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Case Report / Olgu Sunumu

Torsade de Pointes during placement of an implantable cardioverter-defibrillator in a child with long QT syndrome

Uzun QT sendromlu bir çocukta implante edilebilir kardiyoverter-defibrilatör yerleştirilmesi sırasında Torsade de Pointes

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ABSTRACT

Long QT syndrome is characterized by a prolongation of the QT interval resulting in a tendency to ventricular tachyarrhythmias, particularly Torsade de Pointes. Inhalational anesthetics are often accused of prolonged QT interval. Herein, we report a pediatric case of long QT syndrome with a persistent Torsade de Pointes episode under general anesthesia with sevoflurane during surgical implantable cardioverter-defibrillator placement. Recurrent Torsade de Pointes requiring electrical cardioversion were considered to be unrelated to the surgical management. These episodes were considered to be related to sevoflurane inhalation. After terminating sevoflurane, arrhythmias disappeared. As malignant arrhythmias may have detrimental results for patients, we conclude that inhalation anesthetics should be avoided in patients with long QT syndrome.

Keywords: Arrhythmia; long QT syndrome; sevoflurane.

ÖZ

Uzun QT sendromu, Torsade de Pointes başta olmak üzere, ventriküler taşiaritmilere yatkınlığa neden olan, QT aralığında uzama ile karakterizedir. QT aralığının uzamasından inhaler anestetikler sorumlu tutulmaktadır. Bu yazıda, implante edilebilir kardiyoverter-defibrilatör yerleştirme cerrahisi sırasında sevofluran ile genel anestezide iken inatçı Torsade de Pointes atağı geçiren uzun QT sendromlu bir pediatrik olgu sunuldu. Elektriksel kardiyoversiyon gerektiren tekrarlayan Torsade de Pointes ataklarının cerrahi tedavi ile ilişkili olmadığı düşünüldü. Bu ataklar sevofluran inhalasyonu ile ilişkilendirildi. Sevofluran sonlandırıldıktan sonra, aritmiler ortadan kayboldu. Malign aritmiler hastalar için tehlikeli sonuçlar doğurabileceği için, uzun QT sendromlu hastalarda inhaler anestetiklerin kullanılmaması gerektiği kanısındayız.

Anahtar sözcükler: Aritmi; uzun QT sendromu; sevofluran.

Long QT syndrome (LQTS) is a congenital disorder characterized by prolonged QT interval on electrocardiogram (ECG), resulting in a tendency to ventricular tachyarrhythmias, particularly Torsade de Pointes (TdP).[1] The latter is a malignant arrhythmia which may lead to syncope, cardiac arrest, or even sudden death.[1-3]

QT interval is measured from the beginning of the QRS complex to the end of the T wave and is corrected for heart rate based on the Bazett formula (QTc).[4] The presence of QTc >500 ms is associated with the highest incidence of malignant arrhythmias.[3] In these patients, implantable cardioverter-defibrillator (ICD) implantation can be considered.[5,6] Patients with

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LQTS have also increased risk for development of arrhythmias during anesthesia and, therefore, caution should be exercised in the management of these patients.[7] Furthermore, tachyarrhythmias may be provoked by various stimuli in the perioperative period.[8,9] Increased adrenergic activity such as emotional and surgical stress, electrolyte disturbances, hypothermia, and the use of some drugs such as inhalational anesthetics accused of prolonged QT interval may precipitate arrhythmias.[10-13]

Despite evidences suggesting that sevoflurane may prolong the QT interval, there is an ongoing debate on the torsadogenicity of it. Therefore, its safety in patients with LQTS still remains controversial. Herein, we report a pediatric case of LQTS with a persistent TdP episode under general anesthesia with sevoflurane during surgical ICD placement.

CASE REPORT

A six-year-old girl with LQTS was scheduled for an ICD implantation procedure. She had a history of four syncope episodes and a sudden cardiac arrest. She was then diagnosed with LQTS (QTc: 565 ms). A written informed consent was obtained from the parents of the patient.

