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True Umbilical Cord Knot without Adverse Perinatal Outcome: A Brief Review

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ABSTRACT

True umbilical cord knots are not a common occurrence, however when they do present, it is ironic that despite having availability of antenatal ultrasound, they are not diagnosed antenatally most of the time, due to cord length and loops of cord making visibility poor. However with 4 dimension ultrasound and serial doppler study there can be better pick up rate. There is controversy around risks with true knots and cases of meconium stained liquor, low Apgar scores, hypoxic ischemic encephalopathy, other neonatal complications necessitating neonatal intensive care unit admission and fetal still birth have been reported. The umbilical cord attaches to the placenta and transfers blood, oxygen and nutrition to the fetus. A true umbilical cord knot happens when the cord loops over itself with fetal movements, a tight knot can impair the fetal circulation and lead to fetal hypoxia. In such a situation, fetal surveillance shows sub optimal cardiotocograph tracing, and when the patient is taken for emergency cesarian section, a tight umbilical cord knot is seen, which was causing fetal hypoxia. Certain conditions are more predisposed for true knots such as polyhydramnios, longer length of the cord, smaller than average size fetus, monoamniotic twins and multiparity. Our case report presents a true umbilical cord at an elective cesarian section in a primigravida. The patient had an uneventful pregnancy with regular fetal surveillance through ultrasound and doppler scans and fetal heart tracing. An elective cesarian section was performed at 38 weeks at patient's request and at the time a nuchal cord and true umbilical cord was noted.

Keywords: True umbilical cord knot, Doppler study, Antenatal ultrasound, and Perinatal outcome.

INTRODUCTION:

True umbilical cord knot is relatively common and occurs in 0.3 - 1.3% of all pregnancies. It is associated with increased incidence of SGA infants, premature birth, need for neonatal intensive care, and fetal death (Bhoomika *et al.*, 2020). The condition is associated with several maternal risk factors like advanced maternal age, multiparity, obesity, previous spontaneous abortion, chronic hypertension, and gestational diabetes, in addition to various obstetric variables such as genetic amniocentesis, male fetus, polyhydramnios,

long umbilical cord, and prolonged gestation. In several studies, it has been related to adverse pregnancy and delivery outcomes such as cord accidents (cord prolapse and nuchal cord (Elhassan and Miskeen, 2023; Nugraha *et al.*, 2023).) fetal acidosis (Sherer *et al.*, 2021), low Apgar score at 1 minute (Sherer *et al.*, 2021), higher risk of cesarian delivery (Elhassan and Miskeen, 2023; Sherer *et al.*, 2021), and intrauterine fetal death (Elhassan and Miskeen, 2023; Sherer *et al.*, 2021; Maher and John, 1996; Reli *et al.*, 2001). Since the fetal blood supply is derived from the umbilical

cord, any defect in the cord may significantly affect the fetal outcome. Numerous factors including increased cord length, polyhydramnios, male babies, amniocentesis, monoamniotic twins, grand multiparity and tiny fetuses can predispose to true knot. The risk of fetal death from true knot is up to four times higher than that from other causes, and it can have a wide range of adverse effects on pregnancy and labour (Maher and John, 1996).

In addition, active foetuses may move around more frequently, increasing their chances of forming a knot. True knots are usually diagnosed during routine prenatal ultrasounds. The ultrasound may show an unusual shape or pattern in the umbilical cord that suggests a knot. In some cases, changes in fetal heart rate could be detected which indicate reduced blood flow due to a tight knot (Reli *et al.*, 2021). The management of true knots depends on several factors, depending on how tight the knot is and the fetal status (Reli *et al.*, 2021). In most cases, obstetricians closely

monitor mother and baby throughout pregnancy to ensure that there are no complications (Vidya *et al.*, 2023). However if there are signs of fetal compromise due to a tight knot (such as changes in fetal heart rate or on Doppler) then, obstetricians may recommend early delivery via induction or caesarean section.

Case Study

Here, we present a case study on a primigravida who elected to have an elective cesarian section at 38 weeks, and to our surprise, a nuchal cord and true umbilical cord knot were seen. The patient, a 36 years old primigravida, had a spontaneous conception with a low risk, and uneventful pregnancy. She was booked at 14 weeks with normal blood results and was followed with regular antenatal clinic visits, antenatal ultrasound scans and dopplers, showing the fetus with growth along the 50th centile, normal liquor volume and Umbilical artery doppler values. Patient reported good fetal movements throughout her pregnancy and there were no fetal concerns (Elhassan and Miskeen, 2023).

