Prenatal Diagnosis of VACTERL Association : A Case Report

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Abstract

A prenatal diagnosis of VACTERL association, a combination of vertebral (V), anal (A), cardiac (C), tracheoesophageal (TE), renal (R) and limb (L) anomalies was made at 30 weeks of gestation, based on the sonographic demonstration of vertebral defects, bilateral renal agenesis, and left lower limb defects. Additionally, severe oligohydramnios and fetal growth restriction were also documented. After proper counseling, elective termination of pregnancy was done, resulting in a stillborn infant with multiple malformations compatible with the VACTERL association. The postnatal X-ray and autopsy revealed verterbral defects, anorectal atresia with undetermined sex, cardiac defect of ventricular septal defect, tracheal agenesis with distal atresia of esophagus, bilateral renal agenesis, and limbs defects. The chromosomal study revealed normal, 46,XY. This report emphasizes the important role of prenatal ultrasound in the diagnosis and management of this disorder.

Key word : VACTERL Association, Prenatal Diagnosis, Ultrasound

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VACTERL association is defined as a combination of vertebral (V), anal (A), cardiac (C), tracheoesophageal (TE), renal (R) and limb (L) anomalies[1]. This is a rare expanded form of the VATER association, a combination of morphological defects including vertebral defects, anal atresia, tracheoesophageal fistula, esophageal atresia, radial/renal anomalies, that includes cardiac defects and limb defects. The disorder has generally been a sporadic occurrence in an otherwise normal

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family. The etiology is unknown. Though the VACTERL association is not uniformly fatal, it is a great burden of caregiving. Therefore, prenatal diagnosis is of clinical importance for proper management, either pregnancy termination in a lethal case or a plan for rehabilitation in cases of mild form, such as an attempt to avoid preterm delivery secondary to polyhydramnios. Although the diagnosis of VACTERL association has been reported several times, there have been prenatally recognized in only a limited number[2-5]. The purpose of this report was to emphasize the important role of prenatal ultrasound in diagnosis and management of this disorder.

CASE REPORT

A 29-year-old pregnant woman, P0-0-0-0, was referred to the Department of Obstetrics and Gynecology, Faculty of Medicine, Chiang Mai University due to severe oligohydramnios. Her pregnancy course was unremarkable, no history of any familial disease, normal fetal movements, and no other obstetric or medical complications. However, at her last visit of antenatal care at a community hospital at 30 weeks of gestation, small-for-date uterine size was clinically detected so she was referred, and ultrasound examination was performed. Sonographic examinations at Maharaj Nakorn Chiang Mai hospital showed severe oligohydramnios and single growth-restricted fetus with multiple malformations (Fig. 1A-C). Bilateral renal agenesis was prenatally detected on the basis of inability to demonstrate both kidneys after several attempts of detailed ultrasonography with permanently empty bladder, and severe oligohydramnios. Vetebral defects at the lower thorax, lumbar and sacrum were visualized, including disorganized morphology, scoliosis and fragmented, but normal echogenicity. The long bone survey showed limb defect at the left lower extremity, including complete absence of pattella, lower leg and foot, very shortened and angular femur (2.4 cm), the short thigh ending up with skin tag as shown by the arrow head in fig. 1C. All other extremities were normal in both morphology and number but crowded in compressed position due to oligohydramnios. VACTERL association was prenatally diagnosed based on the positive sonographic findings of vertebral defects, bilateral renal agenesis, and left lower limb defects. After proper counseling regarding the very poor prognosis due to bilateral renal agenesis, elective termination of pregnancy was successfully performed with transvaginal misoprostol at 30 weeks of gestation. Obviously on the postnatal X-ray (Fig. 1D), and macroscopic findings (Fig. 1E), the stillborn fetus showed short left thigh with no lower leg and foot and undetermined ambiguous genitalia with no anus. The autopsy confirmed the prenatal findings. In addition, no development of genitourinary tract, anorectal atresia, tracheal agenesis (Fig. 1F), distal

