

Umbilical Cord around the Fetal Leg Co-Existing with Type IV Placenta Previa in a Primigravida with Successful Neonatal Outcome in a Low-Income Setting: A Case Report

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Abstract

Cord entanglement is defined as an umbilical cord that encircles the fetal body, neck, or extremities with overall reported prevalence of 30 %. Its effects on perinatal outcomes is controversial and management is very challenging in low and middle-income settings especially when it co-exists with bleeding Type IV placenta previa. A 19-year-old undergraduate, unbooked primigravida who was unsure of her last menstrual period, presented with sudden vaginal bleeding and collapse. The vaginal bleeding was recurrent, of moderate volume and the current episode started about one hour prior to presentation. She had no antenatal care. On examination, she was pale and in shock. Her abdomen was enlarged and the symphysio-fundal height was 34 cm; there was a singleton fetus in longitudinal lie and cephalic presentation, the fetal heart rate was 166 beats per minute. There was active vaginal bleeding. Bedside 2D Ultrasound revealed Type IV placenta previa at 34 weeks and 6 days of gestation. She was promptly resuscitated and an informed consent obtained for an emergency caesarean section for antepartum haemorrhage due to major degree placenta previa. She had a live female infant weighing 2.2 kg with Apgar scores of 4 and 7 at the 1st and 5th minutes respectively with umbilical cord around the right leg. The neonatal period was satisfactory. The case involved an umbilical cord around the leg only diagnosed intrapartum with co-existing bleeding type IV placenta previa, which could have led to severe neonatal and maternal complications. This report reveals the importance of antenatal care, early diagnosis and prompt management of obstetric patients to prevent morbidity and mortality.

keywords: Umbilical Cord Around the Leg, Cord Entanglement, Placenta Previa, Neonatal, Maternal Complications

1. Introduction

Cord entanglement is defined as an umbilical cord that encircles the fetal body, neck, or extremities [1]. The overall reported prevalence of cord entanglement is up to 30 %, most cases are of umbilical cord around the fetal neck (nuchal cord), affecting 5.5 % to 22.8 % of all pregnancies worldwide. This condition can occur at any stage of pregnancy but is more commonly diagnosed during the second and third trimesters. The effect of a cord entanglement on perinatal outcomes is controversial. Some studies have shown an association with a low Apgar score (<7 at 1 min), fetal heart rate decelerations, meconium stained amniotic fluid, low birthweight, intrauterine fetal death, and a higher rate of both instrumental and cesarean deliveries [1-3].

Worldwide, the detection and management of true umbilical cord around the fetal leg have been enhanced by advancements in prenatal imaging techniques, such as Doppler ultrasound

scan and 3/4-dimensional ultrasonography. However, the condition remains a challenge due to its unpredictable nature and potential for severe outcomes, including stillbirth, intrauterine growth restriction, and neonatal asphyxia [4-6].

In low and middle-income settings, the prevalence and outcomes of umbilical cord around the leg are less well-documented due to limited access to advanced prenatal care and diagnostic facilities [7].

Studies from various regions within Africa indicate a need for improved prenatal care services to enhance the early detection and management of such complications. In low and middle-income settings specifically, the healthcare infrastructure often struggles with resource limitations, which can impact the timely diagnosis and management of pregnancy-related complications. Despite these challenges, awareness and training among healthcare providers are

improving, leading to better outcomes in recent years. Locally in low and middle-income settings, there is a growing recognition of the importance of comprehensive prenatal care to detect and manage conditions like umbilical cord around the leg. Case reports and studies from hospitals in low and middle-income settings highlight the critical need for routine antenatal visits and the use of ultrasound to monitor fetal development and umbilical cord anomalies. This case report contributes to the growing body of literature on umbilical cord complications in low and middle-income settings, emphasizing the importance of early detection and appropriate management to improve maternal and fetal outcomes [8-23].

2. Case Presentation

A 19-year-old female undergraduate, primigravida, at an unknown gestational age presented to the hospital with a history of vaginal bleeding of about an hour prior to presentation and sudden collapse. The bleeding started after her routine morning exercise, it was of moderate volume and associated with passage of blood clots, dizziness and weakness. She has had recurrent episodes of symptoms but she did not seek any health care. She was unaware of the pregnancy and has not received any form of antenatal care. She also had no knowledge of contraception and had never practiced breast self-examination. There was no history of previous surgeries, chronic medical conditions, allergies or blood transfusions. She is the first child of her parents in a monogamous family setting. She has a male partner who is also an undergraduate whom she has been having intermittent unprotected coitus with. She had no family history of chronic illnesses and does not drink alcohol or use tobacco in any form. On examination at presentation, she was pale, afebrile, her pulse rate was 130 bpm, thready and fast, with a blood pressure of 90/60 mmHg. The abdomen was uniformly enlarged, corresponding to a symphysis-fundal height (SFH) of 34 cm, with a fetal heart rate of 166 beats per minute. Her vulval pad was fully soaked with blood, and there was active vaginal bleeding. A 2-Dimensional bedside Obstetric ultrasound scan done showed a viable fetus with type IV placenta previa at 34 weeks plus 6 days of gestational age. A diagnosis of antepartum haemorrhage due to placenta previa at 34 weeks of gestation was made.

