Concomitant Exencephaly and Limb Defects Associated with Pentalogy of Cantrell

Chih-Ping Chen[1,2,3,4]*, Chin-Yuan Tzen[5], Chen-Yu Chen[1], Fuu-Jen Tsai[6,7], Wayseen Wang[2,8]

Departments of [1]Obstetrics and Gynecology, and [2]Medical Research, Mackay Memorial Hospital, Taipei, [3]Department of Biotechnology, Asia University, [4]School of Chinese Medicine, College of Chinese Medicine, China Medical University, Taichung, [5]Department of Pathology, Mackay Memorial Hospital, Taipei, Departments of [6]Medical Genetics, and [7]Medical Research, China Medical University Hospital, Taichung, and [8]Department of Bioengineering, Tatung University, Taipei, Taiwan.

A woman, aged 42, gravida 5, para 2, presented with a dichorionic twin pregnancy and an abnormal fetus at 16 weeks' gestation. The parents were non-consanguineous and healthy. The father was aged 46 years. The mother denied any recent infections or exposure to teratogens and had not experienced any assisted reproductive technology. She had two healthy sons and had suffered two spontaneous abortions. There was no family history of congenital malformations or of diabetes mellitus. Amniocentesis revealed a 46,XX karyotype in the abnormal fetus and a 46,XY karyotype in the normal twin. Sonographic examination of the abnormal fetus revealed scoliosis, ectopia cordis, a ventricular septal defect, a large ventral wall defect with protruding heart, liver, spleen and bowel loops, exencephaly, acranium, shortening of the left upper limb, and arthrogryposis of the left wrist and bilateral ankles. The umbilical cord appeared normal, and there was no amniotic band. A diagnosis of pentalogy of Cantrell with exencephaly and limb defects was established. The co-twin was normal. The parents elected to continue the pregnancy. Preterm labor occurred at 32 weeks' gestation. The 1,760-g normal male co-twin survived, while the 1,098-g abnormal female fetus (Figure) died after delivery. An autopsy confirmed a defect of the lower sternum, a deficiency of the diaphragmatic pericardium, an anterior diaphragmatic hernia, a ventricular septal defect, scoliosis, hypoplasia of the left upper limb, a deficiency of the left thumb, and arthrogryposis of the left wrist and bilateral ankles in the abnormal fetus. Her face, toes and other fingers, except the left thumb, were normal. No amniotic band could be found in the fetus and placenta.

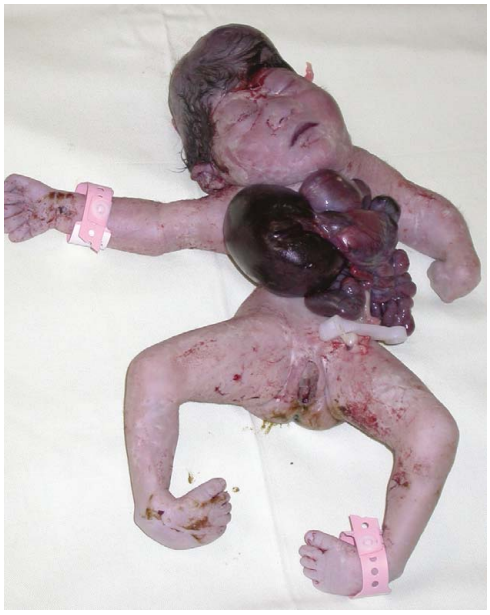

Figure. The fetus at birth.

We present here the first report of concomitant exencephaly and limb defects associated with pentalogy of Cantrell. Cantrell et al [1] first described a specific combination of congenital defects with the full pentalogy of a midline supraumbilical abdominal wall defect, a defect of the lower sternum, a defect of the diaphragmatic pericardium, a deficiency of the anterior diaphragm, and congenital cardiac anomalies. Cantrell et al [1] suggested that the combination of five disorders comprised a specific entity, and proposed that its pathogenesis was related to developmental failure of a segment of the lateral mesoderm at around 14–18 days of embryonic life. Pentalogy of Cantrell has been thought to be the result of mechanical teratogenesis, major gene mutations, chromosomal abnormalities, disruptive vascular defects, and major gene mutations [2,3].