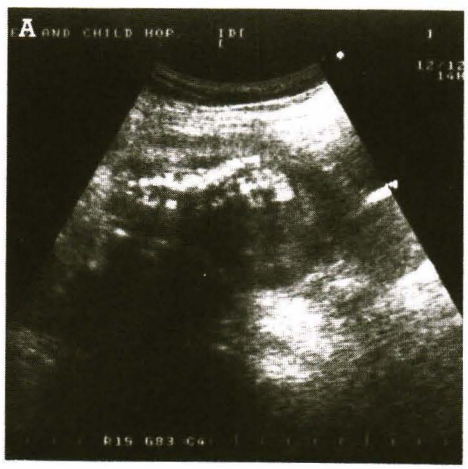

Fig. 1A. Sonographic sagittal view of the spine.

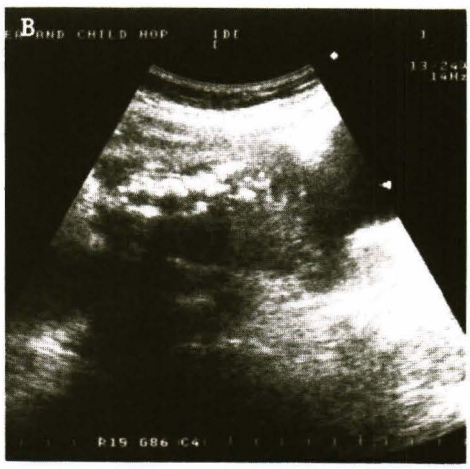

Fig. 1B. Coronal view of the spine.

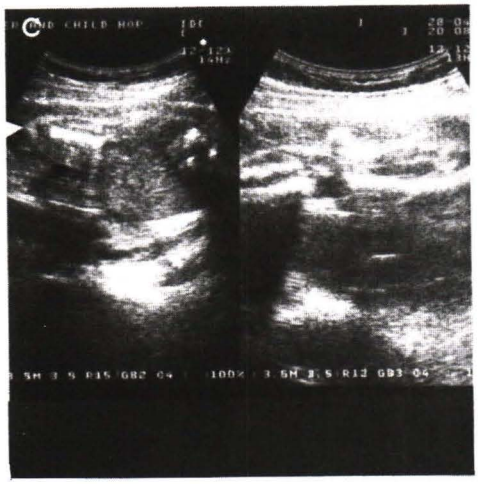

Fig. 1C. Short left thigh (arrowhead shows the distal end of thigh) compared with right thigh.

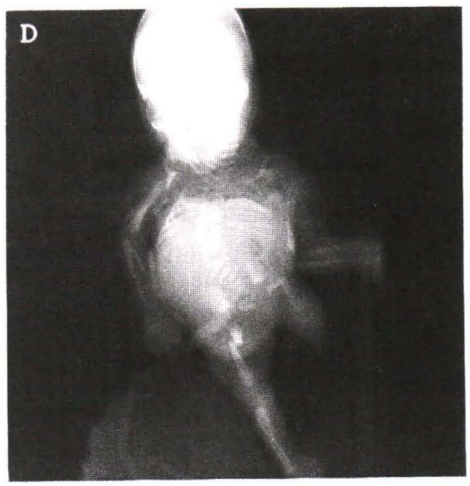

Fig. 1D. Postnatal X-ray (fracture of right femur occurred during delivery).

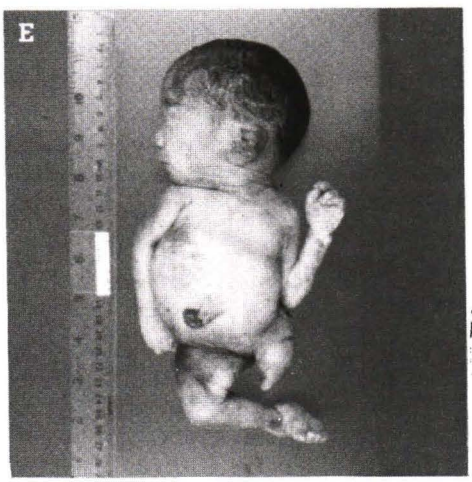

Fig. 1E. Macroscopic finding.

