.45 % saline in 5 % dextrose) was administered as a replacement fluid before the operation.

In the operating room, 5-channel electrocardiogram (ECG), pulse oxymeter and non-invasive blood pressure measurements were continuously monitored. The patient was sedated with intravenous 1 mg midazolam and 10 µg fentanyl simultaneously, and 2 L min⁻¹ supplemental oxygen was delivered via face-mask. After then invasive arterial cannulation was scheduled, he was placed in a lateral decubitus position. Lumbar puncture was performed using a midline approach through L4- L5 intervertebral space with a 26 G Atraucan (Braun, Melsungen, Germany) pediatric spinal needle and 0.3 mg kg⁻¹ 0.5 % hyperbaric bupivacaine was injected intrathecally. A lower extremity motor block was obtained within 5 min. The degree of motor block was 2 according to modified Bromage Scale ⁽⁶⁾. The sensory block was achieved approaching T6-7 level verified by skin cold test after 10 min, then skin incision was started. Intraoperative fluid maintenance was provided with 0.45 % saline in 5 % dextrose (5 mL kg⁻¹ intravenous) during the surgery. The operation lasted 25 minutes, intraoperative course of patient was comfortable, and hemodynamical status was stable.

IV paracetamol 15 mg kg⁻¹ was given to prevent postoperative pain, and children were transferred to the recovery room. Additionally analgesic agents were not required during the intraoperative and postop-

erative first hour. Postoperatively, motor block completely recovered 75 min after the surgical procedure. He was monitored in the recovery room until postoperative first hour, then he was transferred to the pediatric surgery ward.

DISCUSSION

BCPS has become an important intermediate step in the treatment of pediatric patients with a single ventricular physiology who are ultimately destined for palliative surgery ⁽¹⁾.

The anesthetic management of these patients is associated with several risks and challenges. Arousal or light anesthesia can elevate PVR. It is pointed out that elevated PVR may cause decreased pulmonary blood flow and systemic hypoxemia after a BCPS ⁽²⁾. The goal of intraoperative management is to maintain an adequate intravascular volume to enhance PBF, and minimize PVR in patients with BCPS ⁽²⁾. General anesthesia and endotracheal intubation may induce abnormal hemodynamic and respiratory response and life threatening bronchospasm in patients with BCPS.

Additionally, mechanical positive airway pressure ventilation, delayed extubation, and postoperative agitation with increased mean airway pressure and noxious stimuli such as pain can trigger a rapid increase in PVR. In general anesthesia practices, it is emphasized that spontaneous breathing with smooth and early extubation is a safe procedure to maintain systemic oxygen levels in these patients.

Regional anesthesia is a technique that is used as an alternative and complementary to general anesthesia in elderly patients. However, the use of this technique was rarely reported until 1980s in pediatric anesthesia practices. In 1980s spinal anesthesia has been described as a safe and efficient anesthetic technique in the pediatric population especially in premature infants scheduled for infraumbilical surgery ⁽³⁾. Abajian et al in 1984 reported the use of spinal anesthesia in high risk ex-premature infants and considered regional anesthesia by spinal approach to be safe and effective in this pediatric patients ⁽³⁾. However, spinal anesthesia is a feasible technique not only in neonates, but also in older children and adolescents ⁽⁴⁾.

Additionally this technics appears to provide suitable operative conditions, excellent relaxation, and effective postoperative pain relief. Central neuraxial

blockade in young children is characterized by remarkable hemodynamic stability⁽⁴⁾. Volume loading before such blocks, commonly practiced in adults, is unnecessary in this age group. This phenomenon is considerable advantageous in patients with BCPS.

Despite this beneficial effect in spinal anesthesia, still there are some controversial issues. One of this topic is sedation. It may be impossible or dangerous to perform a block in an awake child, because the child can have uncontrolled movements during the application of a block. Children at this age group may necessitate sedatives. The aim of sedation is to provide analgesia, anxiolysis, and motor control during puncture⁽⁵⁾. Some sedatives used in conjunction with spinal anesthesia seems to be associated with increased risk of apnea⁽⁵⁾. Therefore, children should be monitored closely during sedation.

We didn't observe respiratory adverse effects, agitation, and pain during perioperative period in our patient. We provided adequate analgesia with spinal anesthesia and, preemptive paracetamol.

Additional analgesic agents (eg. opioid or NSAIDs) were not required during the early postoperative period.

Children with heart disease undergoing noncardiac surgery are at increased risk of perioperative morbidity and mortality compared with other children. These children pose a serious challenge for anesthesia. If general anesthesia is used, spontaneous breathing and rapid recovery of consciousness are desirable to al-

low the child full airway control after extubation.

In previous studies, it has been suggested that when compared with general anesthesia, spinal anesthesia is associated with fewer cardiovascular and respiratory complications, less need for postoperative mechanical ventilation, and a shorter hospital stay⁽⁶⁾. Because of these factors, spinal anesthesia seems reliable and safe anesthetic technique in children with heart disease for noncardiac, especially lower abdominal surgery.

In conclusion, good and smooth recovery and uneventful postoperative period can be achieved with spinal anesthesia. We consider that spinal anesthesia would be a reliable and an alternative technique to general anesthesia in children with BCPS.

REFERENCES

1. **Leyvi G, Wasnick JD.** Single-ventricle patient: pathophysiology and anesthetic management. *J Cardiothorac Vasc Anesth* 2010;24(1):121-130. <http://dx.doi.org/10.1053/j.jvca.2009.07.018> PMID:19864163
2. **Yuki K, Casta A, Uezono S.** Anesthetic management of noncardiac surgery for patients with single ventricle physiology. *J Anesth* 2011;25(2):247-256. <http://dx.doi.org/10.1007/s00540-010-1081-4>
3. **Abajian JC, Mellish RW, Browne AF, Perkins FM, Lambert DH, Mazuzan JE Jr.** Spinal anesthesia for surgery in the high-risk infant. *Anesth Analg* 1984;63:359-362. <http://dx.doi.org/10.1213/00000539-198403000-00015>
4. **Bosenberg A.** Benefits of regional anesthesia in children. *Pediatric Anesth* 2012;22(1):10-18. <http://dx.doi.org/10.1111/j.1460-9592.2011.03691.x>
5. **Kokki H.** Spinal blocks. *Pediatr Anaesth* 2012;22(1):56-64. <http://dx.doi.org/10.1111/j.1460-9592.2011.03693.x>
6. **White MC.** Approach to managing children with heart disease for noncardiac surgery. *Pediatric Anesth* 2011;21:522-529. <http://dx.doi.org/10.1111/j.1460-9592.2010.03416.x> PMID:20880154