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Echogenic focus in the fetal left ventricular cavity: Is it a false tendon?

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ABSTRACT

Objective: To draw attention to the left ventricular false tendon which can be misinterpreted as echogenic focus in the fetus.
Methods: The study group consisted of 9 fetuses out of the 161 who had been misdiagnosed for left ventricular false tendon as echogenic focus by obstetricians. Fetal echocardiography and 2-D color Doppler echocardiography were performed in the pre–postnatal period. The standard fetal echocardiographic views (4,5 chamber views, long axis view of the left ventricle, short axis view of the ventricles and great arteries, three vessels and trachea view, long axis views of the duct and aortic arch) were obtained for each case.
Results: Of the 161 fetuses with echogenic focus in the left ventricle which underwent fetal echocardiography, 9 (5.6%) were diagnosed with false tendons present in the left ventricular cavity with no other cardiovascular anomaly. Six out of 9 patients underwent amniocentesis as follows: for age of over 35 years (two patients), abnormal double-triple screening tests plus echogenic focus (two patients) and soft ultrasonographic markers including echogenic focus (two patients). These fetuses revealed no cardiovascular and other systemic pathology or dysmorphism except for false tendons in the left ventricular cavity.
Conclusion: False tendon should be taken into account as differential diagnosis of left ventricular echogenic focus in the fetus. Misinterpretation of false tendon as echogenic focus may cause unnecessary fetal invasive approach and maternal anxiety, especially when it arises with a background of borderline fetal findings and knowledge.

1. Introduction

Left ventricular false tendons (muscular bands, aberrant bands, myocardial bands) are fibrous or fibromuscular structures of different lengths and thicknesses that are regarded as benign cardiac anatomic variants lying between interventricular septum and left ventricular free wall or papillary muscles [1,2]. False tendons are generally regarded as having no clinical importance, however they may have association with vibratory murmur [1]. Though prenatal reports are few, prevalence of left ventricular false tendons that are common in all age groups is reported in the echocardiographic series to be present with a ratio of 0.4–61% [2,4–6]. Although they may sometimes attach to the papillary musculature, it is unusual for them to attach to chordae tendinae and valves. False tendons are mostly single, but they may also occur in multiples. They are mostly isolated, but may also be accompanied by cardiac anomalies.

On two dimensional echocardiography false tendons are depicted as linear echogenic structures running from the interventricular septum to the free wall in the left ventricular cavity. False tendons are classified as transverse, diagonal and longitudinal according to the location of the apical, mid, basal left ventricle parts [6]. The thickness of the tendons ranges from 3 mm diameter to less than 1 mm and length is variable. While evaluating false tendon in children, one should be aware of differentiating it from tumor, thrombosis, subaortic membrane and mitral valve apparatus anomalies [6,7]. Histopathological examinations have demonstrated that they consist of connective tissue, vascular structures and elements of cardiac conduction system, bundle of His other than myocardial tissue [8,9]. For this reason, false tendons may also be accompanied with repolarization abnormalities, cardiac arrhythmias, preexcitation and even with left ventricular hypertophy and systolic dysfunction [10,11].

Echogenic focus is defined as an echogenic structure with dimensions of approximately from 1 to 4 mm comparable to bone density in the fetal ventricular cavity [12]. It is a small calcification surrounded by fibrotic tissue in the atrioventricular valve papillary muscles or chorda tendinae which moves with the valve leaflets. Though ischemic changes in the papillary muscle and chordae tendineae or infections have been suggested to be a causative factor, the exact etiology is unknown. They may be found in either ventricles, mostly in the left ventricle, in singles or multiples. It is estimated to occur between 3 and 5% in low risk pregnancies [13]. Echogenic focus is known to be one of the soft obstetric ultrasonographic markers [14,15]. Soft markers are nonspecific minor abnormalities that can be readily detected during the second trimester ultrasound. These markers may be seen in the normal fetus, but have been reported with an increased incidence with chromosomal abnormalities such as Down syndrome, trisomi 18,

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13 [16,17]. Discrimination of true echogenicity from the spurious one is important while scanning the fetus [18].

This study is aimed to draw attention to the false tendon in the left ventricular cavity which can easily, and usually, be misinterpreted as an echogenic focus in the left ventricular cavity, which may lead to time consuming diagnostic approach and stress for the mother and healthcare team.

2. Patients & methods

The study group was selected from 1167 consecutive pregnant women referred for fetal chocardiography with different indications between January 2006 and June 2007 at the Pediatric Cardiology Unit of the Doctor Zekai Tahir Burak Maternity Teaching Hospital. Out of these 1167 fetuses, 161 were sent for fetal echocardiography of having echogenic focus in the left ventricle. Before fetal cardiac evaluation, maternal screening tests for each patient, and amniocentesis for five patients, had been performed by the obstetricians. Of the 161 fetuses with echogenic focus in the left ventricle which underwent fetal echocardiography, 9 (5.6%) were diagnosed with false tendons present in the left ventricular cavity with no other cardiovascular anomaly.

