

Neuroanaesthesia in children with inherent neurological malformation

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Introduction

This study shows a variety of anaesthesiological approaches, that is anaesthesiological procedure concerning neurologically affected children, from segment of diagnostic procedures (MRI), surgical interventions, embolisation in AV malformation and SAH or gamma knife in some necessary situations. Anaesthesia in malformed paediatric patients carries specific risk and complications due to already damaged CNS, anatomical differences in cranium as well as immaturity of certain organs, low natal weight or infection of nervous system. These patients due to emergency indications must be operated on the same day when they were born or in early infancy (craniostenosis, trigonocephalus i.e. various malformations cranium, arachnoidal cysts or tumors). Increased risk neuroanesthesia encountered in situations postnatal meningitis with strong hydrocephalus where immediate access to surgery an EVD drainage possibly ventriculoperitoneal drainage for obstructive hydrocephalus that contributes to poor general condition of the newborn, particularly in children injured in childbirth, and a variety of intracerebral hemorrhage.

Material and methods

Neurosurgical operations (150)

In the course of two years 150 children were processed aged from 1 day to 16 years with following diagnoses: meningomyelocoele (9), hydrocephalus (55), craniostenoses (10), trigonocephalus (2), arachnoidal cysts (10), tumors (19), tumor trunci cerebri (4), tumor venriculi tertii (4), AV malformations (2), haematoma subdurale (2), Mb.Chiary (5), prolapsus dysci (2), implantation of O-Mayo reservoir (2) and VP drainage changes (32). Induction a mixture of gases Sevorane (2-2.5 %) with oxygen, relaxation with Norcuron (vecuronium bromide at a dose of 0.08 to 0.10 mg/kg), and the maintenance of anesthesia O₂ /N₂O 50-50 with Sevorane. For children older than 1 year we used, in premedication, Dormicum syrup in premedication (2 mg/kg), fentanyl (1,25-2,5 µg/kg), barbiturates (less than 1 month: 3 to 4 mg/ kg intravenously; less 1 year: 5 to 8 mg/kg intravenously 1 year to 12 years: 5 to 6 mg/kg intravenously and over 12 years: 3 to 5 mg/kg intravenously), Norcuron (for intubation dose 0,08 do 0,1 mg/kg vekuronii bromide and after 0,02 do 0,03 mg/kg) in the preamble while maintaining anesthesia O₂ /N₂O 50 :50 % to Sevorane addition, except in cases that are not allowed, such as brain tumors and AV malformation where the use TIVA. The children were awakened after completion of operation. In the process of the brain tumor and arachnoidal cysts children are anesthetized, sedated and artificially ventilated transferred to pediatrics ICU where they subsequently awakened.^{1,2}

MRI (magnetic resonance) (336)

In the course of two years 336 children were processed aged from 1 day to 16 years. Search is performed on Magneto Siemens Symphony.

Anesthesia apparatus is particularly adapted for use in a magnetic field which is contraindicated available any metal parts (cannula, reinforced tube, metal rings on infusions). The diagnostic procedure lasted 45 minutes ± 15 minutes. Search requires a certain monitoring, well secured airway (intubation is almost impossible during the time, especially in patients with "Frem on the head" in children who go on stereotactic biopsy or installation O- Mayo reservoir in the area of the scalp). Anaesthesia be implemented in two ways. 122 in the diagnostic test are with Dormicum (0.3 mg/kg slow iv) and maintained with a mixture gas of O₂ /N₂O 50 - 50 and Sevorane (2-2.5%) through a mask. 24 children who required intubation (stereotactic, installation O-Mayo reservoir) were intubated and anesthetized in the operating room, sedated, relaxed and artificially ventilated transported to the MRI and then again transported to the operating room where continued the surgery. Anesthesia was performed as already described. Induction a mixture of gases Sevorane (2-2.5%) with oxygen, with relaxation Norcuron (vecuronium bromide at a dose of 0:08 to 0:10 mg/kg), and the maintenance of anesthesia O₂ /N₂O 50 - 50 with Sevorane. After surgery are awakened.

Endovascular embolization(3)

2 AV malformation and 1 SAH (rupture ACM lat.dex.) Anesthesia in children with AV malformations and SAH who underwent endovascular embolization is almost identical as in surgery in same diagnosis with prolonged waking in the pediatric ICU. Central vein and direct monitoring of blood pressure were necessary. Malformation rupture during endovascular surgery is possible but has not been

Gamma - knife(6)

Anesthesia for children Gamma-knife also requires prior marking

areas of the brain on MRI, followed by a transfer to an area with Gamma-knife and subjecting several hours of radiation child. Anaesthetic procedure was as already described. The children were awakened after completion of radiation.

Results

Anesthetized 495 children in the last 2 years all together. We only had a few complications. In the first case, where due prone position occurred malposition tube into the right bronchus. The child was returned to supine position and tube is placed at the right depth. There was no complications after that. In another case is a child with a large arachnoid cyst during surgery had a sudden bradycardia (50 beats per minute) due to a shift of brain mass. Reanimation was successful and the baby the next day awakened and extubated, some heavy bleeding in 2 cases in extraction of brain tumors, and 2 pneumotorax due to providing ventriculo-peritoneal drainage system, resolved in pediatric Intensive Care Unit with thoracic drainage.³

Conclusion

Neuroanesthesia has its own characteristics, primarily due to the damage to the brain from the start. Any hypoxia may bring new damage. Good monitoring work is inevitable at all times, especially when transporting patients to postoperative scan as well as during transport to the pediatric ICU. Setting the central vein and invasive measurement of blood pressure is the gold standard in all major operations of the brain, as well as compensation of red blood cells which in many craniosynostosis also indicated the rather large loss of

blood. Specific procedures such as treating the Gamma-knife require anesthesia a few hours with the child awake at the end. Monitoring and experienced neuroanesthesiologist is necessary at all in said examples.

Conflicts of interest

There is no conflict of interest.

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