3. Resuscitation, Delivery and Outcomes

The diagnosis was explained to the patient and her caregiver. She was admitted into the un-booked labour ward. Two

wide bore cannulae were used to gain intravenous access. Her blood samples were collected for investigations. She was resuscitated with two litres of normal saline fast. Foley urethral catheter was passed and it drained 200mls of concentrated urine. Her urine sample was also collected for investigations. The need for an emergency caesarean section with or without hysterectomy was discussed with them. They expressed their intention to conserve her uterus for reproductive function. Intravenous ceftriaxone 1gm stat was given to her. A written informed consent was obtained from them for emergency caesarean section. She was reviewed by the anaesthetist and the theatre booked for surgery.

4. Results of Investigations

1. Packed cell volume- 22%
2. Blood group- O Rh 'D' positive.
3. Haemoglobin genotype- AA
4. Retroviral screening- Seronegative to HIV 1 and 2
5. Serum electrolyte, urea and creatinine- normal
6. Urinalysis- normal
7. Four units of blood were cross-matched and made available for her.
8. Hepatitis B and C screening: Negative.

She subsequently had an emergency caesarean section and was delivered of a live 2.2kg female baby with Apgar scores of 4 and 7 at the 1st minute and 5th minute respectively, with a Type IV placenta previa. The baby had an umbilical cord around the right fetal leg (Figure 1 and Figure 2).

The estimated blood loss at surgery was 700mls and she received three units of blood in the peri-operative period. The baby was observed in the neonatal unit for the first 12 hours and returned to the mother in satisfactory condition. Post operatively, she was monitored closely and she received intravenous fluids, antibiotics and analgesics. Her vital signs were stable on the first post-operative day and she was ambulant and commenced oral feeds. Her packed cell volume on the second day post-surgery was 28%. Her parenteral medications were later converted to orals and she was discharged home after adequate counselling on contraception and antenatal care on the fourth post operation day in stable clinical condition. She was seen for post-natal care follow-up two weeks and six weeks respectively and she had no complaint. She was subsequently discharged to the family planning unit for contraception.

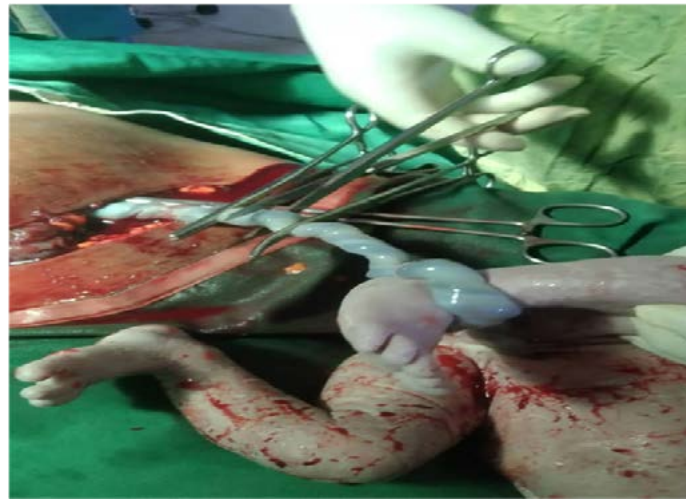


Figure 1: Lateral View Demonstrating an Umbilical Cord Around the Right Fetal Leg

