

Anesthetic management for pediatric correction of pectus excavatum with NUSS technique

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Key points

The pain is undoubtedly a dominant factor that determines the quality of the postoperative course of patients undergoing Nuss technique: the front elevation of the sternum through the placement of the bar, generates high-intensity pain in the chest and spine of the patient. The association between general anesthesia and the thoracic epidural block allows the use of low concentrations of halogenated and curare and better perioperative analgesia, avoiding the administration of drugs that could interfere with the respiratory or gastrointestinal functions.

Abstract

The Pectus Excavatum (PE) is the most common malformation of the sternum (90% of all cases). The Nuss procedure is minimally invasive: a stainless steel bar is slipped under the sternum, under thoracoscopic guidance, through 2 small incisions made on the side of the chest. The bar is then reversed, and the sternum restored to the normal anatomical position. Combined anesthesia could be an efficient technique for perioperative pain management and this article describes a successful analgesic management.

Keywords: NUSS technique, pectus excavatum, combined anesthesia, intraoperative pain management

Introduction

The Pectus Excavatum (PE) is the most common malformation of the sternum (90% of all cases) and is represented, therefore, by a depression of more or less

marked than the apophyses ensiform sternum and costal cartilages III°, IV°, V°, VI°, VII° on each side with a consequent reduction in the anterior-posterior diameter of the chest. This sternal malformation is congenital and can, therefore, occur sporadically or as a framework hereditary, but the familiarity is identified in 43% of cases. Depending on the severity of PE are possible deviations of the thoracic organs and spinal deformity. In most cases, the PE has minimal or not influence the functionality of the internal organs, the aesthetic defect due to the onset of mood and anxiety disorders such as to require therapy, whose treatment option is surgery (1). To date, the cause of PE is not yet known; between the various etiopathogenetic theories, the most likely is the development of chaotic and exuberant costal cartilages that bends inwards in association with a hyperstimulation of the diaphragm anterior fibers that is due to a

connective tissue congenital defect : in fact, frequently, there is the association of PE with Marfan syndrome (5-8%) and Ehlers-Danlos syndrome (3%) (2). Generally, pediatric patients are asymptomatics , beginning possibly to exhibit the symptoms in adolescence, secondary to the worsening of depression costal cartilage that is registered at the start accretive puberty. The depression of the sternum can move the heart and reduce lung volume. As a result, these anatomical changes cause chest pain, fatigue, dyspnea, respiratory infections, asthma symptoms, heart murmurs, and extrasystoles. The most frequent symptoms are dyspnea on exertion and a reduced tolerance to physical exertion. The symptoms may appear and then mixed, respiratory rate and dyspnea on exertion represented by restrictive ventilatory defect and conduction disturbances in heart rhythm and / or congenital heart disease; in other cases, the patient is asymptomatic or oligosymptomatic and the disorder most reported is represented by blemishing of the malformation (3). Surgical correction of deformities of the anterior chest wall is indicated not only aesthetic purposes but only in the presence of symptoms, signs of severity of the malformation or signs of suffering cardio-respiratory. The surgical correction of PE is therefore indicated in cases of: cardio-respiratory symptoms, functional alterations in cardio-respiratory instrumental tests (even if asymptomatic), severe defects in the wall (Haller index > 3.5), rapid progression of malformation, psychological disorders related to the malformation. These are the only real indication for correction of PE (4). In the literature, is struggling about the best age for the repair of the defect; adolescents surgery is more prolonged and more burdened by loss of blood; however, if the repair is carried out in too young patients, the subsequent growth of the coasts may possibly be prevented by the removal of the cores growth cartilage, with the resultant formation of a chondrodystrophy asphyxiating thoracic which causes a 'restrictive ventilatory failure (Jeune syndrome) and other complications, including recurrences (5).

Materials and Methods

5 patients were enrolled , male, aged between 15-16 years, height between 170-182 cm, weighing between 65-75 kg , ASA I-II. Exclusion criteria: failure informed consent for NUSS by their parents. All patients were premedicated orally 30 minutes prior to surgery with midazolam (0.3mg/kg). In the operating room monitoring of vital parameters: ECG, invasive blood pressure by radial artery, SpO₂, heart rate. General anesthesia was induced with propofol (3-4 mg/kg), muscle relaxation by cisatracurium (1mg/10kg), intubation with endotracheal tube Univent for selective intubation; maintenance of general anesthesia with isoflurane (1 MAC). Then, performed thoracic epidural block at T8-9 level (Isobaric Levobupivacaine 0.5% 50 mg) and then continuous infusion syringe pump at 4ml/h (20 ml of Isobaric Levobupivacaine 0.5%+20 ml saline NCl 0.9%+20 mcg Sufentanil). The evaluation of postoperative analgesia occurred with the use of NRS scale.

Results

In the intraoperative period, vital signs did not change correlated with pain; immediate postoperative, the patients did not report pain (NRS=0) and none complications related to the thoracic epidural was noticed. The association between general anesthesia and thoracic epidural block allows the use of lower halogenated and curarization (and therefore faster and safer awakenings) and a better postoperative analgesia, avoiding the administration of drugs that could interfere with the respiratory or gastrointestinal functions .

Discussion and Conclusions

The pain is undoubtedly a dominant factor that determines the quality of the postoperative course of patients undergoing Nuss technique. In fact, the elevation of the sternum before for positioning of the bar, generates high-intensity pain in the chest and spine of the patient. The patients keep the epidural catheter for about 2 days and the first postoperative day is usually already able to stand and walk and after 5-7 days out of the hospital (6). Even though the aesthetic result of the correction with

the bar is immediate, it must be left in place for 2-3 years, in order to take place the remodeling of the chest wall and then be removed with a second operation under general anesthesia. Excellent aesthetic results were reported in 85% of patients, and the technique has rapidly gained popularity thanks to the small skin incisions and for the short intraoperative surgical time (7).

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