

## Anesthetic Management of Cesarean Section in a Grown-Up Congenital Heart Patient with Placenta Previa and Giant Placental Tumor: A Case Report

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### Abstract

The patient had complete placenta previa and a giant placental tumor, and had a history of repair for cor triatriatum (CorT) 19 years previously. After anesthetic induction with remifentanyl, thiamylal, and rocuronium, tachyarrhythmia occurred following multifocal ventricular premature contraction. Treatment with lidocaine was not effective. However, tachyarrhythmia converted naturally after delivery and removal of the placental tumor. We speculated that the surgical scar remaining after CorT repair acted as an arrhythmogenic substrate, and that these factors associated with hemodynamic change and hypomagnesaemia in this patient, including sympathetic instability of pregnancy, giant placental tumor, and general anesthesia, resulted in unexpected arrhythmia.

In conclusion, in cases of caesarian section in grown-up congenital heart pregnant patients with complete placenta previa and giant placental tumor, careful consideration should be given to alterations in the hemodynamic condition.

**Keywords:** Tachyarrhythmia; Grown-up congenital heart patient; Placenta previa; Giant placental tumor; Cesarean section

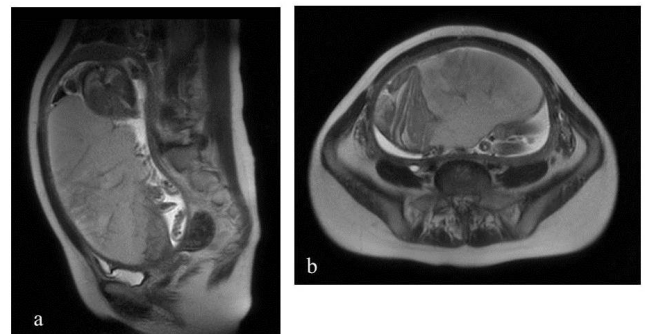
### Introduction

Recently, remarkable advances in the diagnosis and surgical treatment options of congenital heart disease (CHD), including complex congenital heart disease, have enabled long-term survival in 95% of patients. Moreover, more than 90% of patients reach adulthood after treatment of CHD, and there are approximately 4 million such patients in Japan [1]. Subsequently, grown-up congenital heart (GUCH) female patients may become pregnant. However, such patients may develop sudden-onset arrhythmia due to the CHD repair. Several reports are published regarding anesthetic management of GUCH patients in adulthood [2]. According to previous reports, ventricular arrhythmia may occur in GUCH patients [3].

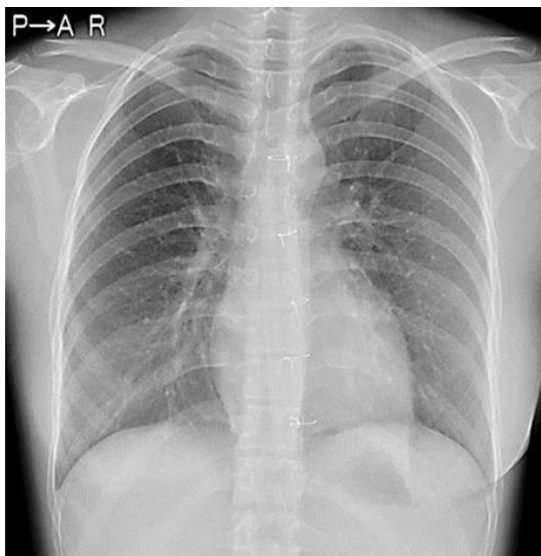
Herein, we report a case of cesarean section (CS) in a woman with complete placenta previa and giant placental tumor who had undergone repair for cor triatriatum (CorT) 19 years previously.

### Case Presentation

A 20-year-old pregnant woman, 170 cm in height and weighing 61.8 kg, was scheduled for elective CS at 23 weeks of gestation because of fetal hypoplasia caused by giant placental tumor and complete placenta previa (Figure 1a, 1b). She had undergone radical surgical repair of CorT 19 years previously. After CorT repair, her activities of daily living had not been limited and she had not displayed any detectable cardiac abnormalities. Therefore, no specific examination of cardiac function was performed before surgery.



**Figure 1:** Abdominal computed tomography (CT) images. (a) Abdominal CT image (sagittal slice) indicates complete placenta previa and giant placental tumor. (b) Abdominal CT image (horizontal slice) indicates complete placenta previa and giant placental tumor.

