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Case Report

Sirenomelia Associated with Truncus Arteriosus

Rosa Bermejo¹, Faz Cartagena¹, Marta Valiente², Elizabeth Mármol² and Pedro Acién^{1,3*}

¹Service of Obstetrics and Gynecology, Spain

²Service of Pathology, San Juan University Hospital, Spain

³Departament of Gynecology, Miguel Hernández University, Campus of San Juan 03550 San Juan, Alicante, Spain

Abstract

Sirenomelia is a sporadic congenital anomaly caused by a disruptive vascular defect. This syndrome is characterized by fusion of the lower extremities, almost invariably associated with bilateral renal agenesis and generally absence of sacrum, rectum and bladder. In this case, the bilateral renal agenesis was present with severe oligohydramnios, in association with other anomalies as single umbilical artery and ambiguous external genitalia, which are often found in other cases publicated, and truncus arteriosus type IV. This latter association has been never described before in the revision of the literature.

Keywords: Sirenomelia; Truncus arteriosus; Potter syndrome; Prenatal diagnosis

Introduction

Syrenomelia sequence is a rare (incidence of 1: 60000 births) [1,2] lethal pattern of congenital anomalies characterized by a number of hallmark skeletal anomalies including fusion of the lower extremities or a single lower limb, bilateral renal agenesis or dysgenesis with absent or hypoplastic renal arteries, oligohydramnios and the presence of aberrant vasculature. Prenatal sonographic detection of the lower limb anomalies associated with this condition is severely limited by the oligohydramnios that accompanies bilateral renal agenesis.

Classification of syrenomelia in 7 types according to Stocker and Heifetz [3]: I- All thigh and leg bones are present, II-Single fibula, III-Absent fibula, IV-Partially fused femurs, fused fibulae, V-Partially fused femurs, VI-Single femur, single tibia, VII-Single femur, absent tibia (Figure 1).

We present a syrenomelia type I case associated with truncus arteriosus.

Case Report

A 28-year-old primigravida woman with a past medical history of right anexectomy due to endometriosis, presents to our emergency department with one-day nausea and vomiting history. She was at her 21st week of gestation according to the last menstrual period, with prenatal controls performed in other Hospital. She refereed intermittent dysmenorrhea-like pain without other symptoms.

The physical examination with speculum revealed a well epithelialized nulliparous cervix, normal vaginal discharge, and no leakage after Valsalva maneuver. Bimanual vaginal examination found a long, closed and posterior cervix. Transvaginal ultrasound showed a cervix length of 42 mm without funneling. In the abdominal



Figure 1: Classification of syrenomelia according to Stocker and Heifetz (Perspect Pediatr Pathol 10:7-50, 1987).

ultrasound a 19 weeks living singleton, left anterolateral placenta and anhydramnios were reported. The detection of placental alpha microglobulin-1 (Amnisure[®] test) came positive, therefore the diagnosis of premature rupture of membranes with threatened miscarriage of 22 weeks gestation was made. She was then admitted to the obstetrics ward.

In a morphological ultrasound scheduled during her hospitalization we encountered anhydramnios, bilateral renal agenesis (no visualization of the renal arteries with Doppler), no stomach, early severe intrauterine growth restriction and a single umbilical artery. The fetal echocardiography revealed a single vessel overriding both ventricles and large perimembranous ventricular septal defect (VSD) (Figure 2), leading us to the diagnosis of truncus arteriosus.

During her stay, the patient was pyrexial and the C-Reactive Protein raised, which together with the poor fetal outcome brought us to the decision of ending the pregnancy through a pharmacological induced abortion with misoprostol. Fetal expulsion occurred after four doses of 400 micrograms of oral and vaginal misoprostol with the following findings: male fetus, syrenomelia (complete fusion of the lower limbs) and Potter's facies (flattened nose, recessed chin, epicanthal folds and low-set ears) without other visible phenotypic defects (Figure 3A).



Figure 2: Ultrasound images: truncus arteriosus and VSD with and without color Doppler. A: truncus arteriosus, B: right ventricule, C: left ventricule and D: VSD.

*Corresponding author: Pedro Acien, Department of Gynecology, Miguel Hernández University, Campus of San Juan 03550 San Juan, Alicante, Spain, Tel: 34-965919272; Fax: 34-965919551; E-mail: acien@umh.es

Received March 12, 2014; Accepted March 25, 2014; Published March 27, 2014

Citation: Bermejo R, Cartagena F, Valiente M, Mármol E, Acién P (2014) Sirenomelia Associated with Truncus Arteriosus. J Clin Case Rep S1: 005. doi:10.4172/2165-7920.S1-005

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Figure 3: A. Macroscopy fetal; and B. Fetal heart in with *A*: truncus arteriosus, B: right brachiocephalic trunck *C*: left carotid artery, *D*: left subclavian artery and *E*: pulmonary arteries.

Fetus and placenta were sent for anatomopathology examination, and a fragment of the heel for cytogenetic study. Manual removal and curettage were applied to a retained placenta despite oxytocicn administration. The patient was discharged after 24 hours with inhibition of lactation.

The pathological findings were: 295 g male fetus, type I syrenomelia (Stoeker & Heifetz classification), bilateral renal agenesis, Potter's facies, single umbilical artery and type IV truncus arteriosus (Collet & Edwards classification) (Figure 3B), ambiguous genitalia and intrabdominal testes.

