

# Pentalogy of Cantrell: first case reported in Saudi Arabia

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Pentalogy of Cantrell (PC) is a rare congenital anomaly involving defects in the anterior diaphragm, supraumbilical abdominal wall, diaphragmatic pericardium, and lower sternum, and other congenital intracardiac abnormalities. Here, we report the case of a newborn infant who was born at 32 weeks of gestation and had all 5 features of PC, in addition to absent kidneys and a deformed left hand. Medical intervention would not be able to save the patient, so we allowed her to die in peace. We discuss here the etiology, prenatal diagnosis, and severity of and the mortality associated with this condition. To our knowledge, this was the first reported case of PC in Saudi Arabia.

**P**entalogy of Cantrell (PC) is a rare, severe congenital anomaly of unclear etiology. The hallmark of this syndrome is an omphalocele associated with ectopia cordis (EC). The full spectrum of indications includes the following 5 anomalies: defects in the anterior diaphragm, midline supraumbilical abdominal wall, diaphragmatic pericardium, and lower sternum, and various congenital intracardiac abnormalities. Only a few patients with the full spectrum of indications for this condition have been described previously. In this paper, we present the case of a female neonate who was born at 32 weeks of gestation (weight, 1200 g) and had all 5 anatomical defects of PC, in addition to absent kidneys and a deformed left hand.

## CASE

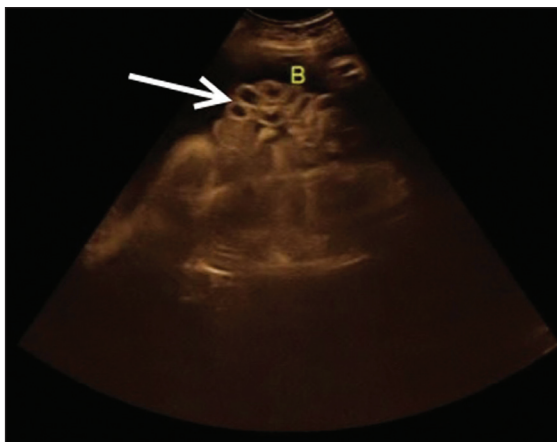
A 20-year-old unbooked pregnant gravida 1 para 0 abortus 0 woman arrived at the emergency room of King Abdulaziz University Hospital (Saudi Arabia), Jeddah, in premature labor (32 weeks of gestation). She gave birth to a preterm female infant who had multiple congenital anomalies. The infant was allowed to die in peace because she would not have survived eventually and corrective surgeries were impossible. There was no family history of congenital anomalies, dysmorphic features, or still births, although the infant's aunt had a past history of recurrent abortion for unknown

reasons. Further, there was no history of exposure to radiation, drugs, alcohol, or tobacco during gestation.

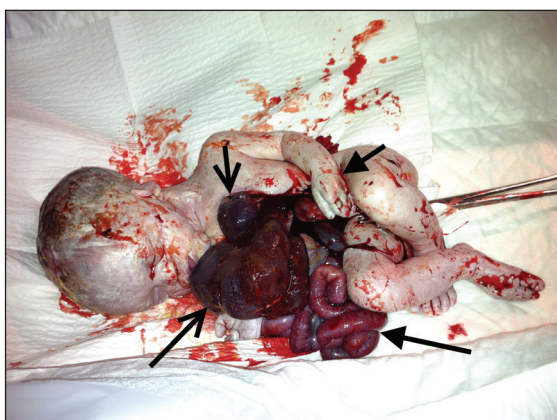
A prenatal sonogram at 17 weeks of gestation had shown that the fetus had freely extruded intestinal loops entering the amniotic sac through a small paraumbilical anterior abdominal wall defect. There was no sac overlying the bowel loops, and the liver was seen inside the abdominal cavity; the ultrasound (US) scan suggested gastroschisis. Abortion was not an option, since it is not offered in Saudi Arabia for ethical issues related to religious and hospital policies.

Further two-dimensional (2D) and 3D US studies (**Figures 1 and 2**) conducted at 31 weeks of gestation showed multiple congenital anomalies: [1] There was a defect in the supraumbilical abdominal wall, specifically, an omphalocele containing the liver and bowel; [2] the heart and mediastinum were displaced due to a defect in the diaphragm; [3] the fetal heart was completely outside the chest wall because of a large midsternal defect; [4] large ventricular and atrial septal defects were found; and [5] an anterior diaphragmatic hernia and lower sternal defect were noted, although the femoral length corresponded with the fetal age. PC was diagnosed prenatally.