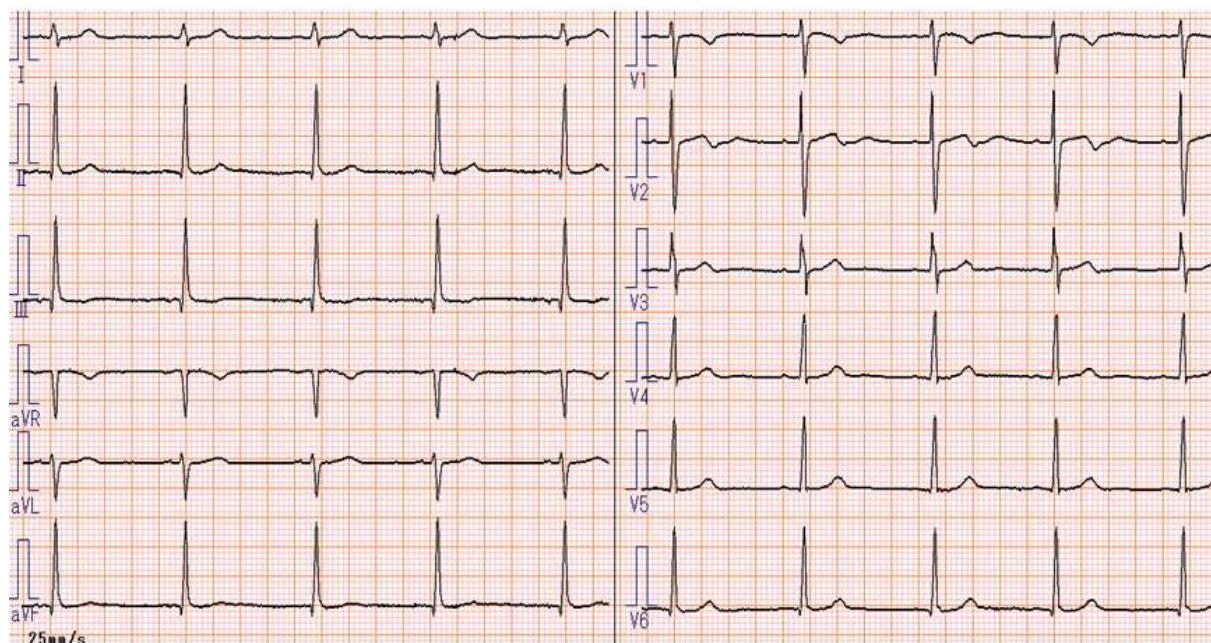


**Figure 2:** Chest radiography image prior to surgery. The cardiothoracic ratio is less than 50% on chest radiography.

On the preoperative examination, chest auscultation revealed normal vesicular breath sounds with no abnormal sounds. The rest of the systemic examination did not reveal any abnormality. The

cardiothoracic ratio was less than 50% on chest radiography (Figure 2), and a regular sinus rhythm was observed on ECG (Figure 3). Routine laboratory investigations showed anemia (hemoglobin concentration, 8.4 g/dL), hypoalbuminemia (3.2 g/dL), and hypomagnesemia (1.4 mg/dL). The blood coagulation test showed a slight increase in prothrombin time (international normalized ratio; PT-INR) of 1.08 with levels of serum fibrinogen of 207 mg/dL, serum fibrin degradation products (FDP) of 7.1  $\mu\text{g}/\text{mL}$ , and d-dimer of 3.0  $\mu\text{g}/\text{mL}$ . These data were considered to reflect physiological changes associated with pregnancy. Pregnancy-induced hypertension was not present. Therefore, the patient was given an ASA II physical status because of anemia, hypoalbuminemia, and hypomagnesemia, and we considered her cardiac condition as normal according to her status at the time. We planned general anesthesia combined with a transverse abdomens plane (TAP) block as regional anesthesia to manage the risks of her complications.

The patient's condition was normal on entering the operating theater. ECG, pulse oximetry and capnography, BIS monitoring, and noninvasive blood pressure monitoring were started. Subsequently, we inserted a radial artery catheter to enable invasive arterial pressure monitoring. ECG before anesthetic induction revealed a regular sinus rhythm (Figure 4). For anesthesia, we administered 5 mg/kg thiamylal and 0.8 mg/kg rocuronium in rapid sequence and continuous infusion of 0.2  $\mu\text{g}/\text{kg}/\text{min}$  remifentanil simultaneously. After the patient was unconscious and muscle relaxation was achieved, tracheal intubation with a 7.5-cuffed endotracheal tube was performed successfully and CS was started.



