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Unexpected difficult intubation in a patient with partial anomalous pulmonary venous drainage; A case report

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Abstract

Background: Difficult airway is a common problem encountered in cardiac surgery patients. The cause may be anatomical or physiological, and it results in difficult intubation or extubation.

Case presentation: This paper presents a case of sinus venosus atrial septal defect and partial anomalous pulmonary venous drainage that faced difficulty in intubation during surgery.

Conclusion: Identifying and properly managing difficult airway prior to surgery will significantly decrease the possible complications of difficult airway.

Keywords

Cardiac surgery; Difficult intubation; Difficult airway.

Background

Airway management is an important step in delivering anesthesia in cardiac surgery and recognizing difficult airways and their management is the cornerstone of their practice. Difficult airway is a common problem encountered during cardiac surgery. Difficulty in intubation compromises up to 24% in cardiac patients as compared to non-cardiac patients [1].

The cause may be anatomical or physiological and the result could be difficulty in intubation or extubation. Many cardiac patients with congenital defects may have difficult airways as part of a syndrome, and some may have fixed cardiac output and dysfunctional compensatory mechanisms rendering them unstable if any change in cardiopulmonary status occurs during the perioperative period. Because of this, identifying and managing problems prior to assessment and during surgery by close monitoring is vital [2].

We are presenting a case of sinus venosus Atrial Septal Defect (ASD) and Partial Anomalous Pulmonary Venous Drainage (PAPVD) that had such a problem of difficulty in intubation during surgery in this case report.

Case Presentation

A 11-month-old boy presented with a history of central cyanosis and respiratory distress. On examination, the patient had dysmorphic features, microtia, and asymmetrical facial expression. The patient was tachypneic and tachycardiac with a respiratory rate of 50 per minute and a heart rate of 130 per minute. Cardiovascular examination showed normal first and second heart sounds with ejection systolic murmur grade 3 at the left upper sternal border. Echocardiography was done and shows large high ASDII, PAPVD: Right veins drain to the right atrium, deviated atrial septum causing abnormal drainage. The patient was referred for surgical closure of ASD and PAPVD repair.

The child was evaluated by the anesthesia care team before his scheduled surgery and was classified as Mallampati class IV (6% chance of difficult intubation). The patient underwent routine investigations (Methicillin-Resistant Staphylococcus Aureus (MRSA), Methicillin-Susceptible Staphylococcus Aureus (MSSA), CORONAVIRUS DISEASE (COVID)) in the clinic and was found negative.

In the Operating Room (OR), anesthesia attempted endotracheal intubation with the patient supine 4 times but failed. In the 4th attempt, minimal blood was found in the Endotracheal (ET) tube; The otolaryngology team was then consulted for the possibility of soft tissue injury. They examined the patient in the OR and called off the procedure. Anesthesia was reversed, and the patient was transferred to the Intensive Care Unit (ICU) in a stable condition.

In the ICU, the otolaryngology team assessed the child's upper airway. The child was awake and playful with no signs of stridor and respiratory distress. He was maintaining saturation on room air. Flexible laryngoscopy was done and shows normal laryngeal structures, clear view, bilateral mobile vocal cords, and no abnormalities. The patient had class IV difficult intubation.

2 days later, the surgery was rescheduled. The otolaryngology team was called by the Cardiac Surgery Team for laryngoscopy and rigid scope intubation, under sedation. A 0-degree telescope was introduced to visualize the larynx. It was laryngeal view type III (only visualized arytenoid and small posterior glottic gap). Intubation was achieved with the assistance of the 0-degree telescope, cuffed size 4 ET tube was introduced, and fixed in place. Successful Intubation was confirmed by good ventilation, adequate saturation, CO_2 capnography, and chest auscultation. The patient was then handed to the anesthesia team to take over. Supine X-ray taken in OR showed: ET tube tip was low near the carina but didn't need readjustment. There was mild perihilar interstitial bronchial walls thickening and bilateral patchy atelectasis.

A day after the surgery, the patient had fever spikes. Blood, urine, and respiratory cultures were taken, and an x-ray showed: persistent low position of the ET tube, mild cardiomegaly with increased central pulmonary vascularity, and perihilar haziness related to worsening pulmonary edema/congestion, a

background of perihilar bronchial walls thickening, and patchy atelectatic changes. The patient was started on vancomycin and ceftazidime. Respiratory cultures came back later positive for MRSA.

4 days after the surgery, the patient was successfully extubated and placed on a high-flow nasal cannula 1 L/min O_2. Another x-ray was done, and it showed: interval improvement of bilateral patchy scattered airspace opacities/atelectasis.