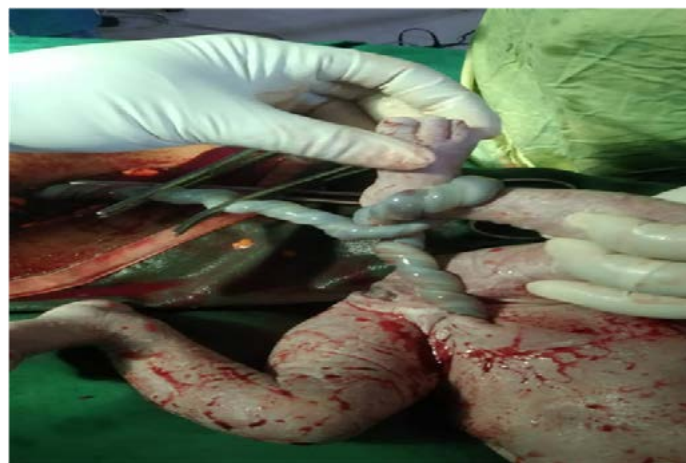


Figure 2: Front View Demonstrating an Umbilical Cord Around the Right Fetal Leg

5. Discussion

The case of a 19-year-old undergraduate who presented with vaginal bleeding and an umbilical cord around the leg underscores the critical role of antenatal care in preventing adverse pregnancy outcomes. The patient's lack of awareness of her pregnancy and absence of antenatal care contributed to the severity of her condition upon presentation. This case aligns with findings from other studies that highlight the dangers of undiagnosed cord entanglement. In this index case, the Apgar scores were 4 and 7 at the 1st minute and 5th minute respectively and a birthweight of 2.2kg. In a previous study by Zabit *et al.*, cord entanglement was found to be significantly associated with one-minute Apgar score less than 7 (OR = 1.21, 95 % CI 1.16–1.27, $p < 0.001$) but without association between cord entanglement and small for gestational age (SGA) babies [1]. However, another study by Sørnes documented that for growth restricted babies, Apgar 5 was not affected by the presence of encirclements when corrected for the level of fetal growth restriction [24]. Only for the infants larger-for-date did the encirclements affect their Apgar score. Our index case has the birthweight of 2.2kg at a gestational age of 34 weeks. Umbilical cord entanglement is associated with several risk factors, including increased cord length, polyhydramnios, multiparity, and fetal hyperactivity.

Umbilical cord entanglement can form at any time during pregnancy, but their impact becomes more pronounced as the pregnancy progresses. The compression of the umbilical cord can lead to intermittent or continuous restriction of blood flow, resulting in fetal hypoxia, which can cause intrauterine growth restriction, fetal asphyxia or stillbirth.

In this case, the presence of umbilical cord around the leg was detected during an emergency caesarean section. The decision to perform a caesarean section was based on the patient's significant antepartum haemorrhage due to placenta previa, a condition where the placenta covers the cervix, leading to severe bleeding during pregnancy and delivery. This intervention was crucial in preventing further complications and ensuring the safety of both the mother and the infant [1-25].

A number of in utero injury has been reported following umbilical cord around the leg. For example, Mehdi and Kapil have reported band injury caused by cord around leg in utero [25]. Additionally, a case of hypoxic-ischemic injury caused by acute haemorrhage from an umbilical cord ulceration in a newborn infant with an antenatal diagnosis of small bowel obstruction has also been reported by Khurana *et al* and

Aronowitz et al [27]. Although our index case has co-existing placenta previa, the baby had no obvious morphological defect and there was no associated umbilical cord ulceration [27].

The discussion of umbilical cord around the leg in low and middle-income settings must also consider the diagnostic challenges they present. Prenatal detection of umbilical cord around the leg is difficult; as standard ultrasound techniques may not always reveal the presence of cord entanglement. However, advanced imaging techniques such as color Doppler and three-dimensional ultrasound scan have shown promise in improving the detection rates of umbilical cord anomalies. These techniques allow for a more detailed examination of the umbilical cord and can help identify the entanglement and other abnormalities that might compromise fetal well-being. For example, Curtin et al, in their report were able to detect umbilical cord ulceration by ultrasound with special attention to the amount of Wharton's jelly within the cord [28].

The management of pregnancies complicated by umbilical cord around the leg requires careful monitoring and timely intervention. In cases where umbilical cord around the leg is detected prenatally, close surveillance of fetal growth and well-being is essential. Decisions regarding the timing and mode of delivery should be individualised based on the severity of the entanglement and the presence of any associated complications. Elective caesarean section may be considered in cases where the risk of labour complications is high [29-31].

Comparing this case with other reports in the literature, the findings are consistent with the documented risks and outcomes associated with true umbilical cord knots. For instance, a study by Carter *et al.* found that true knots at the time of delivery were associated with specific electronic fetal monitoring characteristics and neonatal outcomes, emphasizing the need for careful intrapartum monitoring. Similarly, Agarwal and Singh highlighted the adverse perinatal outcomes of umbilical cord around the leg, including low Apgar scores and increased risk of neonatal morbidity. The case also underscores the importance of antenatal education and the need for increased awareness among young women about the importance of prenatal care. Educating women about the signs and symptoms of pregnancy complications and the benefits of regular antenatal visits can significantly improve pregnancy outcomes. Healthcare providers should prioritise patient education and ensure that women receive comprehensive prenatal care, including routine ultrasound examinations to monitor fetal development and detect any abnormalities early [30].