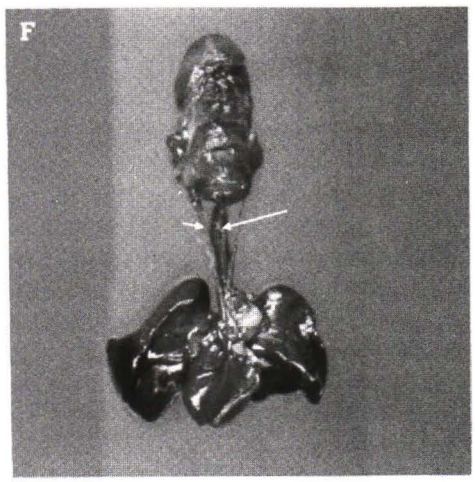

Fig. 1F. Tracheal atresia (short arrow shows carotid vessels, long arrow shows esophagus without trachea anteriorly).

esophageal atresia, and ventricular septal defect were demonstrated. The chromosome study revealed normal, 46,XY.

DISCUSSION

Originally, Say and Gerald[6] described a nonrandom association of vertebral defects, imperforate anus and polydactyly. The spectrum was broadened by Quan and Smith[7] to add tracheoesophageal fistula/atresia and renal/radial defects, and the acronym VATER association was utilized to designate this complex. Temtamy and Miller[8] utilized the acronym VATERS (S; single umbilical artery). VACTERL is a rare extended form, added for cardiac (C) and limb (L), especially non-radial limb, defects. Moreover, a nonrandom association

of VACTERL-H (H; hydrocephalus) has been increasingly reported[9]. Furthermore, it has been suggested that sirenomelia is the severe form of this association[2].

The important sonographic features for diagnosis of this complex included 3 or more typical defects of the disorder. Based on the ultrasonographic findings in our case, VACTERL association was the most likely diagnosis due to the combination of vertebral defects, bilateral renal agenesis, and non-radial limb defects. The major differential diagnoses were trisomy 13, 18; commonly involving multiple organs, and other disorders of vertebral/renal anomalies such as caudal regression syndrome, Jarcho-Levin syndrome, MURCS association, and sirenomelia. However, the nonrandom association of all positive findings in this case were suggestive of the most likely diganosis of VACTERL association, although complete diagnosis of VACTERL could not be made prenatally.

The case presented here demonstrates the important role and limitation of prenatal ultrasonography in diagnosis of this association. Because of multiple malformations, it can readily be diagnosed for some defects, though not all. Good sonographic image can be easily obtained in several cases due to polyhydramnios. Major defects of vetebrae, limbs or kidney are usually easy to detect. However, oligohydramnios in this case was associated with poor image, leading to difficulty in detection of minor defects such as ventricular septal defect. Anal atresia can usually not be detected although many cases of anorectal atresia show some dilated bowel segment[10]. The prenatal diagnosis is most commonly based on an abnormal spine, kidneys, heart, and radial rays, although not all of these features will be present in each case[2-5]. Esophageal atresia is detectable by ultrasound only if little or no fluid is present in the fetal stomach, wheareas, the amniotic fluid volume is increased.

Polyhydramnios, commonly seen in VATER or VACTERL association secondary to esophageal obstruction, usually improves the quality of sono-graphic image, therefore, it is easier for detection of anomalies in this condition. However, this case presents a rare manifestation of oligohydramnios caused by renal agenesis resulting in poor sonographic image, leading to difficulty in detection of minor defects like VSD in this case. However, VACTERL association was the most likely diagnosis because vertebral, renal and limb defects were prenatally visualized, and the others including VSD, trachea-esophageal defects, and anorectal atresia were postnatally demonstrated. Tracheal-esophageal fistula or agenesis can usually be diagnosed prenatally by demonstration of absence of the stomach due to no swallowed amniotic fluid, but the absent stomach in our case could not represent the tracheal-esophageal defects because there was no amniotic fluid to swallow.

