

## **Anesthetic Considerations in Polymalformed Neonate, for the Closure of Myelomeningocele and Colostomy, in the Same Surgical Act**

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### **Abstract**

The anesthesia of the newborn, due to the physiological characteristics and the difficulty in monitoring, can be a challenge. In addition, those who require major surgery may associate pathologies that increase the morbidity of the surgical act. The use of non-invasive monitoring is relevant in this type of patients. We present a case of polymalformed neonate who undergoes general anesthesia for cystoscopy, myelomeningocele correction and colostomy.

**Keywords:** *Cystoscopy; Myelomeningocele; Colostomy*

### **Introduction**

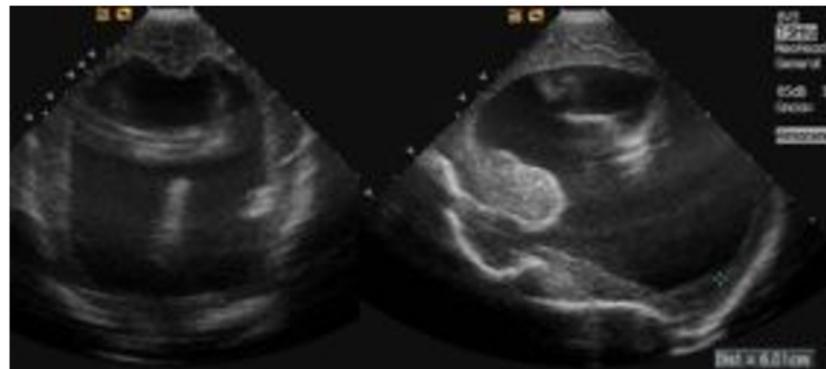
The anesthesia of the newborn, due to the physiological characteristics and the difficulty in monitoring, can be a challenge. In addition, those who require major surgery may associate pathologies that increase the morbidity of the surgical act. The use of non-invasive monitoring is relevant in this type of patients. We present a case of polymalformed neonate who undergoes general anesthesia for cystoscopy, myelomeningocele correction and colostomy.

Neural tube defects are present in 6 - 17 per 1000 live births and in the case of myelomeningocele 0.5 - 1 in 1000 [1,2]. Despite being an infrequent pathology, it is convenient to know the anesthetic management of this group of patients, due to the need to be operated in the first 24 hours of life [4] and the frequent association of others malformations, including hydrocephalus (67.4%) and Arnold Chiari II (58.4%) [3].

### **Case Description**

We present the case of a neonate of 24 hours of life, full-term newborn with adequate weight for gestational age (39 weeks), 3.4 kg, with prenatal diagnosis of lumbosacral myelomeningocele in eight vertebral bodies. It also associates Arnold-Chiari grade II malformation with hydrocephalus (Figure 1), anal atresia without fistula, genitoureteral anomaly that technically prevent bladder catheterization (cloaca vs single urogenital sinus) and left renal agenesis with grade III right hydronephrosis. The echocardiogram shows patent foramen ovale (I-D shunt) and ductus arteriosus with bi-directional shunt. Preoperative analysis: Hemoglobin 18.8 g/dl, TP: 15.7 s, TTPa 31s, fibrinogen: 114 mg/dl. At 36 hours after delivery by caesarean section, it was decided to perform in the same surgical procedure, correction of the neural defect and discharge colostomy.

Before anesthetic induction we monitor with 3-channel ECG, peripheral pre and post-ductal oxygen saturation, non-invasive blood pressure, esophageal thermometer and cerebral oximetry (NIRS). The patient was placed in the left lateral recumbency, with protection and cushioning of the neural defect. We perform induction (sevoflurane 6%, fentanyl 4 mg/kg and rocuronium 1 mg/kg i.v) and orotracheal intubation in this position, with minimal mobility of the head (Cormack-Lehane I).



**Figure 1:** Transfontanelar ultrasound, ventriculomegaly and cerebellum displacement.

The anesthetic maintenance was performed with 1.5% sevoflurane, 0.1 mcg/kg/min remifentanyl, 0.5 mg/kg/h rocuronium, and fentanyl bolus. We cannulated the right internal jugular vein ecoguided. Ventilated in control pressure, 1.3 ml/min (FR 43 rpm), 23 cmH<sub>2</sub>O and current volumes of 6.5 ml/kg, reaching a minimum venous pH of 7.25 (with PCO<sub>2</sub>: 64 mmHg bicarbonate 19 mmol/l). It was oxygenated with FIO<sub>2</sub> of 0.3% and PEEP 3 cm of water for saturations of 97%. Temperature control was performed with heating of intravenous fluids and heat blanket. Balanced isotonic crystalloid solutions were used and baseline glucose needs were responded with 5% glucose in continuous infusion. He required 70 ml of red blood cell concentrate during the transfusion procedure. We continue antibiotic therapy of neonatal ICU (Vancomycin and Gentamicin).

