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CASE REPORT

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Antenatal Diagnosis of Jeune Syndrome (Asphyxiating Thoracic Dysplasia) with Micromelia and Facial Dysmorphism on Second-Trimester Ultrasound

Authors' Contribution:
A Study Design
B Data Collection
C Statistical Analysis
D Data Interpretation
E Manuscript Preparation
F Literature Search
G Funds Collection

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Summary

Background: Jeune syndrome is a rare congenital malformation with a reported incidence of 1 in 100,000–130,000 live births. Thoracic hypoplasia is the most striking abnormality of this disorder. Here we report a case of Jeune syndrome with marked thoracic hypoplasia, micromelia and facial dysmorphism, which was diagnosed on a second-trimester antenatal real-time three-dimensional ultrasound.

Case Report: A 24-year-old primigravida came for routine anomaly scan at 19 weeks of gestation. Transabdominal grey scale and real time 3D ultrasound (US) was done with GE Logiq P5 with curvilinear array transducers (4C and 4D3C-L). US findings were consistent with the diagnosis of Jeune syndrome (Asphyxiating thoracic dysplasia).

Conclusions: Jeune syndrome is an extremely rare congenital disorder with a spectrum of abnormalities of which thoracic hypoplasia is the most striking. It can be diagnosed on early antenatal US by its characteristic skeletal and morphological features which can guide further management of pregnancy in form of termination or preparation for surgical correction of the deformity.

MeSH Keywords: Congenital Abnormalities • Imaging, Three-Dimensional • Prenatal Diagnosis • Ultrasonography

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Background

Jeune syndrome is a rare congenital malformation with a reported incidence of 1 in 100,000–130,000 live births. Thoracic hypoplasia is the most striking abnormality of this disorder. Here we report a case of Jeune syndrome with marked thoracic hypoplasia, micromelia and facial dysmorphism, which was diagnosed on a second-trimester antenatal real-time three-dimensional ultrasound.

Case Report

A 24-year-old primigravida came for a routine anomaly scan at 19 weeks of gestation. Transabdominal grey-scale and real-time 3D ultrasound (US) was done with GE Logiq P5 with curvilinear array transducers (4c and 4D3C-L).

The biparietal diameter (BPD), occipitofrontal diameter (OFD), and head circumference (HC) were within normal range showing a normally-shaped skull. The fetal brain was normal. The average gestational age calculated from BPD, HC, and AC was 19 weeks and 3 days. The fetal thorax was stenotic and bell-shaped with short ribs reaching less than halfway to the thorax (Figure 1A, 2A). Both lungs showed reduced cross-sectional areas at the level of a four-chamber view of the heart (1.04 cm^2 on the right and 0.86 cm^2 on the left side) which were more than 2 standard deviations (SD) below mean measurements for a gestational age of 19 weeks [1]. The abdominal circumference was normal for gestational age (Figure 2B) with the ratio of thoracic to abdominal circumference of 0.68 which was again 2 SD below mean [2]. Fetal abdominal visceral organs including stomach, bowel, kidneys, and urinary bladder