Managing antepartum haemorrhage due to placenta previa, especially in a primigravida unaware of her pregnancy and without antenatal care, presents significant challenges. Immediate resuscitation and stabilization are crucial to manage hypovolemic shock, as seen with the patient's thready pulse and hypotension. The necessity for urgent delivery via caesarean section, complicated by patient and

caregiver preferences to preserve fertility, requires rapid multidisciplinary coordination and informed consent. Blood management is critical given the patient's low packed cell volume of 22%, and reducing the need for perioperative transfusion. Postoperative care includes vigilant monitoring for haemorrhage, infection prevention with antibiotics, and ensuring adequate pain control. Finally, comprehensive post-discharge education on contraception and antenatal care is vital to prevent future obstetric complications [32-34].

6. Strengths

This case report provides a comprehensive and detailed account of a rare obstetric complication, highlighting the clinical presentation, diagnostic process, and management strategies. This level of detail can serve as a valuable reference for healthcare professionals encountering similar cases. The report underlines the critical importance of antenatal care, especially in low-income settings. By detailing the adverse outcomes associated with the lack of antenatal care, this report contributes to the growing body of evidence advocating for improved prenatal healthcare services. The case serves as an educational tool for both medical students and practicing clinicians. It illustrates the complexities of diagnosing and managing umbilical cord anomalies, providing insights into the challenges and solutions in a real-world clinical setting. The discussion on the difficulties in prenatal detection of true umbilical cord around the leg using standard ultrasound techniques adds valuable information to the existing literature. It emphasises the need for advanced imaging techniques and the importance of routine monitoring. The case provides practical insights into the management of emergencies in pregnancy, including decision-making processes in conducting an emergency cesarean section. This practical approach can help inform clinical practice in similar low-resource settings.

7. Limitations

As a single case report, the findings may not be generalizable to all populations or settings. The unique aspects of this case may limit the applicability of the conclusions to other cases with different clinical presentations or in different healthcare environments. The report does not provide long-term follow-up data on the mother or the infant. Longitudinal studies are necessary to understand the long-term implications of true umbilical cord entanglement on neonatal health and development. The report highlights the limitations of diagnostic tools available in low-resource settings. Advanced imaging techniques that could provide more comprehensive data were not utilized, which may have impacted the diagnosis and management of the condition. Without a control group or comparative cases, it is difficult to assess the relative effectiveness of the management strategies employed. Comparative studies or case series could provide a broader perspective on the outcomes and best practices for managing similar cases. The report may be subject to selection and reporting bias, as the case was selected based on its unique presentation and managed by a specific team of healthcare providers. This may influence the perceived outcomes and management approaches.

8. Conclusion

This case report reveals the critical importance of comprehensive antenatal care and the challenges faced in managing obstetric emergencies in low-income settings. The case of a 19-year-old undergraduate presenting with coexistence of the umbilical cord around the leg and placenta previa underscores the potential risks associated with undiagnosed pregnancy complications and the urgent need for timely medical intervention. The patient's presentation with severe vaginal bleeding and collapse, coupled with the lack of antenatal care, illustrates the vulnerabilities and challenges in low-resource settings. The successful delivery of a female infant despite the presence of a true umbilical cord knot and the complications associated with placenta previa is a testament to the importance of skilled medical intervention and emergency preparedness.

9. Key Points for Clinical Practice

Early Detection and Monitoring: Regular antenatal visits and routine ultrasound examinations are essential for early detection and management of pregnancy complications. Advanced imaging techniques, such as Doppler ultrasound and three-dimensional ultrasonography, can enhance the detection of umbilical cord anomalies and improve pregnancy outcomes. **Education and Awareness:** Increased education and awareness among women of reproductive age about the importance of prenatal care and the signs and symptoms of pregnancy complications can significantly improve maternal and fetal outcomes. Healthcare providers should prioritize patient education and ensure that women are well-informed about the benefits of regular antenatal visits.

Emergency Preparedness: Healthcare facilities, especially in low-resource settings, must be equipped to handle obstetric emergencies. This includes having trained personnel, appropriate medical supplies, and protocols in place for the timely management of complications such as placenta previa and umbilical cord anomalies. **Further Research:** There is a need for further research to understand the long-term outcomes of infants born with true umbilical cord around the leg and other umbilical cord anomalies. Longitudinal studies and case series can provide valuable data to inform clinical practice and guide future management strategies.

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Ethical Consideration

An informed consent was obtained from the patient to allow the reporting of this case as well as the use of her intraoperative picture.

Availability of Data and Materials

Data sharing is not applicable to this article as no datasets were generated or analyzed during this study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with

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Ethical Approval

Our institution does not require ethical approval for reporting individual cases or case series.

Informed Consent

Written informed consent was obtained from the patient to publish patient information.

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