CASE REPORT

Foetal akinesia deformation sequence: A rare lethal entity

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Abstract

Foetal akinesia deformation sequence (FADS) represents a group of disorders resulting from absent or diminished in utero foetal mobility. The aetiology is multifactorial, including genetic, environmental, maternal, and foetal causes. The absence of foetal movements leading to multiple joint contractures, pulmonary hypoplasia, and intrauterine growth restriction are the key features of foetal akinesia deformation sequence. Herein we describe the case of a 30-year-old gravida 4 (para 2+1) who came for foetal ultrasound at 28 weeks of gestation due to decreased foetal movements. Ultrasound showed features of FADS with fixed flexed position of foetal limbs, pulmonary hypoplasia, polyhydramnios, and intrauterine growth restriction. The timely use of ultrasound enables early detection of these cases and aids in appropriate counselling and management.

Keywords: Foetal arthrogryposis, antenatal, foetal akinesia, ultrasound.

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Introduction

The 'foetal akinesia deformation sequence' (FADS) is a rare lethal disorder which was first described by Moessinger in 1983 who paralyzed a group of rat foetuses and observed several anomalies in them, concluding that normal in utero movements are imperative for optimal foetal growth and development.[1] Foetal movements begin at around 7-8 weeks of gestation, gradually progressing to generalised movements of the head, limbs, and body by the end of first trimester.[2,3] Foetal breathing, swallowing, trunk and limb movements allow for successful development of the lungs, gastrointestinal tract, muscle and joints, and bone integrity. Absence of diaphragmatic and intercostal muscle movement results in pulmonary hypoplasia while inability to swallow leads to polyhydramnios. About a third of foetuses affected by FADS are stillborn and live-born infants usually die within the first month of life.[4,5] Only about a hundred cases of FADS have been reported in the literature.[6] The other name given to this disorder is arthrogryposis multiplex congenita, Pena-Shokeir syndrome, multiple congenital contractures, and multiple pterygia syndrome. Herein we describe a case of foetal akinesia deformation sequence diagnosed on antenatal ultrasound. This is the first case encountered in our practice and there is no local literature available to the best of our knowledge. Through this case report we intend to bring awareness about this condition to referring physicians and sonologists so that this condition can be recognised prenatally.

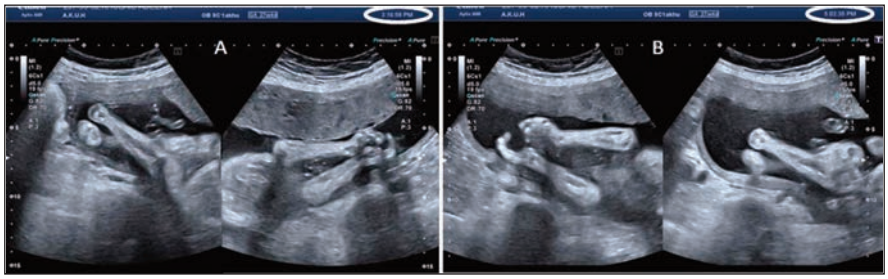

Figure-1: (A) Foetus shows fixed crossed legs and crossed upper limbs which persisted on delayed scanning (B). The timings of scan are circled by the white ovals in the corner of the images.

Approval for publishing the case report was obtained from our institute's Ethical Review Committee (ERC # 2022-7975-22606).

Case Report

A 30-year-old G4P2+1, having history of two previous Caesarean sections, presented with reduced foetal movements to the Radiology department of Aga Khan University Hospital, Karachi, Pakistan in December 2021. She was referred from an outside facility for obstetrical ultrasound. There was no history of diabetes, hypertension or any other comorbidity. Her previous miscarriage had occurred in early first trimester without any known cause. Ultrasound showed a single alive foetus with growth parameters corresponding to 23 weeks and 4 days of gestation. According to her last menstrual period the gestational age was 28 weeks, suggesting intrauterine growth restriction. Foetus was in a non-vertex presentation with fixed crossed legs and crossed upper limbs (figure 1A) and showed reduced gross body movements. The thorax was small sized (figure 2A), the foetal heart to thoracic ratio

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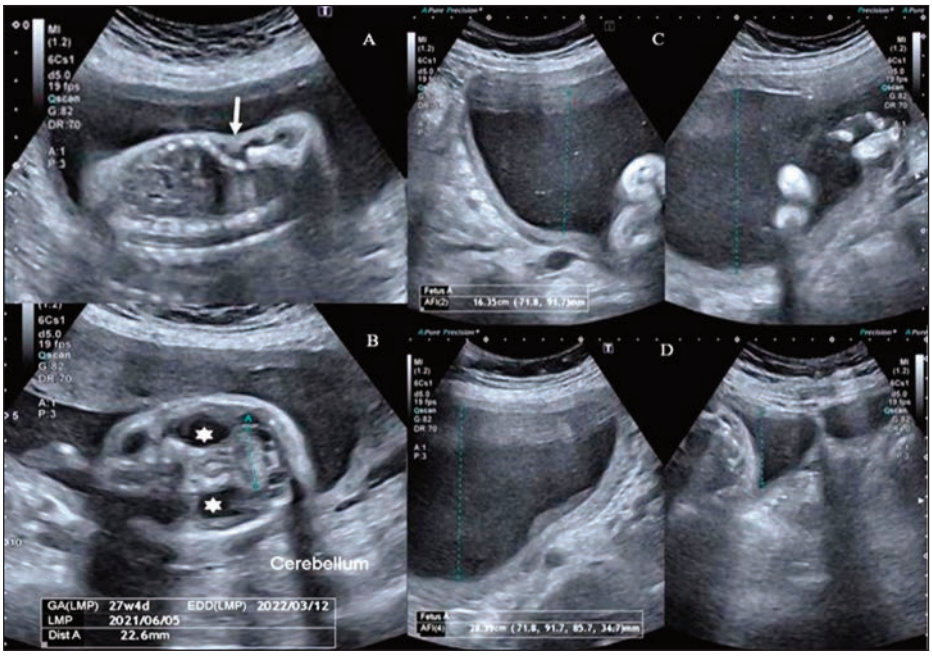