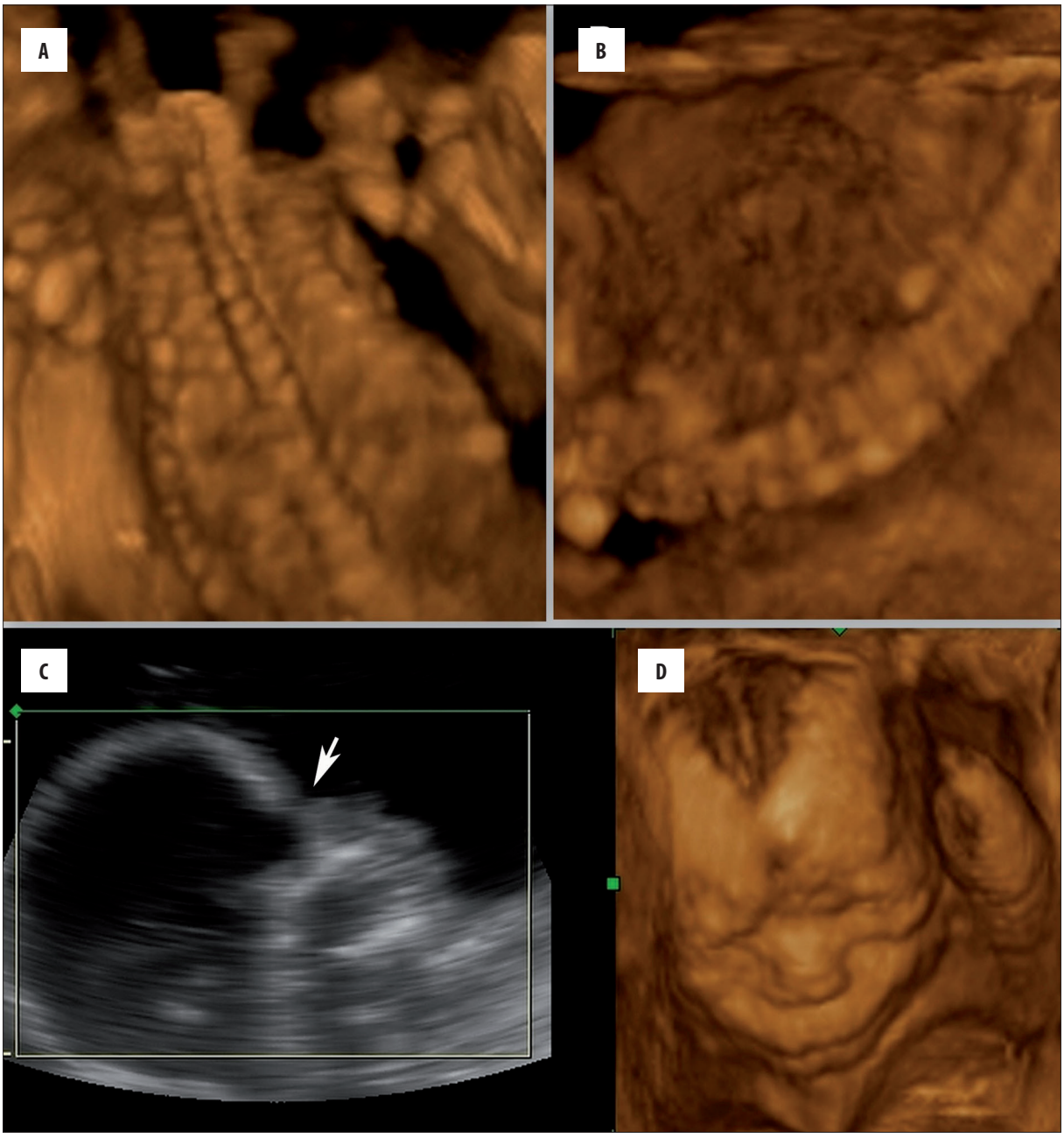

Figure 1. (**A**) Coronal 3D volume rendered US image showing a narrow bell-shaped thorax with short ribs reaching approximately halfway around the thorax. (**B**) Sagittal 3D volume rendered US image showing a normal fetal spine. (**C**) Mid-sagittal grey-scale US image through the fetal face showing the absence of the nasal bone (arrow). (**D**) 3D volume rendered US image of the fetal face showing a broad flat nasal bridge.

were normal. There was shortening of bilateral long bones including femur, tibia, humerus, radius and ulna, of more than 2 SD below mean for a fetus of 19 weeks of age, with mild bowing of both femurs. Fetal bones showed normal mineralization [3] (Figure 2D–2F). Fetal scapulae and clavicles were normal. No excessive skin folds were seen. The fetus showed the absence of the nasal bone on grey-scale US with a broad and flat nasal bridge on 3D US (Figure 1C, 1D). No other craniofacial malformations were seen. The fetal spine was normal (Figure 1B). The amount of the amniotic fluid was adequate. The placenta and cord were normal. All the limbs showed five digits (Figure 2C).

Discussion

Jeune syndrome is a rare entity with a reported incidence of 1 in 100,000–130,000 live births. The major manifestations of Jeune syndrome include short stature, narrow chest, brachydactyly, micromelia, and limb shortening seen in more than 70% of the patients [4]. It has been reported in association with liver diseases (in approximately 30% of cases), renal diseases, pulmonary function abnormalities, repeated pulmonary infections, visual abnormalities, intestinal malabsorption, pancreatic exocrine insufficiency, Hirschsprung disease, corpus callosum agenesis, Dandy

