Chronic Umbilical Cord Entanglements Causing Intrauterine Fetal Demise In Second Trimester

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Abstract:

Entanglement of umbilical cord with fetal body parts is known to occur in early pregnancy. Potentially, this can compromise the cord blood flow and cause fetal demise. We report three instances of intrauterine fetal deaths in second trimester of pregnancy with longstanding cord entanglement. The cord had left impressions of entanglement on the entrapped growing fetal part. Restricted movements of the fetus due to cord entanglement had led to reduced spiraling of the umbilical cord. Our case series demonstrates that tight entanglement of fetal body part by the umbilical cord can cause fetal demise in second trimester. This is associated with a straight umbilical cord. Thus the presence of reduced spiraling in intrauterine fetal demise warrants a search for possible cord entanglement along with established causes like chromosomal and congenital anomalies.

Umbilical cord carries the nutrition and oxygen from placenta to the fetus. Any obstruction to this lifeline is potentially serious for the fetus (1), (2). The compromise to this lifeline may result because of abnormal cord configurations like true knots, increased coiling ,abnormal length of the cord or constrictions (1). Fetus itself may be involved in obstructing the cord vessels in cord prolapse or cord entanglements. Modern ultrasonography tools have revealed that the involvement of fetal body parts in the loops of cord is very common in early weeks of pregnancy when the fetus is active(3). Majority of these entanglements resolve without any untoward outcome(4). However it is quite possible that in some instances the fetus may not be able to free itself from the cord with serious consequences.

Case 1: 32 year old hypothyroid primigravida on eltroxin therapy had conceived naturally. The ultrasonography done at 14 weeks was within normal limits. The fetal demise was noted at 16th week of gestation. On delivery the length of the umbilical cord was 14.7 cm. The cord did not show any coiling. The male fetus had weight of 130 gm. A smooth groove of roughly of the same width as that of the cord was present on the right thigh(Figure 1).The left thigh did not have a similar mark. There were no dysmorphic features or other anomalies. Autopsy did not reveal any internal anomalies. Cytogenetic analysis showed 46,XY pattern on G-banded Karyotype.

Case 2: At 16th week gestation intrauterine fetal demise was noted on routine antenatal check up in a 26 year old primigravida of a nonconsanguineous union. The ultrasonography showed the fetal parameters matching 14th week fetus. The pregnancy was conceived naturally and there was no history of teratogen exposure. The first trimester scan at 12 weeks was normal. The first trimester screen result with NT, PaPP-A and free Beta hCG did not show increased risks for T21, T18 and T13. The male fetus weighed 124 gm and was moderately macerated. A groove mark was present on the waist on left anterior side and posteriorly (Figure 2). The umbilical cord was narrower in the first 4 cm and did not have any spiraling through out its length (Figure 2). The length of the cord was 13.8 cm. The fetus did not have any dysmorphic features. No congenital anomalies were evident in external examination or on autopsy. Fetal cytogenetic evaluation was not possible because of maceration.

Case 3: 34 year old third gravida mother had one normal daughter and one uninvestigated first trimester loss of a nonconsanguineous union. Ultrasonography at 14th week showed gestation appropriate parameters. Triple screen at 16th week did not show increased risk for aneuploidies and open neural tube defects. She reported loss of fetal movements in 19th week and was found to have an intrauterine fetal demise. Male fetus weighing 275 gm was delivered vaginally. The right upper arm and the fetal neck were encircled by multiple tight loops of the umbilical cord (Figure 3). The neck diameter as well as the diameter of right upper arm was reduced (Figure 3). The cord length was 31.2 cm and it showed 5 helices. There were no dysmorphic features and no congenital anomalies were noted on external examination and autopsy. G-banded Karyotype showed 46, XY normal pattern.

Comment:

Umbilical cord is the only connection of the fetus with the placenta and mechanical obstruction to the cord vessels can lead to disruption to the blood flow with serious consequences and fetal demise. The entanglement of the cord around the neck is a well documented entity and is reported to occur with frequency of 15 to 20% at term (1). The cord entanglement is also known to occur involving other fetal body parts. The cord entanglement was demonstrated sonographically to occur much more frequently in early pregnancy; 62.9% (149/237)fetuses were reported to have cord entanglement between 13 to 16 weeks of pregnancy (3). The incidence of Nuchal cord in this study was 27%(64/237), The cord around legs 9.7%(23/237), cord around upper limbs 8%(19/237),

around abdomen 3%(7/237) and around other body parts 15.2%(36/237).Thus the occurrence of cord around the neck in early pregnancy seems to be as common as that found at term while the other fetal body part entanglement seems to be much more frequent (3).

The cases we report illustrate that in some fetuses this early cord entanglement can be tight and the fetus may not be able to extricate its entrapped part from the cord. The marks caused by the cord on the entrapped body part in our series suggest that the entanglement had lasted for considerable period during which the fetus had kept growing. The growth of the entrapped part and/or fetal movement might have stopped the cord blood flow ultimately and resulted in fetal demise.

The length of the cord in these cases was average. The entanglements at term are known to be associated with long cords (5). It is possible that if entanglement occurs in early pregnancy with normal length cords the fetal parts may not be set free. Alternatively the fetal activity is said to play a major role in lengthening of the cord especially in early pregnancy (6). The restricted fetal activity because of entanglement in our cases might not have permitted increments in the cord length.

The noteworthy feature about the umbilical cord in these cases was the reduced spiraling. The spiraling was totally absent in cords of case 1 and case 2, while it was minimal in case 3. The spiraling of the cord is seen from 9^{th} week of pregnancy and the main factor for development of spiraling is the fetal movement (1). Thus fetal conditions with reduced movements like neurological abnormalities are known to have straight cords (1) (7).In the present cases the cord entanglement has probably led to reduced movements by the fetus and resultant straight cord with reduced spiraling.

Parast et al have proposed histopathological criteria for umbilical cord accidents in stillbirths beyond 20 weeks of gestation (8). However application of these criteria will be difficult in confirmation of umbilical cord accidents in intrauterine fetal demises in early pregnancy because of the immaturity of the clotting mechanism and the maceration of the fetus (1). Lack of placental vascular development in the second trimester also makes it difficult to use these histologic criteria (including "fetal thrombotic vasculopathy" characterized by avascular villi) for diagnosis of cord accidents in second trimester Therefore the physical evidence of the marks of tight cord is important for diagnosis of early entanglements.

These three cases are from the 91 fetal autopsies performed in intrauterine fetal demises at our center indicating that early cord entanglement was responsible for 3% of intrauterine fetal demises. This proportion may be high because of the small sample size. However this case series stresses the importance of looking out for the marks of possible cord entanglement in all intrauterine fetal demises and having an even closer inspection when the normal length umbilical cord has reduced spiraling.

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Legends to Figures:

Figure 1: Showing the groove on the entrapped right thigh caused by the umbilical cord

Figure 2: Showing the groove mark on the entrapped waist caused by the umbilical cord.

Figure 3: Showing the narrowing of the entrapped right shoulder and the neck.