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A Case of Atypical Postoperative Malignant Hyperthermia after the Eighth General Anesthesia in a Child with Cheilognathopalatoschisis

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Abstract

Background and Objectives: Postoperative malignant hyperthermia (MH) occurs after discontinuation of volatile anesthetics or in the early postoperative period after general anesthesia. We experienced a case of atypical postoperative MH identified by dark reddish-brown urine produced 40 min after the end of eighth general anesthesia in an 11-year-old male with cheilognathopalatoschisis. **Case Report:** Anesthesia was induced using thiamylal, fentanyl citrate, remifentanil, rocuronium, and maintained with sevoflurane, fentanyl citrate, remifentanil. The patient was observed clenching his teeth, tachycardia, profuse perspiration, shivering-like motion, and hyperpnoea from the end of the operation to return to the HCU ward, whereas the maximum of axillary temperature was 37.9˚C. Although these abnormal symptoms and vital signs were disappeared, abnormally high level of CK, AST, ALT, LDH, ALP, and myoglobinuria were recognized. We decided to not administer dantrolene hydrate because his vital signs and daily activity were restored to those observed preoperatively. However, the patient was continued infusion therapy for 9 days after the operation until the blood and urine test values returned to the preoperative ones. **Conclusions:** We experienced atypical postoperative MH identified by dark reddish-brown urine 40 min after the end of eighth general anesthesia. We decided not to administer dantrolene hydrate because his vital signs and daily activity were restored to those observed preoperatively when we recognized abnormally high level of CK, AST, ALT, LDH, ALP, and myoglobinuria. Consequently, rhabdomyolysis continued and in 9 days, the abnormally high values of CK, AST, ALT, LDH, and ALP recovered to the reference value.

Keywords

Postoperative Malignant Hyperthermia, General Anesthesia, Rhabdomyolysis

1. Introduction

Postoperative malignant hyperthermia (MH) is uncommon. The latency period between the discontinuation of an anesthetic triggering agent and the onset of a sign indicative of MH ranged from 0 to 40 min [1]. The onset signs are generalized muscle rigidity, hypercapnia and/or tachypnea, and tachycardia; hyperthermia is not manifested as the initial presenting sign [1].

Here we report a case of atypical postoperative MH identified by dark reddish-brown urine produced 40 min after the end of the eighth general anesthesia in a child with cheilognathopalatoschisis.

2. Case Report

An 11-year-old male (height 136.5 cm, weight 35.3 kg) had bilateral cheilognathopalatoschisis at birth and underwent cheiloplasty at the age of 3 months and 8 months, palatoplasty at 1 year and 10 years, pharyngeal flap surgery at 7 years, and shinbone graft placement for treating bilateral alveolar clefts at 10 years and 11 years. For the present operation, secondary bilateral cleft lip repair had been scheduled. No abnormality was detected in the preoperative examination without CK 5506 IU/l of the next day of the last operation which performed ten months previously (Table 1).

No premedication was administered prior to general anesthesia. Anesthesia was induced using 175 mg thiamylal sodium, 3% sevoflurane, 0.3 μg/kg/min remifentanil, and 25 mg rocuronium. After oropharyngeal intubation, 1.5% sevof-

Table 1. Characteristics and medical history of the patient are showed in this table. The patient underwent seven times of operations associated with cleft lip and palate under general anesthesia previously. No abnormality was detected in the preoperative examination without abnormally high CK value of the next day of the last operation.

age (years)		11
sex		male
hight (cm)		136.5
weight (kg)		35.3
medical history		bilateral cheilognathopalatoschisis
operation history	3 months	cheiloplasty
	8 months	cheiloplasty
	1 year	palatoplasty
	7 years 11 months	pharyngeal flap surgery
	10 years 1 months	palatoplasty
	10 years 7 months	shinbone graft placement for treating right alveolar clefts
	11 years 1 month	shinbone graft placement for treating left alveolar clefts
special item		CK 5506 IU/l of the next day of the last operation