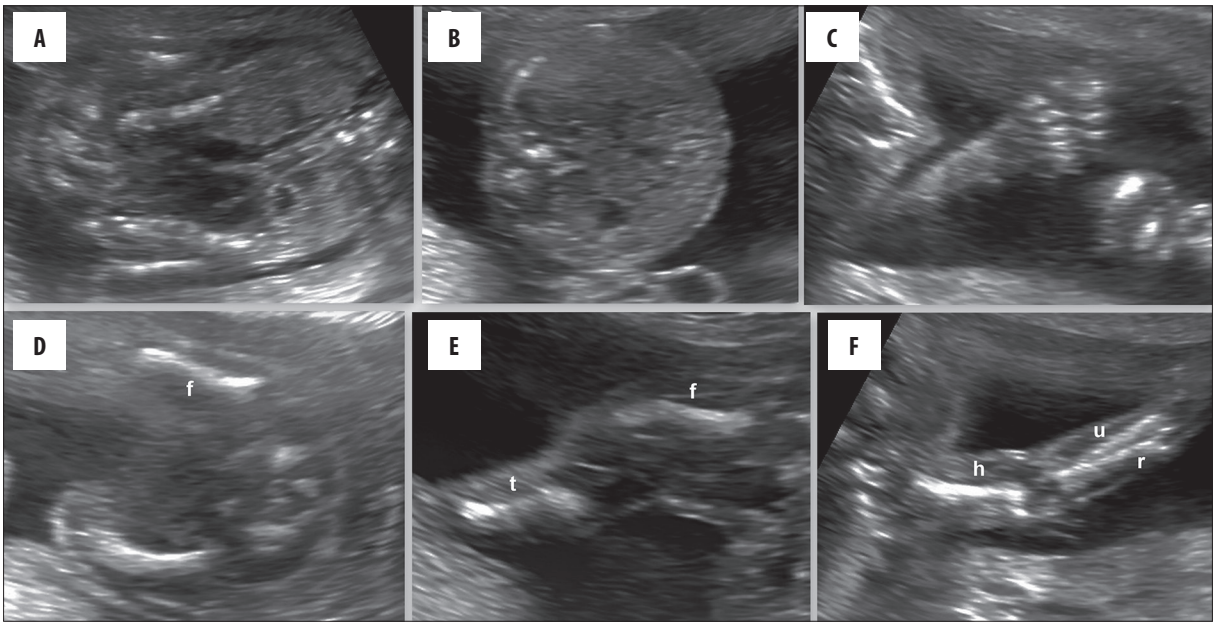

Figure 2. (**A**) Coronal US image showing a narrow bell-shaped thorax with hypoplastic lungs. (**B**) Axial US image through the fetal abdomen showing normal abdominal circumference for gestational age. (**C**) The right fetal hand showing five digits. (**D–F**) Fetal long bones, short for gestational age (f – femur, t – tibia, h – humerus, r – radius, u – ulna).

Walker malformation, spinal cord compression, Joubert syndrome, increased antenatal nuchal translucency and cystinuria [4–7]. Polydactyly is an occasional finding in Jeune syndrome [8].

Yoshimura et al. [2] in their study compared eight parameters for assessment of lethal pulmonary hypoplasia and concluded that the lung area and the thoracic circumference/abdominal circumference (TC/AC) ratio have the highest accuracy for diagnosis. The right and left lung areas were 1.04 cm^2 and 0.86 cm^2, respectively, in our patient, which was more than 2 SD below mean [1]. The TC/AC was 0.68 in our patient, which was again more than 2 SD below mean, suggesting lethal hypoplasia [2].

Facial dysmorphism as seen in our case, i.e. in the form of absent nasal bone and broad, flat nasal bridge, has been described with Jeune syndrome. The reported associations include prominent forehead, hypertelorism, antimongoloid slant, low set/posteriorly rotated ears, retrognathia, absent nasal bone, facial cleft, accessory oral frenula, small lobulated tongue, tongue hamartoma, and cleft palate [9–11].

Chromosomal mapping in cases of Jeune syndrome has shown abnormalities in chromosomes 15q13, 12p11, 3q24 with many of the patients showing a mutation in IFT80 gene mapped to chromosome 3q24 [4,12].

This disorder is commonly associated with mesomelic or rhizomelic dwarfism with a variable degree of shortness of hands. These findings were also observed in our case. Other skeletal findings include trident-shaped pelvis and premature skeletal ossification especially of the femoral epiphysis.

Respiratory insufficiency as a result of a small-sized thorax is the most common cause of morbidity and mortality. Renal dysfunction is the other major cause of mortality in patients with less severe thoracic involvement and prolonged survival beyond infancy [12].

The main differential diagnoses for Jeune syndrome include Ellis-van Creveld syndrome (EVCS), short rib-polydactyly syndrome (SRPS type I-IV), thoracolaryngopelvic dysplasia (Barnes syndrome) and Shwachman-Diamond syndrome (SDS) [13]. The absence of polydactyly in our case excluded the diagnosis of SRPS and EVCS which show its presence in at least one limb. In addition, EVCS shows cardiac and ectodermal defects [14]. Thoracolaryngopelvic dysplasia can be differentiated from Jeune syndrome by less severe rib shortening, presence of laryngeal stenosis, and absence of renal involvement in later life [8]. SDS is an autosomal recessive disorder with exocrine pancreatic dysfunction, short stature, metaphyseal dysplasia and bone marrow failure. With increased survival of patients with asphyxiating thoracic dystrophies due to improving perinatal care, some of these patients may be identified to have manifestations of SDS in later life [13].

Multiple surgical techniques have been described for treatment of thoracic hypoplasia with the primary objective being the expansion of thoracic volume, which can in turn allow improved lung expansion and ventilation. Most of the approaches include median sternotomy with graft interposition [15].

Conclusions

Jeune syndrome is an extremely rare congenital disorder with a spectrum of abnormalities of which thoracic hypoplasia is the most striking. It can be diagnosed on early antenatal US by its characteristic skeletal and morphological features which can guide further management of pregnancy in the form of termination or preparation for surgical correction of the deformity.

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