**Figure 3:** Electrocardiography traces prior to surgery. A regular sinus rhythm is observed in each lead.

## Discussion

This may be a rare report of tachyarrhythmia during CS in a GUCH patient pregnant with giant placental tumor.

CorT is a rare congenital anomaly in which the left atrium is divided into two chambers by an abnormal oblique fibro muscular membrane [4], and may be associated with other anomalies such as atrial septal defect (ASD) or total anomalous pulmonary venous return [5]. CorT is considered to be caused by a failure in the process of absorption of the pulmonary vein into the left atrium during the fetal period.

Classification of CorT is shown in Table 1. Type 2a CorT (ASD connecting the right atrial cavity with the non-native left atrial cavity) and type 2c CorT (dual ASD connecting the right atrial cavity with the non-native left and native left atrial cavities) are known to have the potential for congenital anomaly-associated arrhythmia caused by myocardial conduction abnormalities accompanying septal deficits. Furthermore, after CorT repair, the heart of GUCH patients may have residual cardiac dysfunction or surgical scarring, which may act as an arrhythmogenic substrate. Therefore, we speculated that the patient in the presented case might have undergone repair of type 2a or 2c CorT 19 years previously, which might have been a factor in the observed arrhythmia, but this speculation could not be confirmed.

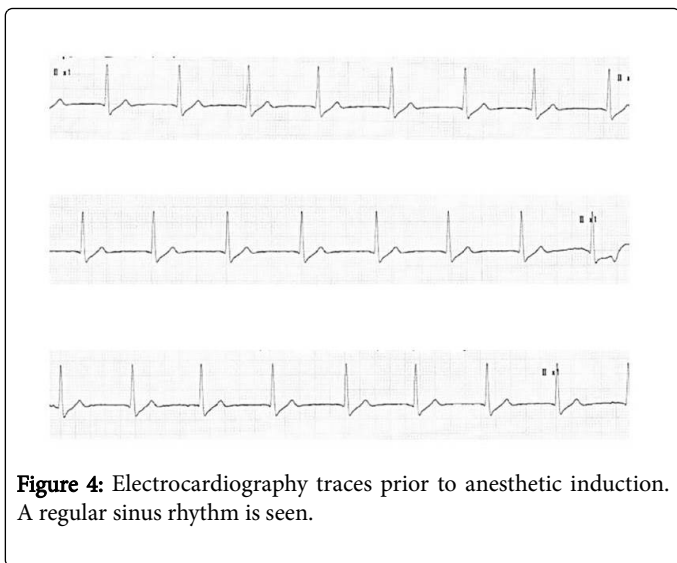
|         |  |
|---------|--|
| Type 1  | no atrial septal deficit (ASD)   |
| Type 2a | ASD connecting right atrial cavity with non-native left atrial cavity                        |
| Type 2b | ASD connecting right atrial cavity with native left atrial cavity                            |
| Type 2c | dual ASD connecting right atrial cavity with non-native left and native left atrial cavities |

**Table 1:** Classification of cor triatriatum (CorT).

Most GUCH patients can tolerate a pregnancy with proper care [6]. The highest maternal risk is associated with Eisenmenger's syndrome, with a maternal mortality of  $\geq 50\%$  [7]. Several manuscripts regarding the management of CS in non-treated CorT patients are already published [8, 9]. Mathew et al. [8] reported a case of a pregnant woman with non-treated CorT who underwent emergency CS under general anesthesia because of severe pre-eclampsia. Kanbara et al. [9] suggested that spinal anesthesia may be the method of choice for CS in patients with non-treated CorT when adequate hemodynamic monitoring is available. In our case, the patient's cardiac function was normal and non-harmful VPC was observed before CS and augmentation with oxytocin. This fact may support our speculation described above.

