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Case Report

Long-term Extrauterine Survival in a Triploid Infant: A Review of the Clinical Features of Live-born Infants with Triploidy

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Abstract Almost all triploid fetuses abort spontaneously in the first trimester; live-born triploid infants are rare. We herein report a triploid infant who survived for >250 days. The infant was delivered at 33 weeks 4 days of gestation because of severe fetal growth restriction. The birth weight was 1,108 g, and multiple malformations were present. Chromosomal analysis demonstrated a karyotype of 69,XXY. At the time of this report, she lived at home and was 280 days old. A review of triploid infants revealed that the relatively unique clinical features of triploidy were syndactyly of the third and fourth fingers and abnormal erythrocyte indices. The associated karyotypes were 69,XXX and 69,XXY but not 69,XYY. Two of five infants died of pneumonia. Two infants, including the infant described herein, developed infantile spasms after the age of 200 days. Triploid infants with long-term survival are at high risk of developing pneumonia and infantile spasms.

Key words Erythrocyte indices; Fetal growth restriction; Long-term survivor; Syndactyly; Triploidy

Introduction

Triploidy is a chromosomal abnormality that occurs in 1% of pregnancies.[1] Almost all triploid fetuses abort spontaneously in the first trimester; therefore, live-born triploid infants are rare.[2-6] In addition, live-born triploid infants usually die soon after birth. We herein report a triploid infant who survived for more than 250 days and was discharged home. We also performed a review of the long-term survival of triploid infants to understand the relevant clinical features.

We obtained permission from the patient's parents to publish the features of this case.

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The infant's father was 43 years old and unrelated to the mother, who was 40 years old. The mother was 7 gravida, 1 para and had undergone 6 abortions (4 spontaneous abortions, 2 induced abortions). There was no significant family or medical history. Because severe fetal growth restriction was noted from 19 weeks of gestation, the infant was delivered at 33 weeks 4 days of gestation by cesarean section.

The birth weight was 1,108 g (below 1st percentile), length was 36.5 cm (below 1st percentile), and head circumference was 27.5 cm (just below 5th percentile). The Apgar score was 3 points at 1 minute and 6 points at 5 minutes. The infant had multiple external malformations including sparse eyebrows, blepharoptosis, bilateral syndactyly of the third and fourth fingers, bilateral overlapping of the third and fourth toes, and labial adhesions. The placenta weighed 360 g and had no cystic villi. A complete blood count obtained at birth showed that the mean corpuscular volume, mean corpuscular haemoglobin, and mean corpuscular haemoglobin concentration were 129.8 fL, 47.2 pg, and 36.4%, respectively. These three abnormal erythrocyte indices are reportedly increased in infants with triploidy.[7] Bilateral colobomas were noted upon eye

examination. Brain magnetic resonance imaging demonstrated brain atrophy (mainly in the frontal lobe) and agenesis of the corpus callosum; however, whole-body computed tomography and ultrasound scanning revealed no major congenital anomalies.

Chromosomal G-banding of peripheral blood samples demonstrated a karyotype of 69,XXY in all 100 cells analysed. Although a Y chromosome was detected, the external genitalia were female; therefore, we determined that the infant was female. We recommended a chromosomal analysis and further analysis of other tissues, including the buccal mucosa or skin; however, the parents did not grant approval.

The patient required intratracheal intubation and ventilator management for treatment of respiratory failure until the age of 21 days, and indomethacin was administered twice to manage a patent ductus arteriosus. Administration of intravenous glucose for hypoglycemia was necessary until the age of 55 days. She developed bacteremia caused by *Enterobacter cloacae* at 66 days, which resolved after antibiotic treatment. She was vaccinated after 90 days; however, she developed a high fever, poor general condition, and elevation of her C-reactive protein blood concentration soon after vaccination. Because she had mild apnea and a respiratory disorder, she required oxygen therapy until 148 days of age. Oral feeding was difficult to perform after a corrected age of 1 month; therefore, she required tube feeding. At the age of 222 days (corrected age of 5 months), she required no medical treatment except tube feeding and was discharged home.

At the age of 248 days, she was readmitted because of convulsive seizures. An electroencephalogram demonstrated an abnormal electrical pattern consistent with hypsarrhythmia; therefore, we diagnosed her with infantile spasms. Antiepileptic drugs were administered, and her seizures were gradually controlled. At the time of this report, she was 280 days old and still at home.

Discussion

Long-term survival (>150 days) of triploid infants is very rare. The clinical features of such triploid infants are reviewed in Table 1.[2-6] All parents except those in the present case were <40 years of age. There are no characteristic antenatal features with which to diagnose triploidy during the fetal period. The features of live-born triploid infants are various; therefore, there are no absolute clinical findings of triploidy. Nevertheless, bilateral syndactyly of the third and fourth fingers is not often reported in other chromosome disorders.[8] In addition, abnormal erythrocyte indices are unique to triploidy.[7] These findings might be helpful for diagnosis.