*Correspondence to: Dr Chih-Ping Chen, Department of Obstetrics and Gynecology, Mackay Memorial Hospital, 92, Section 2, Chung-Shan North Road, Taipei 104, Taiwan.
E-mail: cpc_mmh@yahoo.com
Accepted: October 31, 2008

The present case was associated with exencephaly, arthrogryposis of the limbs, a deficiency of the left thumb, and shortening of the left upper limb. Central nervous system abnormalities, such as anencephaly, meningocele, encephalocele and hydrocephalus [4], exencephaly [5], craniorachischisis [6], spina bifida [7], and a small posterior encephalocele with myelomeningocele [8], have been reported to be associated with pentalogy of Cantrell. Pivnick et al [9] reported an infant with a midline thoracoabdominal syndrome, a deficiency of the right lower limb, and ectrodactyly. Uygur et al [10] reported an infant with pentalogy of Cantrell and limb defects. Chen et al [11] reported a fetus with pentalogy of Cantrell, hypoplasia of the right upper limb, and ectrodactyly. The present case provides evidence for the concurrence of pentalogy of Cantrell, neural tube defects and limb defects, and implies that the syndrome involves genes responsible for limb morphogenesis, neural tube closure, and fusion of the sternum.

Acknowledgment

This work was supported by a research grant MMH-E-97004 from Mackay Memorial Hospital, Taipei, Taiwan.

References

1. Cantrell JR, Haller JA, Ravitch MM. A syndrome of congenital defects involving the abdominal wall, sternum, diaphragm, pericardium, and heart. *Surg Gynecol Obstet* 1958;107: 602–14.
2. Parvari R, Carmi R, Weissenbach J, Pilia G, Mumm S, Weinstein Y. Refined genetic mapping of X-linked thoracoabdominal syndrome. *Am J Med Genet* 1996;61:401–2.
3. Chen CP. Syndromes and disorders associated with omphalocele (II): OEIS complex and pentalogy of Cantrell. *Taiwan J Obstet Gynecol* 2007;46:103–10.
4. Carmi R, Boughman JA. Pentalogy of Cantrell and associated midline anomalies: a possible ventral midline developmental field. *Am J Med Genet* 1992;42:90–5.
5. Bognoni V, Quartuccio A, Quartuccio A. First-trimester sonographic diagnosis of Cantrell's pentalogy with exencephaly. *J Clin Ultrasound* 1999;27:276–8.
6. Polat I, Gül A, Aslan H, Cebeci A, Ozseker B, Caglar B, Ceylan Y. Prenatal diagnosis of pentalogy of Cantrell in three cases, two with craniorachischisis. *J Clin Ultrasound* 2005;33:308–11.
7. Dane C, Dane B, Yayla M, Cetin A. Prenatal diagnosis of a case of pentalogy of Cantrell with spina bifida. *J Postgrad Med* 2007;53:146–8.
8. Loureiro T, Oliveira C, Aroso J, Ferreira MJ, Vieira J. Prenatal sonographic diagnosis of a rare Cantrell's pentalogy variant with associated open neural tube defect—a case report. *Fetal Diagn Ther* 2007;22:172–4.
9. Pivnick EK, Kaufman RA, Velagaleti GVN, Gunther WM, Abramovici D. Infant with midline thoracoabdominal schisis and limb defects. *Teratology* 1998;58:205–8.
10. Uygur D, Kiş S, Sener E, Günçe S, Semerci N. An infant with pentalogy of Cantrell and limb defects diagnosed prenatally. *Clin Dysmorphol* 2004;13:57–8.
11. Chen CP, Hsu CY, Tzen CY, Chern SR, Wang W. Prenatal diagnosis of pentalogy of Cantrell associated with hypoplasia of the right upper limb and ectrodactyly. *Prenat Diagn* 2007; 27:86–7.