A placenta weighting 140 grams, with excessive maturation of chorionic villi in relation with utero-placental insufficiency, with pseudo hyperplasia amniotic epithelium. Cytogenetic study reported fungal contaminated sample.

Discussion

Sirenomelia or mermaid syndrome resembles the mermaid of Greek and Roman mythology, which is characterized by having the head and half upper body of a human and the half down is the tail of a fish. The etiology is still unknown. It was considered in the past to represent a severe form of caudal regression syndrome, but recent studies have found a different embryologic origin. While an embryologic insult to the caudal mesoderm that occurs between 28 to 32 days gestation is felt to be responsible for caudal regression syndrome, a primary vascular defect that leaves the caudal part of the embryo hypoperfused is postulated as the origin in sirenomelia [4].

An alteration in early vascular development leads to a vitelline arterial steal, in which blood flow is diverted from the caudal region of the embryo to the placenta, resulting in multiple defects of the lower extremities. Many of these fetuses have an aberrant vasculature with the umbilical arteries connected to the old vitelline arteries (the superior mesenteric arteries) [5-7].

Garrido-Allepuz et al. [8] suggested that it can have a genetic basis in mice. Sirenomelia occurs in mice lacking Cyp26a1, an enzyme that degrades Retinoic Acid (RA), and in mice that develop with reduced bone morphogenetic protein (Bmp) signaling in the caudal embryonic region. The phenotypes of these mutant mice suggest that sirenomelia in humans is associated with an excess of RA signaling and a deficit in Bmp signaling in the caudal body.

Also, altered oxidative metabolism from maternal diabetes may cause free oxygen radicals in the developing embryo which may be teratogenic and diabetes may be a cofactor that modifies the action of one or more unknown teratogens [9,10].

This condition is found in approximately one out of every 60,000-

100,000 live births [1,2]. It is 100 times more likely to occur in monozygotic than in dizygotic twins or singletons [11]. Males are three times more often affected than females [12].

The diagnosis of sirenomelia is based on the presence of fusion of the lower extremities, associated with bilateral renal agenesia which leads to severe oligohydramnios and commonly gastrointestinal tract malformations and skeletal and lumbar spine deformities. Other associated anomalies are ventral wall defects, cardiac or thoracic defects, single umbilical artery, imperforated anus and ambiguous or absence of genitals. Potter's syndrome consists of Potter's facies (large, low-set ears, prominent epicanthal folds, hypertelorism, flat nose, and receding chin), oligohydramnios, and pulmonary hypoplasia [13]. This syndrome is almost invariably present with bilateral renal agenesis. Actually, prenatal diagnosis of sirenomelia has been made by ultrasound mostly during the first trimester, when the normal amount of amniotic fluid allows detailed sonographic scanning [5,6,12,14-16]. Unfortunately, in the second half of pregnancy, a proper skeletal evaluation may be difficult owing to the progressive oligohydramnios secondary to renal agenesis or dysgenesis.

We report a fetus with sirenomelia type I, bilateral renal agenesis, single umbilical artery, ambiguous external genitalia and cardiac malformation, truncus arteriosus type IV, but the diagnosis of sirenomelia was made after the delivery of the fetus. In the ultrasound examination the diagnosis was impossible because the first control in our hospital was at 21 weeks of gestation, there was a severe oligohydramanios, absence of fetal's moving and it was a sirenomelia type I, the mildest form, in which all bones in the two fused limbs are present, and the fusion only affects superficial tissues.

Prognosis is very poor, sirenomelia is a lethal condition due to the associated renal agenesis and its complications, although a few cases of surviving infant have been report, associated with renal dysgenesis [17].

We made a literature review and we didn't found a report of sirenomelia associated to truncus arteriosus, although we did associated to another type of cardiac malformations [18,19]. In truncus arteriosus a single arterial vessel arises from the base of the heart overriding both ventricles. The truncal valve is usually tricuspid, occasionally quadricuspid, or bicuspid, and rarely pentacuspid or unicommisural, it is often insufficient and rarely stenotic. A large ventricular septal defect is almost always present. The truncus gives rise to systemic, pulmonary and coronary circulation. Truncus arteriosus is a rare cardiac defect accounting for 1% of structural heart defects. There is an association with others cardiac anomalies, aneuploidia in 25% (chromosome 22q11



Figure 4: Classification of truncus according to Collet & Edwards (1949) and Van Praagh (1976).

deletion, trisomy 13 or 18) and extra cardiac malformations in 20-40%. The prognosis depends on its association with others anomalies and the presence of truncal insufficiency and interrupted aortic arch. It may develop intrauterine heart failure and hydrops. There are two principal classifications of truncus, according to Collet and Edward [20] and Van Praagh [21] but we use the Collett and Edwards classification in this case, in which there are four types depending on the localization of the pulmonary arteries. The pulmonary arteries may arise from the truncal root either as a common trunk that bifurcates (type I), or separately but close together (type II), separately at some distance from each other (type III) or from the descending aorta (IV) (Figure 4). In the present case the prenatal diagnosis was truncus arteriosus but the postnatal examination identify it was type IV.

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This article was originally published in a special issue, **Obstetrics and Gynecology** handled by Editor. Dr. Yigit Cakiroglu, Kocaeli University, Turkey