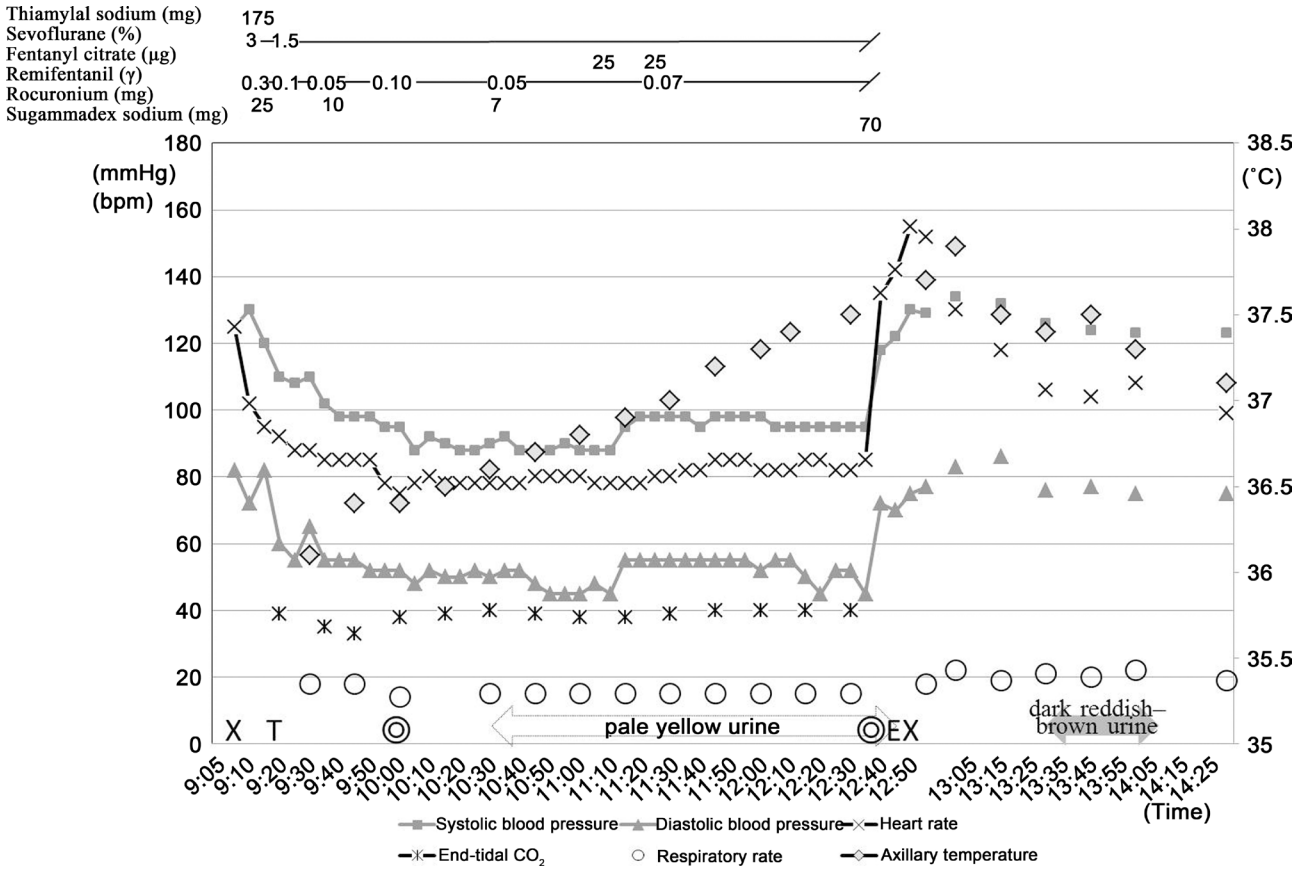

Figure 1. Changes in vital signs from the induction of anesthesia to 90 min after returning to the HCU ward.

lurane, 0.05 - 0.10 μg/kg/min remifentanil, 50 μg fentanyl citrate, and 17 mg rocuronium were administered for the maintenance of anesthesia. On mechanical ventilation, end-tidal CO2 was 38 - 40 mmHg with a tidal volume of 350 - 377 ml and a respiratory rate of 15 - 17 beats per minute. The heart rate was 78 - 85 beats per minute and blood pressure was 88 - 98/54 - 55 mmHg. The axillary temperature gradually increased from 36.4˚C to 37.5˚C during the operation time of 2 h and 44 min. The intraoperative infusion volume was 500 ml, blood loss was 10 g, and pale yellow urinary volume was 220 ml (Figure 1).