The karyotype of triploid infants with long-term survival is 69,XXX or 69,XXY, but not 69,XYY. Some infants were diagnosed by analysis of both peripheral blood lymphocytes and skin; therefore, the infant described herein may have had mosaic triploidy. A previous report has described live-born mosaic triploid infants.[9] In most such cases, triploid cells were not detected in the peripheral blood, but they could be detected using fibroblast cultures derived from the skin or bone. In the present case, triploidy was confirmed in all 100 blood cells tested; therefore, we assumed that she was a complete triploid infant. In cases involving investigation of the origin of the extra haploid set of chromosomes in triploidy, the extra set was of maternal origin in all infants. Such analysis was not performed in our case because the parents did not grant permission. However, we considered that the extra set of chromosomes was of maternal origin because the infant showed fetal growth restriction, a large head relative to body size, and no cystic villi in the placenta, which are all characteristics of maternal origin.[1]

Only six infants survived for >150 days, and the longest surviving infant was aged 312 days. Two of the five infants died of pneumonia. Our patient developed bacteremia and strong side effects of vaccination; therefore, triploidy might cause immune system dysfunction. We believe that adequate and rapid treatment of infection is important for long-term survival of triploid infants.

Seizures due to infantile spasms were reported in the longest surviving infant with triploidy.[4] That infant and the present infant developed seizures at the age of 225 and 248 days, respectively; therefore, long-term survival might be associated with the development of infantile spasms after the age of 200 days.

In conclusion, our patient had similarities with previously described live-born triploid infants and showed the second-longest survival at the time of this report. Clinical findings of triploidy are difficult to diagnose in the fetal period and at birth; however, several unique features, including bilateral syndactyly of the third and fourth fingers and abnormal erythrocyte indices, might be useful for diagnosis. This disease has a poor prognosis, and very few infants live for >150 days. Prevention of infection (including pneumonia) and seizures caused by infantile spasms are important for long-term survival of triploid infants.

Table 1 Clinical features of long-term survival (>150 days) of triploid infants

Parameters	Present case	Am J Med Genet 2008[2]	Genet Mol Res 2005[3]	Am J Med Genet 1986[4]	Acta Paediatr Scand 1986[5]	Ann Genet 1977[6]
Mother age (years)	40	36	28	29	31	25
Father age (years)	43	36	28	31	33	26
Para	1	0	1	1	1	1
Family and past history	No	No	No	No	No	No
Antenatal features	FGR	FGR	FGR Oligohydramnios	No	Subnormal symphyseal-fundal length	No
Gestational age (weeks)	33	29	39	37	31	28
Birth weight (g)	1,108	566	1,850	1,417	700	1,450
Postnatal features (main facial anomalies)	Blepharoptosis Sprase eyebrows	Hypertelorism Blepharoptosis Low-set ears Micrognathia Microstomia	Small palpebral fissures Low-set ears	Hypertelorism Cleft lip and palate Micrognathia	Hypertelorism Low-set ears Cleft lip, alveolus and palate	Hypertelorism Bleopharoptosis High-arched palate Micrognathia
Postnatal features (main limb anomalies)	Syndactyly of the 3rd and 4th fingers (bilateral) Overlapping of the 3rd and 4th toes (bilateral)	Syndactyly, clinodactyly and camptodactyly of fingers	Overlapping of the 3rd and 4th fingers (bilateral) Overlapping of the 2nd and 3rd toes (bilateral)	Syndactyly of the 2nd and 3rd fingers (unilateral) Campylodactyly and clinodactyly of fingers (bilateral) Bowed tibia (unilateral) Rocker-bottom feet (bilateral)	Syndactyly of the 3rd and 4th fingers (unilateral)	Overlapping fingers Clinodactyly and camptodactyly of fingers Bowed tibia Rocker-bottom feet
Karyotype	69,XXY	69,XXX	69,XXX	69,XXY	69,XXY	69,XXX
Tissues of choromosomal analysis	Peripheral blood lymphocytes	Peripheral blood lymphocytes	Peripheral blood lymphocytes Cord blood Skin	Peripheral blood lymphocytes Skin	Peripheral blood lymphocytes	Peripheral blood lymphocytes Skin
Origin of triploidy	Not analysed	Not analysed	Not analysed	Maternal	Maternal	Maternal
Discharge to home	Yes (222 days)	No	Yes (15 days)	Yes (22 days)	No	Yes (104 days)
Survival time	> 280 days	221 days	164 days	312 days	27 weeks	23 weeks
Cause of death	(Survival at the time of this report)	Pulmonary hypertension progressed	Cardiorespiratory problems	Pneumonia	Pneumonia	Dyspnoea

FGR, fetal growth restriction

Disclosure Statement

All the authors declare that there is no conflict of interest.

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