The total duration of the procedure was 380 minutes, divided into three periods: induction, central venous canalization and probing by supine recumbent cystoscopy (60 minutes); closure of the neural tube defect in the prone position (230 minutes) and colostomy in the supine position (90 minutes).

After procedures, transfer is carried out in mechanical ventilation with incubator for transport to neonatal ICU.

## Discussion

There are several aspects that should be considered in neonatal anesthesia and that our case shows.

### Invasive monitoring

Invasive monitoring in the neonatal patient is difficult and with a high frequency of complications. NIRS as a non-invasive measure whose value is modified by changes in tissue perfusion, helps diagnosis and can guide decision-making [5]. In our patient there were 3 episodes of decrease with respect to baseline (Figure 2), related to:

- Hypotension 40/19 mmHg with HR: 137 bpm, after induction (which yields after 5% albumin infusion (15 ml). The NIRS fall occurred before the PANI determination, which was performed at intervals of 5 minutes
- Selective intubation, after changing the patient's position. Descent even to peripheral desaturation. 56/34 mmHg FC: 114 bpm.
- Hypotension: 47/16 mmHg reaching a minimum NIRS value of 35 at that time. We perform gasometry (hemoglobin 11g/dl; lactic 1mmol/l) so we increase the rate of transfusion by rapidly improving the number of NIRS. It is relevant that, after failure in heat blanket, during this episode the patient was in hypothermia (34.9°C) assuming lower consumption of cerebral oxygen. However, this situation did not prevent the decrease in NIRS secondary to bleeding (Table 1).

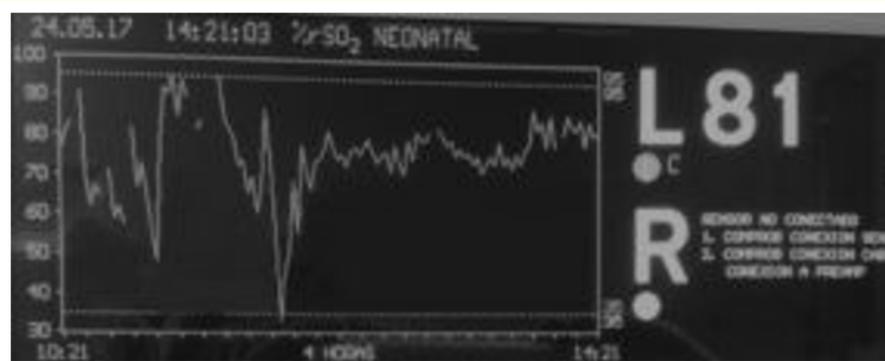


Figure 2: Registration of NIRS values during the closure of the myelomeningocele.

	Basal	1 <sup>st</sup> Episode	2 <sup>nd</sup> Episode	3 <sup>rd</sup> Episode
NIRS	82	63	47	35
PANI mmHg	63/43	40/19	56/34	47/16
FC Ipm	115	137	115	122
SATO (Pro/post Ductal)	96/97	94/94	84/87	97/97
Temperature °C	36.3	36.3	36.1	36.9
Hemoglobin g/dl	14.7	13.9		11
A. Lactate mmol/l	0.9	1.4		1

Table 1: Episodes of decreased cerebral oximetry values during the procedure.

**Patient position**

During the intervention three changes of surgical position are necessary. The mobilizations must be careful. The Arnold Chiari II malformation has been associated with cardiac arrest due to herniation of the 4<sup>th</sup> ventricle [3], in induction maneuvers. In our case we perform intubation in the lateral recumbency with cervical control. The occipital area was protected by an impeller, trying to minimize the effect on intracranial pressure. Prone is placed on the face with two padded cylinders at the roots of the limbs and cotton in prone areas (Figure 3). Repeated changes in the surgical position are accompanied by endotracheal tube malposition and loss of patient temperature. The colostomy is performed supine using an impeller in the back, whose internal diameter prevents pressure on the posterior incision.



Figure 3: The asterisks show the padded cylinders exposing the surgical area.

### **Analgesia**

Alterations in the sensitivity of myelomeningocele should be considered but the use of analgesic drugs should not be different.

### **Temperature control**

The surgical exposure of different cavities, as well as repeated changes of position, lead to a great loss of heat.

### **Conclusion**

The anesthesia of the patient with multiple malformations is an anesthetic challenge, both for the hemodynamic implications due to the loss of volume, and for the changes in position that increase the frequency of events (loss of pathways, endotracheal tube malposition or accidental extubation, loss of temperature).

Attending to the surgical position, hydroelectrolytic alterations and temperature control is of special relevance in these procedures. We observe that in our daily practice the NIRS helps us to diagnose adverse events and to make anesthetic decisions, so we recommend its use.

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