The patient was sedated with oral midazolam 20 minutes before the operation to prevent stress responses. After monitoring, anesthesia was induced with propofol (2 mg/kg), rocuronium bromide (0.6 mg/kg) and fentanyl (2 μg/kg). The trachea was intubated and anesthesia was maintained with sevoflurane 2% and 50% oxygen and air mixture. During the operation, arterial blood and central venous pressures were monitored continuously. A bolus of fentanyl and rocuronium bromide was given, if required. The operation was uneventful during the first 45 minutes. Then, recurrent TdP episodes requiring electrical cardioversion occurred. These episodes were considered to be unrelated to the surgical intervention. Magnesium replacement therapy and esmolol hydrochloride were infused. Arterial blood gas analyses showed no abnormalities. Electrolyte levels were also within normal ranges. The patient was normothermic. As recurrent TdP episodes were considered to be related to the sevoflurane inhalation, sevoflurane was discontinued and propofol infusion 4 mg/kg/h was, rather, initiated. Arrhythmias disappeared following the infusion. During the operation, no other complications were recorded. The patient was extubated four hours after surgery and discharged in the fourth postoperative day.

DISCUSSION

Patients with LQTS have an increased risk for malignant arrhythmias during anesthesia and, therefore, a special care should be exercised to avoid some factors precipitating these arrhythmias.[8] One of them is an increased adrenergic activity such as emotional and surgical stress.[8] To prevent stress responses, we sedated our case with oral midazolam before the operation and during the operation anesthesia level was considered to be sufficient, as the patient was hemodynamically stable until the occurrence of a TdP episode. Arrhythmia occurrence was also unrelated to the surgical intervention. After controlling the electrolyte levels and initiating an anti-arrhythmic therapy, we suspected that sevoflurane induced TdP episodes. As a result, we replaced sevoflurane with propofol. Then, arrhythmias disappeared and the surgery went uneventful until completed.

The use of volatile anesthetics in patients with LQTS remains challenging. In addition to the reports supporting its safety,[17,18] there are also some concerns regarding regeneration of malignant arrhythmias.[14-16] There are several case reports showing the development of intraoperative TdP episodes during sevoflurane anesthesia.[14-16] Altogether, sevoflurane has been associated with the development of malignant arrhythmias.

Similar to our case, Saussine et al.[1] presented a pediatric case of LQTS with a TdP episode during ICD implantation. The authors also concluded that sevoflurane induced TdP, as it disappeared after substituting propofol for sevoflurane during surgery.

On the other hand, there are several reports supporting its safe-to-use profile. In their case report, Kansara et al.[17] reported the anesthetic considerations in an infant with LQTS. They used sevoflurane not only for induction, but also for maintenance of anesthesia without any adverse effect, considering that sevoflurane has minor effects on cardiac electrophysiology. Kenyon et al.[18] also published a retrospective review in 22 patients with LQTS who underwent videoscopic left cardiac sympathetic denervation surgery. They also used sevoflurane safely for the maintenance of the anesthesia.

Moreover, several studies in the literature investigated the torsadogenicity of sevoflurane. Whyte et al.[19] analyzed the effects of sevoflurane on the transmural dispersion of repolarization (TDR). They showed that, although sevoflurane markedly prolonged QTc, it did not increase TDR, indicating low or no torsadogenicity. Of note, caution should be exercised

in children with LQTS, as their study only included healthy children. In another study of Whyte et al.,[20] the effects of propofol and sevoflurane on the QT interval and TDR were compared. The results were similar to the other study, suggesting no torsadogenicity.

In addition, Nathan et al.[21] performed a retrospective study in children with LQTS undergoing several surgeries under general anesthesia and reported perioperative adverse effects. They found increased adverse effects during the period of enhanced sympathetic activity, such as emergence from anesthesia in association with the use of anti-cholinergic and anti-emetic drugs. However, they did not observe any direct relationship with the use of inhalational anesthetics, although they are widely used in most of the procedures.[21] They also divided the patients into two groups. One group consisted of patients undergoing pacemaker or ICD replacement procedure and the other of those undergoing other surgeries. Although they described the first group as the high-risk group due to nature of the procedure, they did not find an increased risk for adverse effects.

In a case report of Ela et al.,[22] a nine-year-old adenotonsillectomy case with LQTS was presented. The authors concluded that his condition depended on congenital pathology and undiagnosed congenital LQTS was induced with sevoflurane anesthesia.

In conclusion, in our case, after eliminating possible factors which might have been accused, sevoflurane was considered to be the only cause of Torsade de Pointes. As malignant arrhythmias may have detrimental results for patients, we conclude that inhalation anesthetics should be avoided in patients with long QT syndrome.

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