19 days after surgery, the patient's work of breathing became normal, and he was switched from a high-flow nasal cannula to simple nasal cannula oxygen. Postoperative Echo showed: all pulmonary veins are seen draining normally to the left atrium with no obstruction, no residual atrial septal defect, mildly dilated right atrium, mildly decreased right ventricle systolic function, dilated main pulmonary artery branches with normal flow to both pulmonary artery branches, no pulmonary hypertension, normal left ventricle systolic function, no coarctation, and normal abdominal aorta doppler.

The patient was discharged 22 days post-surgery on home oxygen because he had right diaphragmatic weakness on fluoroscopy.

The patient followed up in the pediatric cardiology clinic a month later. He was observed off O_2 in the Echo Lab, and SPO_2 was 95% and above. Plans for weaning off oxygen were instituted. The patient's scar is healing well, and he is growing and gaining weight.

Discussion

Difficult airway is a clinical condition where a physician, skilled in airway management, encounters difficulty with mask ventilation or trachea intubation [3]. Difficult intubation is a common issue in cardiac anesthesia and may be attributed partly to the sociodemographic profile of the patient. Because congenital cardiac conditions are often part of a syndrome, physicians can experience difficulty in airway management because of abnormal facial and/or oropharyngeal anatomy [2]. Difficult intubation in the pediatric population can result from natural anatomical conditions, congenital abnormalities, and the limited availability of airway devices suitable for the small size of pediatric patients. Difficult intubation is a significant problem due to the potential risks, such as hypoxia and hypoxic brain injury. Because children have higher oxygen consumption and lower oxygen reserve, difficult intubation can result in worse tolerance to respiratory interruptions and can lead to rapid patient compromise [4].

Direct laryngoscopic intubation is found difficult in 1%-4% and impossible in 0.05%-0.35% of patients who have seemingly normal airways. Unanticipated difficult intubation places patients at increased risk of complications. To aid the anesthesiologist in identifying difficult airways, several non-invasive clinical preoperative airway measures have been described that possess significant associations with difficult intubation. However, no single measure of the airway can be expected to predict difficult intubation accurately [5]. Mallampati classification, thyromental distance, sternomental distance, and a simple summation of risk factors (Wilson risk sum score) are widely recognized as tools for predicting difficult intubation, but the diagnostic accuracy of these screening tests has varied from trial to trial [6]. There is a high percentage

(75%-93%) of unanticipated difficult intubation in daily routine practice that underlines the importance of always being prepared for unexpected airway management difficulties [7].

This child was evaluated by the anesthesia care team before his scheduled surgery and was classified as class IV according to the Mallampati classification. In the OR, anesthesia attempted endotracheal intubation with the patient supine but failed. The otolaryngology team was then consulted, and the procedure was cancelled; the patient had class IV difficult intubation, and anesthesia was reversed.

Endotracheal intubation is not without risk, and its many complications, which range from minor soft tissue injuries to severe life-threatening airway complications, are described in the literature [8] and difficult intubation usually results in prolonged intubation. According to a systematic review, between 10 and 20% of patients on mechanical ventilation for more than 48 hours develop ventilator-associated pneumonia (VAP). In early VAP (within the first 4 days of admission), the most commonly found organisms are Streptococcus pneumoniae, Haemophilus influenzae, and MSSA; while in the late-onset VAP: MRSA, Gram-negative bacilli are the frequent causative organisms [9]. Risk factors for respiratory tract colonization include the presence of endotracheal tubes and the duration of this intervention. The procedure of intubation itself increases the risk significantly, as has been demonstrated in patients requiring reintubation [10]. The patient had fever spikes a day after surgery. A series of investigations were done, and the patient was started on antibiotics. He was intubated for 4 days and had difficult intubation, to begin with. After extubation, the patient also required reintubation.

If there has been difficulty with intubation, extubation may also prove to be difficult. Despite the serious risk that exists with the difficult airway during this period, there is little guidance on when to extubate a patient with a known difficult airway. Extubation of a patient should not take place until it has been established that the patient can protect their airway and that the airway is patent, and in difficult to intubate patient, additional concerns must be considered [11]. In addition, extubation should not be performed until it has been determined that the patient's medical condition is stable and potential difficulties in case reintubation is needed have been identified, and a plan that includes backup options has been developed and shared among the team members involved [12]. In certain higher-risk patient populations, such as cardiac surgery patients, the reintubation rate can be high. The patient with a known difficult airway is at greater risk for an even more difficult reintubation. That's why determining when to extubate a patient is crucial.

Conclusion

Difficult intubation is a specially common problem in pediatric cardiac anesthesia. Identifying and properly managing a difficult airway before surgery will significantly reduce the many possible consequences of difficult airway.

Declarations

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