At the end of the operation, the patient was observed to be clenching his teeth; therefore, a few minutes were needed to insert a bite block between the incisors. After the insertion, sevoflurane was discontinued and 70 mg sugammadex sodium was administered. After 5 min, the heart rate increased to 155 beats per minute, blood pressure increased to 120/70 mmHg, and bucking was noticed. Immediately after that, the patient was able to open his eyes and mouth on verbal instruction, and the tracheal tube was removed. We decided to transfer the patient to the HCU ward after confirming a heart rate of 152 beats per minute, a blood pressure of 129/77 mmHg, an axillary temperature of 37.7˚C, and consciousness. On moving the patient from the operating room to a stretcher, we detected profuse perspiration on the head, shivering-like motion, and hyperpnea. Hyperpnea settled on verbal instructions to breathe slowly but repeated

twice until arrival to the HCU ward. The axillary temperature increased to a maximum of 37.9˚C 5 min after he arrived to the HCU ward but decreased with occipital cooling. Thirty minutes after moving to the HCU ward, the urine suddenly turned dark reddish-brown; therefore, we ordered blood and urine tests to determine whether these symptoms indicated MH (**Figure 1**). Three hours after sampling, the test results showed an abnormally high CK value of 12,281 IU/l and urine myoglobin values of 230,000 ng/ml. Meanwhile, the patient complained of pain in the left shoulder and right buttock; therefore, we recognized these symptoms as those of atypical postoperative MH based on the Clinical Grading Scale [2]. At that time, his vital signs, urinary color, and daily activities, including oral ingestion and playing on a portable game machine, were restored to those observed preoperatively. Therefore, we decided to not administer dantrolene sodium hydrate but to continue monitoring the vital signs such as blood pressure, heart rate, ECG, respiratory rate, axillary temperature, and urine (**Table 2**).

The blood test values increased (CK 68,271 IU/l; AST 1240 IU/l; ALT 127 IU/l; ALP 1198 IU/l; and LDH 1412 IU/l) 21 h after returning to the HCU ward.

Table 2. Postoperative course from moving to the HCU ward to discharge from the higher order medical facility are showed in this table. The axillary temperature and activity were restored to those observed preoperatively within 4 hr 10 min after moving to the HCU ward, however the blood and urine test values were abnormally high in 9 days after the operation.

the number of days after the operation	0			1		2 ~ 8	9
hospitalized	our hospital			our hospital		the higher order medical facility	discharge
the elapsed time after moving to the HCU	1 hr 10 min	4 hr 10 min	19 hr 30 min	21 hr 0 min	23 hr 30 min		
axillary temperature (˚C)	37.3	37.1	36.5	36.8		within the reference value	
blood test (IU/l)	CK 12,281			CK 68,271 AST 1240 ALT 127 ALP 1198 LDH 1412	CK 71,480 AST 1337 ALT 159 ALP 1098 LDH 1521	the abnormally high CK, AST, ALT, and LDH values gradually reduced to the preoperative ones.	
urine test	dark-reddish color pH 6.5 protein 2+ occult blood 3+ myoglobin 230,000 ng/ml		pH 7.0 occult blood 3+		myoglobin 470 ng/ml		
medical treatment	infusion therapy withdrawing urine	infusion therapy withdrawing urine	infusion therapy withdrawing urine	infusion therapy withdrawing urine	infusion therapy withdrawing urine	infusion therapy	
activity	supine conscious clear	restored to those observed preoperatively					