Figure-2: (A) Small size thorax (white arrow), (B) Moderate bilateral hydrocephalus (white asterisks) and hypoplastic cerebellum. (C, D) show polyhydramnios.

was 1:3 (normal is 1:2). The stomach bubble was also small. In addition, there was moderate bilateral hydrocephalus and a hypoplastic cerebellum with trans-cerebellar diameter measuring 22.6 mm (figure 2B) and polyhydramnios (figure 2C, D). A repeat scan performed one hour and forty-five minutes later (figure 1B) showed no change in foetal position. There was no gross uterine anomaly or mass lesion. The findings led us to conclusion of foetal akinesia deformation sequence with intrauterine growth restriction (IUGR) and polyhydramnios. The patient was advised karyotyping which she refused. She presented a week later to her obstetrician at an outside facility with lower abdominal pain where the ultrasound showed intrauterine foetal demise. The foetus was delivered by Caesarean section. The limb contractures were confirmed on delivery. Postoperatively, she remained stable and was discharged three days later.

Discussion

Our case presented with multiple abnormal ultrasound findings and IUGR suggestive of FADS, culminating in intrauterine foetal demise a week later.

Foetal akinesia deformation sequence is a consequence of paucity of in-utero foetal movements which are crucial for normal development of the foetus. Decreased foetal movements can be due to a number of causes which can be grouped into extrinsic and intrinsic.[4,7,8] The extrinsic causes include those that compromise the intrauterine space, such as multiple gestations, congenital uterine anomalies, or uterine leiomyomas as well as maternal illnesses like TORCH infections, multiple sclerosis, diabetes, ischaemia and maternal antibodies to neurotransmitters, myelin, and muscle proteins. There was no structural uterine abnormality in our case and it was a singleton pregnancy. The mother did not have diabetes, however, as the patient was an outside referral, we do not have access to detailed maternal laboratory workup which is a limitation. The intrinsic causes are related to the foetus and include abnormalities of the central or peripheral nervous system, connective tissue abnormalities, and restrictive dermopathy which are mostly genetic as well as aneuploidy such as trisomy 18. Mutations in numerous genes have been reported as the cause of FADS.[3,4,6,9] Unfortunately, due to being a low-middle income country, genetic testing is not available in our set up which is another limitation in ascertaining the aetiology of this condition. Intrinsic causes usually lead to lethal forms of the disorder and are not amenable to treatment.

Foetal akinesia can be suspected by prenatal ultrasound at as early as 12 weeks of gestation, which is the first line imaging modality.[5,10] Decreased movements, increased nuchal translucency, cystic hygroma or hydrops foetalis are the first trimester indicators of FADS. In later pregnancy, the constellation of findings include persistent abnormal posture of the limbs, lack of facial and swallowing movements, polyhydramnios, small thorax/pulmonary hypoplasia, micrognathia, hypertelorism, high arched palate, short umbilical cord and IUGR.[4,9] When ultrasound is performed due to complaint of decreased foetal movements or if there is history of an affected sibling in the past, attention should be paid to the amniotic fluid volume, position and movement of foetal limbs, dysmorphic features and the swallowing motions. MRI may serve as an adjunct for assessing lung volumes, brain malformations, joint abnormalities, and the facial features.

Postnatal death in akinesia is usually a result of respiratory failure due to pulmonary hypoplasia. The earlier the akinesia occurs in foetal life, the more severe is pulmonary hypoplasia and inability to survive.[5] The reported risk of recurrence is variable, because of heterogeneous aetiology. It ranges from 3-7%, being higher in cases of CNS

involvement.[9] Due to risk of recurrence in future pregnancies and non- availability of genetic testing, we propose non-invasive testing such as cell free foetal DNA in maternal blood for exclusion of aneuploidies and an early ultrasound screening for presence of foetal contractures and foetal movements in subsequent pregnancy. In case multiple contractures are found, the foetus should be thoroughly assessed for presence of other system abnormalities. Suspicion of FADS on ultrasound should prompt appropriate counselling and referral to a tertiary care centre.

Conclusion

Although foetal akinesia deformation sequence is rare, ultrasound plays a crucial role in early recognition. When decreased foetal movements are suspected clinically, careful attention should be paid to foetal limb movements and position and detailed assessment of associated abnormalities. Prenatal diagnosis allows appropriate family counselling regarding unfavorable outcome of pregnancy and delivery planning.

Patient consent: Written consent was obtained from the patient for publishing her case.

Disclaimer: None.

Conflict of interest: None.

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