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Treatment with mild brain hypothermia for cardiopulmonary resuscitation after myoclonic seizures in infant with robertsonian type of trisomy 13

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Abstract. – Congenital chromosomal abnormality with trisomy 13 is known to be associated with poor life prognosis and lethal. Therefore, physician advice the patients be kept in intensive treatment with resuscitation and state of the art intensive care when sudden change in the general condition with this trisomy is observed. We report herein, the treatment with mild brain hypothermia therapy for cardiopulmonary resuscitation after myoclonic seizures in infant with Robertsonian type of trisomy 13 in intensive care unit. Our study indicated that brain hypothermia therapy and steroid pulse therapy on an infant who was believed to have post-resuscitation hypoxic encephalopathy was highly effective as the patient's general condition recovered to the original state after four months.

Key Words:
Patau syndrome, Epilepsy, Steroid pulse, Intensive care unit, Spectral karyotyping.

Introduction

Intensive treatment for newborns up to infantile period with trisomy 13 is discussed as controversial because their outcome is lethal[1]. In addition, about half of infants with trisomy 13 will survive longer than a week and only 5 to 10% of infants will live past one year[2]. Therefore, non-intervention approach in the management of trisomy 13 is traditionally reflected in the past literature[3,4]. On the other hand, long survival cases of trisomy 13 were recently reported and is argued to follow more conventional medical treatment for trisomy 13[1-6]. We present a case of Robertsonian type of trisomy 13 who recovered after the therapy with mild brain hypothermia in intensive care unit of our hospital due to cardiopulmonary resuscitation following epileptic seizures.

Case report

A 7-month old girl was referred to our emergency room under the condition with cardiopulmonary resuscitation. Her face had variety of minor anomalies such as microophthalmos, microcephaly, sloped shape and capillary hemangioma on forehead. No major heart anomaly was recognized. Her cerebellum and corpus callosum had hypoplastic formation. Both her ribs were 10 in number. On review of her clinical recording at our hospital, she was diagnosed with Robertsonian type of trisomy 13 with the karyotype of 46, XX, +13, der (13; 14) (q10; 10) using spectral karyotyping method (SKY) analysis[7-9] (Figure 1). From her chart, it was assessed that she was born vaginally after 37 weeks and 5 days of gestation weighing 2.17 kg. Birth asphyxia was not noted. She was transported to our hospital because of poor sucking and minor anomalies. After congenital chromosomal anomaly syndrome was doubted and chromosome analysis, she was diagnosed to have Robertsonian type of trisomy 13 in her neonatal period. Her developmental milestone was delayed and neck stabilized at five months. She could not turn over for her age.

On the day the infant was hospitalized, she had multiple myoclonic seizures. When she was fed with milk, she stopped breathing suddenly as she had myoclonic seizure. Her mother shook her and she resumed breathing after less than a minute. However, after she had another myoclonic seizure, she was observed with apnea, and the emergency and rescue was called for. Her father gave her artificial respiration and cardiac

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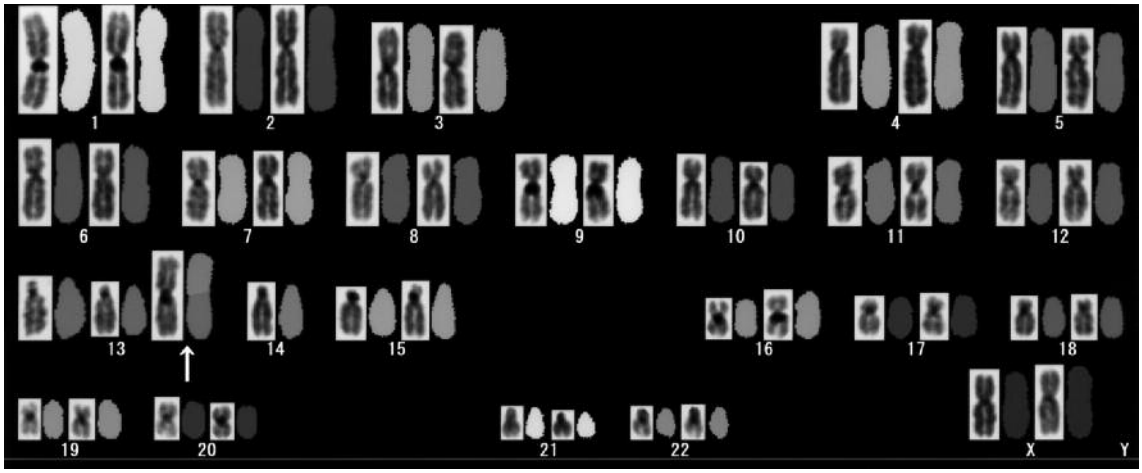

Figure 1. Chromosomal analysis using spectral karyotyping (dual colors) method in the patient of the present study. The karyotype of high resolution band analysis revealed 46, XX, +13, der (13; 14) (q10; q10). Sky method revealed the aberration more clearly (represented by an *arrow*).