The physical examination of the infant after delivery revealed a large defect in the thoracoabdominal wall that extended from the midsternum down to the supraumbilical area, with EC; absence of the pericardium; an



**Figure 1.** A 2D ultrasound scan taken at 31 weeks of gestation showing the extruded part of the bowel (arrow).



**Figure 2.** The infant on delivery. The extruded organs, namely, the heart (flat short arrow), liver (flat long arrow), and bowel (filled long arrow), can be seen through the abdominal defect, along with the clubbed left hand with syndactyly (filled short arrow).

anterior diaphragmatic defect; evisceration of the intestine, stomach, and liver; absent kidneys; and a clubbed left hand with syndactyly. Neither facial dysmorphism nor cleft lips or palate was noted, and no apparent features of trisomy 13 or 18 or of Turner syndrome were found. The birth weight was 1200 g, and the heart rate, which was 150 beats per minute at birth, dropped to 44 beats per minute 10 minutes later; in less than an hour after that, the heart stopped beating, and the respiratory rate was not recordable. Thus, in less than an hour after birth, the baby was announced as dead. A complete autopsy was not conducted because the parents did not allow it.

## DISCUSSION

PC, also known as Cantrell syndrome or Cantrell-Haller-Ravich syndrome, was first described by James

Cantrell in 1958, in a report on 5 patients with this anomaly.<sup>1</sup> PC is a very rare congenital anomaly, with a prevalence of 1 in every 65 000 live births; the survival rate is low if all 5 defects are present or if the cardiac anomalies are serious. The 5 anomalies include the following: a midline upper abdominal wall abnormality, a lower sternal defect, an anterior diaphragmatic defect, a diaphragmatic pericardial defect, and congenital cardiac abnormalities.<sup>1</sup> Full or complete PC is rare and is usually very severe and fatal. Its incomplete form has been reported to include 2 or 3 of the 5 defects.<sup>2</sup> In 1972, Toyama suggested a further classification of the syndrome, as follows: class 1, definite diagnosis with all 5 defects; class 2, probable diagnosis with 4 defects (including intracardiac and ventral abdominal wall abnormalities); and class 3, incomplete expression.<sup>3</sup>

Approximately, 250 cases of PC have been reported thus far, of which 180 are from Europe and the United States, 50–60 from Japan, and 5 from Latin America.<sup>4</sup> To the best of our knowledge, this is the first reported case of PC in Saudi Arabia.

The pathogenesis of PC is unclear, but this syndrome probably occurs sporadically.<sup>5</sup> A defect in the mesodermal origin occurring between days 14 and 18 of embryonic life has been suggested as the cause of PC. Moreover, an association with trisomy 18, trisomy 13, and Turner syndrome has been reported.<sup>6,7</sup> A search for etiological factors conducted in 1990 suggested an alteration in the migration of the primordial mesodermic structures of the medial line as the cause of PC, and in familial cases, a possible association was described between PC and a gene linked to the X chromosome in the Xq25-26.1 region.<sup>8,9</sup>

In up to 75% cases, additional cardiac anomalies and somatic abnormalities as well as genetic anomalies accompany PC.<sup>10</sup> These anomalies may include a cleft lip or palate, kidney dysplasia, cystic hygroma, craniorachischisis, and abnormalities in the extremities. Intracardiac anomalies associated with PC are ventricular septal defects (100%), atrial septal defects (52%), pulmonary stenosis (33%), and tetralogy of Fallot (20%).<sup>1</sup>

Intrauterine diagnosis of PC can be easily made by US, as this method is commonly employed to examine the fetus in the first trimester.<sup>11,12</sup> The unique association of the omphalocele and EC is the hallmark of this syndrome.<sup>13</sup>

Unfortunately, the mortality rate is high for children with EC, and no more than 5% of them survive.<sup>14</sup> Further, survival rate without surgical intervention is about 36 hours after birth, and studies have shown that even with high-quality medical care in professional tertiary centers and with multiple corrective surgeries, the

mortality rate is very high and long-term prognosis is still poor.<sup>15,16</sup> Nonetheless, some infants have survived after a corrective surgery despite an overall poor prognosis; Survival may be related to the severity of the ventral wall, sternal, and cardiac defects.<sup>2</sup>

To our knowledge, this is the first reported case of complete PC in Saudi Arabia, in which the patient also had missing kidneys, lung hypoplasia, and a deformed left hand (syndactyly). Further, the patient had polyhydramnios, which has been reported only in a few cases.

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