True umbilical cord knot; case report without adverse perinatal outcome and literature review.

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Abstract

This case report presents an incident where a true umbilical cord knot was unexpectedly discovered during labor, leading to an emergency cesarean section. The case involved a 32-year-old gravida 2 with a living child at 37 weeks of gestation who was admitted to Elgadaref Maternity Hospital. The report highlights that despite a true umbilical cord knot, the perinatal outcomes were favourable due to timely intervention. It emphasizes the importance of monitoring fetal heart rate during labor to identify signs of fetal distress promptly. Close observation during delivery and postpartum monitoring is crucial in true knot cases to ensure optimal neonatal outcomes.

Keywords: Umbilical cord knot, Perinatal outcome, Sudan.

Introduction

The umbilical cord is crucial in linking the developing fetus to the placenta, facilitating the transfer of vital nutrients and oxygen necessary for the foetus's growth and development [1]. However, in some cases, the umbilical cord can develop a knot, known as a true knot of the umbilical cord [2]. This condition can have serious consequences for both the mother and the baby, making it important to understand its causes, diagnosis and management [3].

A true knot of the umbilical cord occurs when the umbilical cord becomes twisted and forms a knot. This can happen when the fetus moves around in the womb or when the excess amniotic fluid allows more movement. The knot can be loose or tight, depending on how often it has twisted around itself [4].

True knots are relatively rare, occurring in about 1-2% of pregnancies. They are more common in multiple pregnancies [twins or triplets] and pregnancies with long umbilical cords [5].

The exact cause of true knots has yet to be fully understood. However, some factors may increase the risk of developing this condition [6]. A longer-than-normal umbilical cord may allow more movement and twisting [7, 8]. Also, too much amniotic fluid can create more space for fetal movement and increase the risk of knotting [9]. Twins or triplets may have more opportunities to twist their cords around each other [10]. In addition, active foetuses may move around more frequently, increasing their chances of forming a knot [11].

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, doctors may also detect changes in fetal heart rate that indicate reduced blood flow due to a tight knot [12].

The management of true knots depends on several factors, including how tight the knot is and how well the baby is doing. In most cases, doctors will closely monitor both mother and baby throughout pregnancy to ensure no complications [13].

Suppose signs that blood flows through the umbilical cord are compromised due to a tight knot [such as changes in fetal heart rate]. In that case, doctors may recommend early delivery *via* induction or caesarean section [14].

True knots can have serious consequences if left untreated for the mother and baby [15]. Complications may include a tight knot that can reduce blood flow through the umbilical cord, depriving the fetus of oxygen and nutrients [16]. Reduced blood flow can cause fetal distress [heart rate changes], requiring immediate medical attention. Stillbirth may occur in rare cases where blood flow is severely compromised [17].

This case report presents an incidental discovery of a true umbilical cord knot during labor, leading to an emergency C-section and highlighting the presence of a true umbilical cord knot as the main finding.

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Figure 1. *The true, 30 cm distal to fetal insertion, and the cord was found to insert centrally in the posterior placenta.*

Case Report

We present a case report describing the accidental discovery of a true umbilical cord knot during labor, which did not result in adverse perinatal outcomes. Although true umbilical cord knots generally do not have negative effects, they still pose an uncertain risk of perinatal morbidity and mortality.

The patient was a 32-year-old gravida 2 with a previous successful delivery, admitted to the labor and delivery unit at Elgadaref Maternity Hospital at 37 weeks of gestation. Her prenatal course had been uneventful, with appropriate fetal growth for the gestational age. Upon admission, fetal heart rate monitoring showed a baseline rate of 140 beats per minute, moderate variability and no decelerations.

There was no previous history of umbilical cord knotting in the last delivery. The current pregnancy was desired, spontaneously conceived and supported by the husband and family. The patient's booking parameters, haemoglobin level and urinalysis were normal. The pregnancy had been uneventful, with a routine ultrasound at 36 weeks revealing normal findings. Doppler ultrasound was not performed as it was not part of the hospital's routine practice. The patient had no history of hypertension or diabetes and her antenatal care proceeded without complications.

During examination, the patient was in labor and showed no signs of fever, pallor, or jaundice. All physical examination findings were normal, including clear chest auscultation. The abdomen appeared enlarged and moved with respiration, but there was no tenderness—the symphysio-fundal height measured 39 cm, indicating proper fetal growth. The fetus was in a longitudinal lie with a cephalic presentation and palpation revealed that it was 3/5 palpable per abdomen. The fetal heart rate was 150 bpm. Vaginal examination showed a closed cervical so that was not effaced and at station-2. Eventually, an emergency Cesarean section was performed due to the failure to progress in the first stage of labor. The surgical procedure was carried out without any complications and the length of the umbilical cord was determined to be 100 cm during the intraoperative assessment.