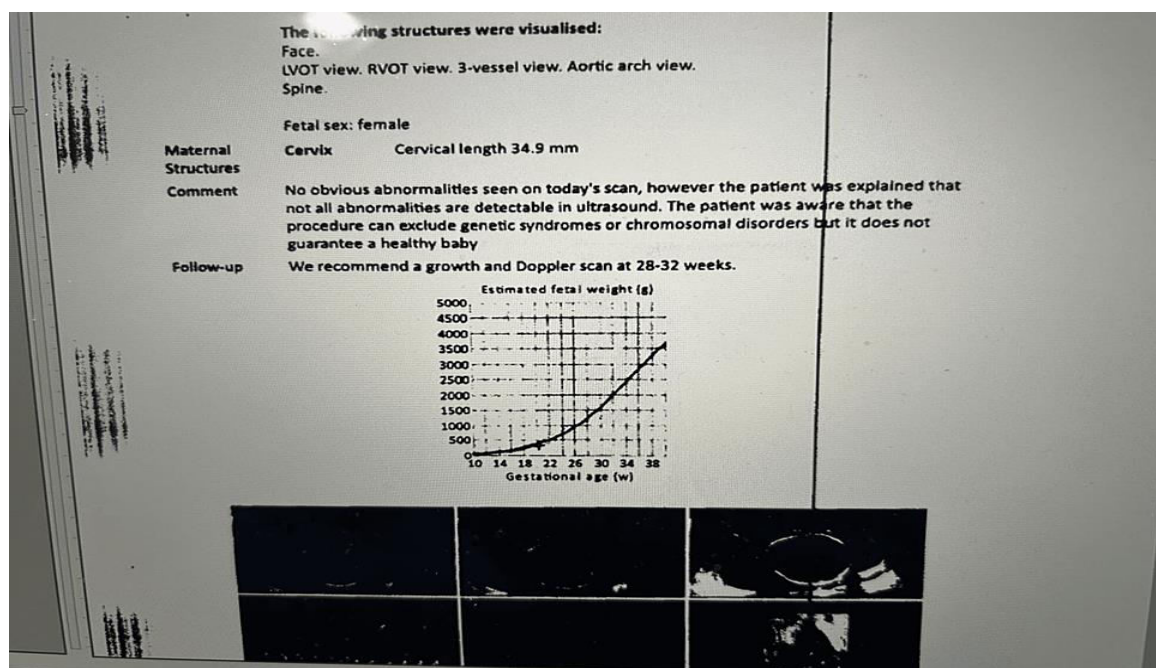


Fig. 1: The antenatal ultrasound anomalies scan which demonstrated normal scan.

She elected to have a cesarian section on request and at that time a loop of nuchal cord was seen along with a true knot in the cord. She delivered a healthy female baby of birth weight 3.1 kg and Apgar score of 9 at 1 and 5 minutes. The patient made good recovery post operatively and was discharged home with the fetus in stable condition. There were no postnatal concerns.

DISCUSSION:

Any defect in the umbilical cord may have a profound impact on the fetal fate by compromising the fetal blood circulation. It has been assumed that the true knot usually manifests between nine and twelve weeks of pregnancy, when sufficient liquor and vigorous fetal movements allow the fetus to pass through a cord

loop (Maher and John, 1996). The majority of difficulty, however, takes place in the later stages of pregnancy when the fetal blood supply is affected by the cord's tightening in response to fetal movements and the decreased liquor volume with advancing gestation. Numerous conditions, including polyhydramnios, increased cord length, monoamniotic twins, male babies, grand multiparity, small fetuses and amniocentesis can predispose to true knot (Reli *et al.*, 2021).

The first sonographic diagnosis of true umbilical cord knot was made almost 20 years ago, there is still a lack of a tool to recognize this dangerous pathology. Four dimensional and color Doppler is very important for the diagnosis. Pregnancies complicated by the true knot are at a 10 fold higher risk of IUFD beyond 37

weeks of gestation. It is important to monitor the fetus closely during pregnancy and labour. In cases where a true knot is diagnosed prenatally, it is essential to provide adequate counseling to the patient due to the increased risk of adverse fetal and neonatal outcomes (Sherer *et al.*, 2021). Close monitoring using Umbilical Artery Doppler velocimetry until term and continuous electronic fetal monitoring during labor is strongly recommended. While elective cesarian delivery may be considered a precaution against cord tightening during labor, a closely monitored vaginal delivery is a safe option that yields better outcomes. Opting for a well-monitored vaginal delivery is a safe alternative that leads to more favorable outcomes, even if a cesarian delivery is considered elective due to the potential for cord tightening during labor.



Fig. 2: Separated True umbilical cord knot.

The longer-than-average length of the umbilical cord and the male fetal gender were identified as risk factors for the adverse antenatal and perinatal outcomes associated with cord knots. As previously men-

tioned, these outcomes result from the constriction of the umbilical vessels by the knot, leading to impaired fetal circulation and uteroplacental insufficiency. It is important to note that loose knots may tighten during

pregnancy due to fetal movements or during labor as the fetus descends through the birth canal. This tightening can reduce umbilical cord blood flow, resulting in fetal distress, birth asphyxia and potentially fetal demise (Sherer *et al.*, 2021). The present case report emphasizes the unexpected discovery of a true umbilical cord knot, which did not result in adverse perinatal outcomes. Although true umbilical cord knots generally pose increased risks to the fetus, timely recognition and appropriate interventions can contribute to positive outcomes. Obstetric teams are advised to maintain a vigilant approach in monitoring fetal well-being, promptly respond to signs of distress and ensure postpartum monitoring to ensure optimal neonatal outcomes.

CONCLUSION:

True knot of the umbilical cord is an important condition which needs careful monitoring during pregnancy and delivery. Doppler ultrasound is the best modality of diagnosis antenatally, with continuous fetal heart tracing in labour. If it is picked up antenatally, then the patient should be counseled in detail about all the risks and complications. The mode of delivery should be at the discretion of the patient, and she should be offered early induction of labour at >37 weeks with continuous fetal surveillance and low threshold for cesarian section.

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CONFLICTS OF INTEREST:

No conflicts of interest.

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