This is an unusual case of VACTERL association since it consists of rare defects such as lower limb defect instead of the more common radial ray defect, bilateral renal agenesis instead of the more common multicystic kidney or hydronephrosis, oligohydramnios instead of polyhydramnios, complete absence of trachea instead of only tracheaesophageal fistula.

The prenatal ultrasonography can identify not only defects for diagnosis but also specify the prognosis in most cases. The outcome depends on the severity of the abnormalities. Most infants have normal intelligence and require surgical and rehabilitative intervention. However, the prognosis of our case was invariably poor because of bilateral renal agenesis.

Serial prenatal ultrasonography in future pregnancy should be considered, although the recurrence rate is unknown. However, X-linked VACTERL association has been well documented in some cases[3], and due to the male infant in our case (by chromosome study), it is also possible to be inherited with this pattern. Therefore, it is very difficult to counsel the patients regarding the recurrence rate in a subsequent pregnancy, because of its heterogeneous causes. A 0 to 25 per cent risk for recurrence seems most appropriate in a sporadic case, like the case presented here.

In conclusion, prenatal diagnosis of VACTERL association based on an abnormal spine, kidney, heart, and limb can be readily made, though not all of these features are present in each case and some minor defects are difficult to detect. The prenatal ultrasonography can identify not only defects for diagnosis but also specify the prognosis in most cases. The outcome depends on the severity of the abnormalities

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การวินิจฉัยก่อนคลอดของกลุ่มความสัมพันธ์ VACTERL : รายงานผู้ป่วย

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รายงานการวินิจฉัยก่อนคลอดของกลุ่มความสัมพันธ์ VACTERL ของทารกในครรภ์ 1 ราย ซึ่งประกอบด้วยความผิดปกติของกระดูกสันหลัง ทวารหนัก หลอดคอ หลอดอาหาร ไต แขนขา วินิจฉัยด้วยคลื่นเสียงความถี่สูงขณะอายุครรภ์ 30 สัปดาห์ โดยอาศัยการตรวจพบการผิดรูปร่างของกระดูกไขสันหลัง ไม่มีไตทั้งสองข้าง ขาซ้ายท่อนบนสั้นส่วนท่อนล่างและเท้าหายไปทั้งหมด นอกจากนั้นยังพบว่ามีภาวะน้ำคร่ำน้อยมาก (ซึ่งเป็นผลจากไตไม่ทำงานทั้งสองข้าง) ทารกโตช้าในครรภ์ หลังจากให้คำปรึกษาแล้วได้ทำการยุติการตั้งครรภ์โดยความสมัครใจของผู้ป่วยและสามี ทารกเสียชีวิตขณะคลอด มีความผิดปกติหลายอย่างตามที่วินิจฉัยไว้ก่อนคลอด จากภาพรังสีหลังคลอดและซันสูตรศพทารกพบความผิดปกติของไขสันหลัง ไม่มีทวารหนักและกำหนดเพศไม่ได้ ผนังกั้นห้องหัวใจล่างรั่ว หลอดคอฝ่อหายไป หลอดอาหารส่วนล่างตีบ ไตฝ่อทั้งสองข้าง ขาซ้ายท่อนบนสั้น ส่วนท่อนล่าง และเท้าไม่มี ซึ่งเข้าได้กับกลุ่มความสัมพันธ์ VACTERL การตรวจโครโมโซมพบปกติ (46,XY) รายงานนี้ย้ำถึงความสำคัญของการตรวจคลื่นเสียง ความถี่สูงในการช่วยวินิจฉัยกลุ่มความผิดปกติดังกล่าว ซึ่งได้ให้ข้อมูลสำคัญทั้งในแง่การวินิจฉัยและแนวทาง ในการดูแลรักษา

คำสำคัญ : กลุ่มความสัมพันธ์ VACTERL, การวินิจฉัยก่อนคลอด, คลื่นเสียงความถี่สูง

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