massage following the rescue crew's direction. Upon their arrival after 10 minutes, she was in cardiopulmonary arrest. With the rescue crew giving resuscitation, she arrived at ER after 30 minutes. Her heartbeats were verified, but as she was not breathing, endotracheal intubation and artificial ventilation were given. Her consciousness level was E1V1M1 that is score 3 on Glasgow coma score. Her height was recorded as 57 cm and weight 6.07 kg and body temperature 33.5ºC. The pupil diameters in both eyes were 3 mm, and light reflex was observed. The venous blood gas level was: pH 6.75, PCO_2 74.1, PO_2 83.3, HCO_3^- 9.8, BE-25.9, and peripheral blood test results were as follows; WBC 16800×109/l, Hb 10.2 g/dl, Glu 385 mg/dl, AST 243 U/l, ALT 98 U/l, LDH 401 U/l, Na 139 mEq/l, CK 293 U/l, CRP 0.01 mg/dl. We diagnosed acute encephalopathy after resuscitation upon her cardiopulmonary arrest. After we obtained the informed consent from her parents, we conducted brain hypothermia therapy that keeps the body temperature at 34ºC for 48 hours combined with steroid pulse therapy on her. After brain hypothermia therapy was conducted, we evaluated electroencephalogram serially. The record of the electroencephalogram on the first day of brain hypothermia therapy (Figure 2A) indicated the low-amplitude of the background activity. Five days after the cardiopulmonary arrest and two days after the brain hypothermia, her eyes opened, and she started responding to the pain stimulations in the arms and legs. The brain wave (Figure 2B) started to show basic activity. How-

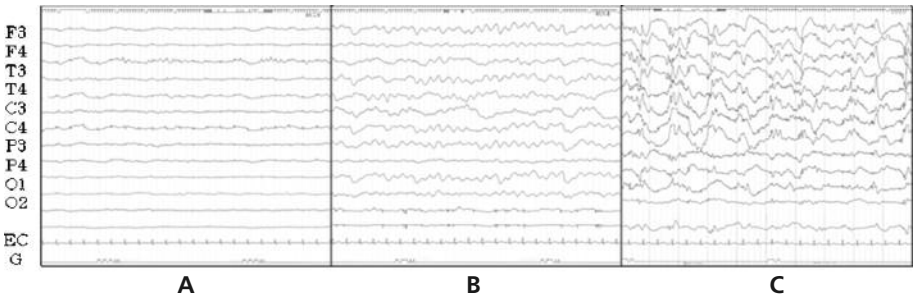

Figure 2. Serial study of electroencepharogram (EEG) during the clinical courses. ***A,*** EEG on admission showed low-voltage background activity. ***B,*** On the 5th day from the admission, brain hypothermia recording revealed basic activity. ***C,*** 3-months after admission, recording revealed multi-focal spikes. Epilepsy was partially controlled with oral administration of phenobarbital.

ever, after approximately one month, partial seizures were observed in the limbs and we started to administer phenobarbital. As six weeks passed, she was able to breathe spontaneously. After three months since the first partial seizures, although the seizures still persisted, their duration improved to less than a minute. The brain wave was observed with multifocal spikes (Figure 2C). As oral and tube feeding did not increase her body weight much, we conducted digestive tract contrast enhance study. As we observed gastroesphageal reflux and intestinal malrotation, we had a pediatric surgeon to conduct gastric fistula, Nissen fundoplication, ladd band operation and prophylaxic appendectomy on the 11-month old infant.

Discussion

In recent years, effectiveness of brain hypothermia therapy has been reported in various studies[10,11]. There is evidence of the effectiveness of brain hypothermia therapy for post-resuscitation encephalopathy after cardiopulmonary arrest in adults[12] or hypoxic-ischemic encephalopathy in newborn infants[13]; the therapy was also recommended in the guidelines. The effectiveness of this therapy for post-resuscitation encephalopathy in children and hypoxic encephalopathy has been indicated. However, there are only few cases that have been reported[10,14]. After informed consent, we performed brain hypothermia therapy and steroid pulse therapy on a seven months old female infant who was strongly suspected to have post-resuscitation hypoxic encephalopathy. The therapy was highly effective. As four months after the admission, the patient's general condition recovered to the original state, we decided to perform surgical treatment in the abdomen. The prognosis for trisomy 13 patients is poor and severe pschyco-motor retardation cannot be avoided even with long-term survival. Thus, there is a trend in which aggressive resuscitation treatment and surgery are not carried out. Although medical environment and way of thinking for human life differ from country to country setting, a limit on the treatment due to the diagnosis of trisomy13 without considering the request of the family members of each individual case might become discriminatory treatment in terms of medical ethics. In recent years, the effectiveness of cardiac surgery and intensive care management for trisomy 13 patients has been reported.

Conclusions

This is the first report in which we have performed brain hypothermia therapy on the trisomy 13 patients with successful outcome. We will need to accumulate more cases in future in order to further examine the adaptation and effectiveness of brain hypothermia therapy.

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