After 2 h and 30 min, these values increased further (CK 71,480 IU/l; AST 1337 IU/l; ALT 159 IU/l; ALP 1098 IU/l; and LDH 1521 IU/l), except for urine myoglobin values (470 ng/ml); therefore, we decided to transfer the patient to a higher order medical facility. Because the CK isozyme test was outsourced to a different pathology lab, the result of CK isozymes was obtained 6 days after the patient was transferred to the higher order medical facility. The results were as follows: BB (CK1) 0, MB (CK2) 0, and MM (CK3) 100. The patient was followed up at the higher order medical facility and discharged 9 days after the operation, where infusion therapy was continued until the blood and urine test values returned to the preoperative ones (**Table 2**).

3. Discussion

The rate of onset of postoperative MH is rare, accounting for only 1.9% [1] - 8.3% [3] of total MH cases, and the onset mechanism remains unclear. The clinical patterns of this disease have been reported as classic acute MH, occurring shortly after the completion of surgery, and general anesthetic or atypical MH, manifesting as delayed rhabdomyolysis in patients subsequently identified as being susceptible to MH on contracture testing [1]. The CICR rate of postoperative MH is lower than that of intraoperative MH [4]; therefore, clinical symptoms of this disease may be relatively less. However, the mortality of this disease is high at 12.2% [4].

The prognosis is associated with hyperthermia above 41˚C, hyperkalemia, ventricular arrhythmia, renal failure, and acidosis, which were not detected in the present case. Monitoring the axillary temperature is a safe measurement method in the perioperative period and is therefore a highly reliable measurement for monitoring temperature change. This patient could completely close his underarm, and the predicted amount of bleeding and volume of infusion were low; therefore, we thought that his body temperature may not decrease by infusion. Meanwhile, the rectal temperature is 0.6˚C - 0.8˚C higher than the axillary temperature; therefore, if the rectal temperature had been measured in the operating room, a body temperature of over 38˚C, tachycardia, profuse perspiration, and shivering-like movement while feeling hot would be suggestive of the onset of MH before allowing the patient to leave the operating room.

Immediate administration of dantrolene sodium hydrate is desirable when MH is clinically diagnosed; however, muscle weakness, respiratory failure, liver dysfunction, and nausea and vomiting are side effects. Therefore, in our case, we withheld the administration of dantrolene sodium hydrate because we considered the acute symptom of MH had disappeared 60 min after returning to the HCU ward when the reddish-brown urine disappeared, and were unable to judge the progression of the patient's condition and we wanted to avoid the onset of side effects. However, the values of CK, AST, ALT, LDH, and ALP continued to rise 23 h and 30 min after returning to the HCU ward, and further 8 days were needed for the abnormal values to return to the reference values. Therefore,

rhabdomyolysis may have been continued for 9 days after the clinical manifestations disappeared. Dantrolene sodium hydrate controls the isolation of Ca^{2+} in the sarcoplasmic reticulum and corrects the hypermetabolic state of the skeletal muscle within 5 min after intravenous administration. We should have administrated dantrolene sodium hydrate immediately after the clinical diagnosis of MH.

4. Conclusion

We experienced a case of atypical postoperative MH identified by dark reddish-brown urine produced 40 min after the end of the eighth general anesthesia with sevoflurane, fentanyl, and rocuronium in a child with cheilognathopalatoschisis. No abnormality was detected in the preoperative examination without CK 5506 IU/L of the next day of the last operation. The patient showed clenching of the teeth, tachycardia, profuse perspiration, shivering-like motion, and hyperpnea from the end of the operation to return to the HCU ward. Although these abnormal symptoms and vital signs disappeared, dark reddish-brown urine was produced 40 min after the end of the anesthesia and abnormally high values of CK, AST, ALT, LDH, ALP, and urinary myoglobin were recognized on blood and urine testing. We decided to not administer dantrolene sodium hydrate because the progression of the condition would be relieved without it. Consequently, rhabdomyolysis continued and in 9 days, the abnormally high values of CK, AST, A LT, LDH, and ALP recovered to the reference values.

Conflict of Interest

The authors declare no conflicts of interest.

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