What is Your Diagnosis? True Knot of the Umbilical Cord

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**History and Symptoms:** This young mother came for routine ultrasound examination at 30 weeks gestational age with a history of normal menstrual cycles before the pregnancy. She had a history of acute rhinitis prior to this sonography. This was her first pregnancy.

**Family History:** The patient (the mother) was one of 4 children.

**Present Pregnancy:** The patient had a history of 30 weeks amenorrhea which corresponded with the age of the fetus on ultrasound scan. She had a history of mild vaginal spotting during the first month of this pregnancy.

**Clinical Examination:** Her blood pressure was normal (BP: 122/84 mm. of Hg); her other vital signs were normal. On examination of the chest there were no abnormalities. On abdominal examination, there were no major clinical findings. The fundal height of the patient corresponded to the age of the fetus (30 weeks).

**Imaging Studies:** This patient underwent routine transabdominal ultrasound imaging to study the biophysical profile of the fetus and also to rule out any fetal anomalies. She had not undergone sonography prior to this scan.

**Image 1:** Transabdominal color Doppler scan image (Images courtesy of Dr. Gidda Ramaiah, MD, India).

**Image 2:** Transabdominal color Doppler scan image (Images courtesy of Dr. Gidda Ramaiah, MD, India).

What are your findings based on these obstetric ultrasound images?

**Sonographic Findings:** Firstly, which part is being studied in these strikingly crisp color Doppler images? The fetal head is seen to the right of the images. But is the focus of the sonography on the fetal body at all? No! Obviously the anatomy being studied here is extra fetal. It is the umbilical cord. Are these images of the umbilical cord, normal? Look again. What is / are the most striking observations that we find? Is there indeed any abnormality? Yes, indeed! What is the obvious anomaly? The structure of the cord is altered. How would you describe it? Yes, the most striking feature is the mass-like structure in the cord. What can cause such an appearance in the cord? Let
us also study the other features that are visible in these images. The liquor appears normal. The placenta appears to be fundal and posterior. The umbilical cord shows three vessels.

Returning back to the umbilical cord, some of the common pathologies that are seen in the cord are: cord cysts, hemangioma, and umbilical vein varix. The mass seen here appears to be vascular in nature. Let us describe it in detail: The mass shows 3 vessels of the cord (the umbilical vein and 2 umbilical arteries) passing through a ring of vessels. Does that ring a bell? Let us proceed with the various diagnostic possibilities. The most unlikely diagnosis is that of an umbilical cord cyst or pseudocyst. Both of these would show a cystic (sonolucent) and non vascular structure within the cord. This is definitely not the case here. The other possibility is that of a hemangioma of the cord. However observe the vessels in the “mass.” Do they form a fusiform tumor? Also, do the vessels within the “mass” appear to be of different sizes? Is there any neo-vascularization within the “mass”? These characteristics of a hemangioma are not present in this lesion. What about umbilical vein varix? This pathology presents as a cystic but vascular lesion that is continuous with the umbilical vein. This is also not the case here. What, then, are we dealing with?

Did we mention that the cord shows 3 vessels and appears to be surrounded by a ring of vessels also arising from the cord? What is this sign called?

Have you heard of the hanging noose sign? This sign describes 3 vessels of the umbilical cord passing en face through a loop of the cord. This is the classic sonographic sign of a true knot of the umbilical cord. Do we have a diagnosis?

**Final Diagnosis:** True knot of the umbilical cord.

Shall we have a look at some more images of this case?

**Image 3:** True knot of the umbilical cord

![Image 3: True knot of the umbilical cord](image)

**Image 4:** Post delivery appearance

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**Prognosis:** The incidence of true knots of the cord is about 1.2% of all deliveries. True knots are associated with significant increase in morbidity of the fetus. Literature suggests that the incidence of antepartum fetal death increases fourfold as a result of this condition. It is postulated that a tightening of the true knot may result in fetal anoxia due to compression of the umbilical arteries. Thus cord knots if discovered in sonography, must result in mandatory and regular follow up ultrasound studies to monitor the condition of the fetus. The mother must carefully look for reduction in fetal movements as this may be the only early indicator of fetal anoxia. Presence of 2 or more true knots of the cord is more ominous. In this case Doppler studies of the umbilical artery showed normal flow.

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(All images in this article are courtesy of Dr. Gidda Ramaiah, MD, India).

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