The obstetrician noted the presence of a true knot in the umbilical cord, which was tight but not compromising blood flow to the fetus. The baby was delivered without difficulty and received Apgar scores of 9 at one and five minutes. The umbilical cord was sent for histopathologic examination, which confirmed the presence of a true knot. The baby was observed in the neonatal intensive care unit for 24 hours and showed no signs of distress or complications. No gross fetal abnormalities were observed. The estimated blood loss during the procedure was approximately 500 ml. The true knot was located 30 cm distal to the fetal insertion point and the cord was centrally inserted in the posterior placenta (Figure 1). The male baby had an estimated weight of 3.3 kg. After a smooth postoperative recovery, the baby cried immediately after birth and remained with the mother without any postnatal concerns.

Discussion

True umbilical cord knots are rare but associated with important adverse outcomes and complications during pregnancy and childbirth. They occur when the umbilical cord becomes entangled, forming a knot that may restrict blood flow and oxygen delivery to the fetus. While these knots are often associated with adverse perinatal outcomes, it is important to document cases where no adverse consequences are observed. This case report presents an incident of an accidental discovery of a true umbilical cord knot during labor.

Prenatal diagnosis of true umbilical cord knots is infrequent and the gestational age at which knots form remains unclear [18]. True knots have been reported to develop in all three trimesters of pregnancy, even during labor [19]. Additionally, diagnosing knots through routine ultrasound scanning of the entire umbilical cord length is challenging as knots do not have a characteristic appearance [20]. However, certain features, such as the "four-leaf clover" appearance and the "hanging noose" sign, have been reported [21]. These features may explain why the patient, in this case, was not diagnosed antenatal, despite undergoing ultrasound scans. Two-dimensional ultrasound and Doppler velocimetry can be useful in the prenatal diagnosis of true umbilical cord knots and differentiating them from false knots.

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The antenatal diagnosis of a true umbilical cord knot is not frequently reported in the literature [22-25]. Routine abdominal ultrasound, typically used to assess the amniotic fluid volume and visualize the abdominal insertion, cord-free and floating-free segments of the umbilical cord, is inadequate for diagnosing an umbilical cord knot. This limitation has contributed to missed prenatal diagnoses of true knots. However, it is worth noting that thick umbilical cords, as observed in our patient with a diameter of 2.5 cm compared to the average of 1.2 cm, offer protection against the tightening of cord knots and subsequent occlusion of fetal vessels.

The presence of a nuchal cord, which complicates the true umbilical knot in our patient, is typically benign and does not result in adverse perinatal outcomes, even when tightly wrapped.

In cases where a true umbilical 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 [26, 27]. Close monitoring using Umbilical Artery Doppler velocimetry until term and continuous electronic fetal monitoring during labor is strongly recommended. While elective cesarean delivery may be considered a precaution against cord tightening during labor, a closely monitored vaginal delivery is a safe option that yields better outcomes. Given the heightened risk of unfavorable fetal and neonatal outcomes, patients who have received a prenatal diagnosis should receive proper counseling. Continuous electronic fetal monitoring throughout labor and close monitoring of pregnancies using umbilical artery Doppler velocimetry until term are advised. Opting for a well-monitored vaginal delivery is a safe alternative that leads to more favorable outcomes, even if a cesarean delivery is considered elective due to the potential for cord tightening during labor.

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 mentioned, these outcomes result from the constriction of the umbilical vessels by the knot, leading to impaired fetal circulation and uteroplacental insufficiency [28]. However, as observed in our patient, loose knots typically do not compromise fetal well-being as fetal blood supply is maintained [29]. 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 [30].

The present case report emphasizes the unexpected discovery of a true umbilical cord knot during labor, 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 thorough postpartum monitoring to ensure optimal neonatal outcomes.

Conclusion

A true knot in the umbilical cord is a rare but potentially important condition that requires careful monitoring throughout pregnancy. While complications are uncommon, it is crucial for healthcare providers to maintain vigilant supervision to ensure positive outcomes for both the mother and the baby. Regular prenatal ultrasounds play a vital role in early detection, allowing potential issues to be identified before they progress to a point requiring intervention. If you suspect that you may have developed this condition during pregnancy or have any concerns regarding your overall pregnancy health, it is important to promptly consult with your healthcare provider.

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