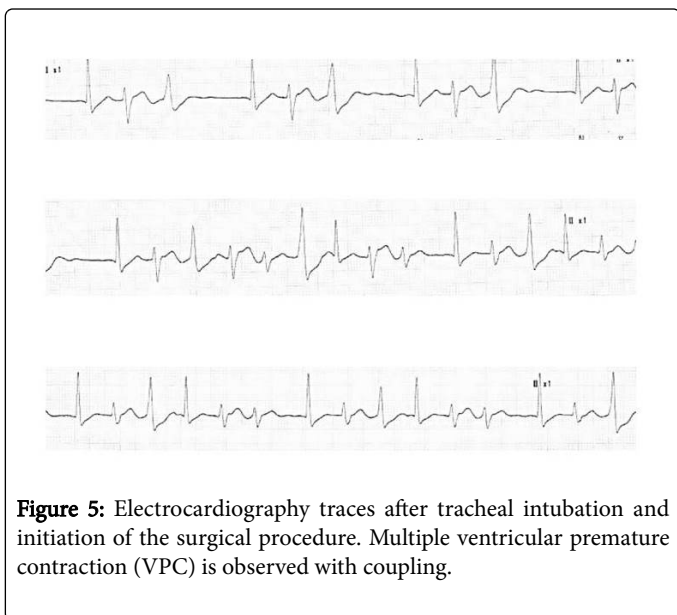
Scavonetto et al. [10] reported that the patients with non-treated CorT and no abnormalities on computed tomography (CT) typically tolerate anesthesia and surgical procedures well. However, other reports indicate that patients with CorT require careful management because of myocardial substance damage or hemodynamic problems in non-treated CorT. For example, Lee et al. [11] reported that CorT presents a clinical picture of mitral stenosis and careful anesthetic management is required.

All arrhythmias that can occur in the normal population can occur in GUCH patients, but the acquired arrhythmias rarely seen in young adults that are a consequence of the underlying pathophysiology and the scarring induced by surgery are much more common [12].



**Figure 4:** Electrocardiography traces prior to anesthetic induction. A regular sinus rhythm is seen.

However, multiple ventricular premature contractions (VPC) occurred immediately after tracheal intubation and abdominal incision. We injected 1 mg/kg lidocaine to treat multiple VPC. However, the VPC did not resolve, so we repeated the 1 mg/kg lidocaine (Figure 5). Although a total of 2 mg/kg lidocaine was injected, VPC did not disappear and developed rapidly into a tachyarrhythmia of 180 beats per minute, so defibrillation was prepared. During tachyarrhythmia, the invasive arterial blood pressure line was maintained, and the blood pressure stayed at over 90 mmHg in the systolic period. However, tachyarrhythmia converted naturally to regular sinus beats immediately after delivery of the fetus and removal of the placental tumor. Regular sinus rhythm was absent for not more than approximately 8 minutes, but hemodynamics were maintained within normal range. After administration of oxytocin, no further premature contractions were observed. Blood loss was 1100mL immediately after delivery and 1974mL (including amniotic fluids) after the operation. No abnormal sequelae were observed in the mother or infant after surgery.



**Figure 5:** Electrocardiography traces after tracheal intubation and initiation of the surgical procedure. Multiple ventricular premature contraction (VPC) is observed with coupling.

We considered that surgical scarring of CorT might have acted as an arrhythmogenic substrate that led to the unexpected arrhythmia in our case, together with one of or a combination of the following factors: (1) systemic circulatory alteration due to pregnancy, such as increased blood volume; (2) sympathetic stimulation due to surgical stress, such as adrenergic response to intubation or pain; (3) abnormal venous return caused by complete placenta previa and giant placental tumor; (4) parasympathetic stimulation by anesthetic agents; (5) sympathetic stimulation due to low ventilation and high CO<sub>2</sub> blood accumulation caused by pregnancy and anesthetic induction; (6) circulatory collapse due to bleeding with delivery; and (7) unexpected arrhythmia caused by hypomagnesaemia due to pregnancy [13].

The findings from recorded ECG traces would be useful to reconsider this accidental event. However, we could not find the stored ECG traces of her tachyarrhythmia in our hospital chart system, so we were unable to analyze the form of the arrhythmia wave. We consider this is a limitation of this report.

We considered that in our case the surgical scar in the heart acted induced arrhythmia together with the factors mentioned above.

General anesthesia might have caused the unexpected tachyarrhythmia. Generally, the choice of drugs is less important than appropriate hemodynamic goals and narcotic-based anesthesia is quite suitable in the presence of ventricular dysfunction [14]. However, we could not use spinal anesthesia because of two factors. One of these was the risk of massive bleeding due to complete placenta previa after delivery. Another factor was the risk of bleeding and anesthesia-induced hypotension because of the giant placental tumor. Therefore, we selected general anesthesia for the management of this case.

In conclusion, in cases of CS in GUCH patients pregnant with complete placenta previa and giant placental tumor, care should be taken regarding alterations in the hemodynamic condition.

## Informed Consent

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

## Competing interests

This report received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

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