The mean gestational age of the 9 patients at the initial echocardiographic examination was 23 + 5.2 weeks (interval of 18–29 weeks), and the mean age of the pregnant women was 24 + 3 years (interval of 19–37 years).

Pregnancy complications were in four patients as follows: Gestational diabetes in one patient, maternal cardiac anomaly (operated atrial septal defect) in one patient, history of cigarette smoking in two patients (Table 1).

Six patients underwent invasive tests (amniocentesis) as follows: for age over 35 years (two patients), abnormal double-triple screening tests (two patients) and soft ultrasonographic markers (two patients) (Table 2).

Fetal echocardiography was performed with two dimensional color Doppler echocardiography system (GE Vivid 7 Pro, GE Healthcare, Salt Lake City, Utah) using 5C MHz, 7S MHz in the prenatal and 10S MHz transducers in the postnatal period by the first author. The standard fetal echocardiographic views (4,5 chamber views, long axis view of the left ventricle, short axis view of the ventricles and great arteries, three vessels and trachea view, long axis views of the duct and aortic arch) were obtained for each case. The diagnosis of false tendon was based on the finding of a linear echogenic strand crossing the left ventricular cavity that is between the interventricular septum, and left ventricular free wall or papillary muscle, but without mitral valve apparatus attachment, which are visualized in more than one view [7]. Special care was taken to differentiate false tendon from echogenic focus.

Echogenic focus was diagnosed as true if it is: located within the ventricle where papillary muscles and chorda tendineae are situated; seen from more than one angle, independent of the zone of specular reflection; and does not show an entrance–exit reflection [18].

Table 1
Maternal history.

Type	n
Maternal cardiac anomaly (operated ASD)	1
Maternal smoking	2
Gestational diabetes (diet regulation)	1
No abnormal history	5
Total	9

Table 2
Amniocentesis history.

Reason	n
>35 years maternal age + EF	2
Serologic abnormality + EF	2
Soft ultrasound marker	2
(echogenic bowel + EF)	1
(mild pyelectasis + EF)	1
No amniocentesis	3
Total	9

3. Results

The study group consisted of 9 fetuses out of the 161 who had been misdiagnosed for left ventricular false tendon as echogenic focus by the obstetricians. Fetal and postnatal clinic and echocardiographic findings of these 9 fetuses were evaluated.

The mean gestational age of the 9 patients at the initial echocardiographic examination was 23 + 5.2 weeks (interval of 18–29 weeks), and the mean age of the pregnant women was 24 + 3 years (interval of 19–37 years).

Pregnancy complications were in five patients as follows: Gestational diabetes in one patient, maternal cardiac anomaly (operated atrial septal defect) in one patient, history of cigarette smoking in two patients (Table 1).

Six patients underwent invasive tests (amniocentesis) as follows: for age over 35 years (two patients), abnormal double-triple screening tests (two patients) and soft ultrasonographic markers (two patients) (Table 2). All patients had an uncomplicated gestational course.

The thicknesses of the false tendons were between 1 and 2 mm in 8 fetuses and >2 mm in 1 fetus. In 6 fetuses false tendons were transverse and located in the mid part of the left ventricle. In the remaining 3 they were diagonal and located in the mid-apical part of the left ventricle.

These fetuses underwent physical examination and transthoracic echocardiography in the postnatal period, and revealed no cardiovascular and other systemic pathology or dysmorphism except for false tendons in the left ventricular cavity.

4. Discussion

Chromosomal abnormalities occur in 0.1% to 0.2% of live births. Trisomy 21 (Down syndrome) is the most common karyotypic abnormality in live-born infants. Trisomy 13, trisomy 18, monosomy X are the other major aneuploidies that can be detected by ultrasound. Coexistence with minor obstetric findings (maternal age > 35 years, positive maternal serologic markers, soft markers) has been reported to be common in aneuploidy [14–16]. The most commonly studied soft markers include thickened nuchal fold, rhizomelic limb shortening, fetal pyelectasis, echogenic bowel, choroid plexus cyst and echogenic intracardiac focus. These markers may be seen in the normal fetus, but have been reported with an increased incidence with chromosomal abnormalities such as Down syndrome, trisomi 18, 13 [17,19–21]. It has been remarked that isolated echogenic focus may be the sole sonographic feature in most of the fetuses with trisomi 21 and other sonographic findings may not be detected [22,23]. The decision whether to check fetal karyotyping or not depends on the maternal–fetal background risk factors. Since there are controversial results for isolated echogenic focus, further evaluation including invasive approach such as amniocentesis can be recommended [24,25]. In our study, 2 patients in the study group had already undergone amniocentesis due to misinterpretation of false tendons as echogenic focus additional to one of other soft ultrasonographic findings. Pre and postnatal