

Velamentous cord insertion - Gross and histological examination

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SUMMARY

Velamentous cord insertion is an abnormal cord insertion in which the umbilical vessels diverge as they traverse between the amnion and chorion before reaching the placenta. The present case study is an incidental finding during a cesarean section. A 30-year-old woman with 37 weeks of pregnancy, gravid 1, presented with bleeding per vagina. Previous ultrasonography reports confirmed the presence of a low-lying placenta. However, the site of cord insertion was not mentioned in her reports. On cesarean section, a healthy male baby was delivered. The placenta had velamentous cord insertion. Approximately 12 cm of vessels traversed the membranes.

In the present case study, the umbilical cord was thoroughly examined, both grossly and histologically. For better understanding, the umbilical cord was also compared with a normal umbilical cord. Morphologically, the length and diameter of the cord were in normal range and blood vessels were patent. Histologically, the slides showed the absence of Wharton's jelly on the cord.

Velamentous cord insertion can lead to many unwanted complications like preterm birth, post-partum hemorrhage, and even fetal death. Abdominal ultrasound can be used to visualize the insertion of the cord; however, it often goes unnoticed, as the insertion site is usually obscured

by the fetus. Moreover, maternal obesity and posterior placenta make the diagnosis even more difficult. This case study highlights the necessity to pre-diagnose velamentous cord insertion. It can be done with the help of trans-vaginal ultrasound and color Doppler imaging of the cord vessels.

Key words: Umbilical cord – Velamentous cord insertion – Color Doppler imaging – Histology of umbilical cord – Placenta – Umbilical vessels

INTRODUCTION

Velamentous cord insertion is an abnormal cord insertion in which the umbilical vessels diverge as they traverse between the amnion and chorion before reaching the placenta. Membranous umbilical vessels at the placental insertion site are the main characteristics. The remainder of the cord is usually normal. Because of the lack of protection from Wharton's jelly, these vessels are prone to compression and rupture, especially when they are located in the membranes covering the cervical ostium. Umbilical cord insertion with great clinical significance. Umbilical cord forms a connecting link between fetus and the placenta through which fetal blood flows to and from placenta. The extension of the cord is dull white, moist and covered by amnion through which umbilical vessels can be seen, which is often consid-

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ered as fetal membrane (Eastman and Hellman, 2022).

According to Dattary and Charavarty (2009), the umbilical cord is attached to the placenta at varying positions. Central attachment of the cord is usually considered normal, but eccentric attachment also mostly results in uneventful delivery. Eccentric attachment refers to the lateral insertion of the umbilical cord at a distance more than 2 cm away from the placental margin. Majority of the placentas present with eccentric attachment of the cord, i.e., 73%. The incidence of central attachment of the cord and marginal and velamentous insertion was described (Soernes and Bakke, 1986). Almost 1% of cases of singleton deliveries have velamentous cord insertion⁴. These data are summarized in Table 1. Interestingly, velamentous cord occurs much more frequently with twins and is observed in as many as 15 percent of monochorionic twin gestations (Sepulveda et al., 2003).

Table 1. Incidence of attachment of the cord.

Central	18%
Eccentric	73%
Battledore	7%
Velamentous	1–2%

Velamentous type of cord insertion is of considerable practical importance, because the umbilical vessels are separated in the membrane at a distance from the placental margin which they reach, surrounded only by a fold of amnion (Fig. 1).

CASE REPORT

A 30-year-old woman with 37 weeks of pregnancy, gravid 1, presented to the Obstetrics and Gynecology Emergency Department with a complaint of bleeding per vagina. Her previous ultrasonography reports showed the presence of a live fetus with a single posterior, low-lying placenta. There was no history of any transvaginal ultrasound and color Doppler imaging, so the site of insertion of the cord was not known. To prevent any further complications, a cesarean section was scheduled. A healthy male baby was delivered.

A posterior discoid placenta with velamentous cord insertion and 12 cm of vessels traversing in membranes were observed. However, no neonatal complications or obstetric complications like vasa previa were recorded. Apgar scores were 9 and 10 at 1 and 5 min, respectively.

The umbilical cord was grossly examined for:

- Length
- Diameter
- Cut sections for the patency of vessels.
- Site of Insertion of the cord

As velamentous insertion of cord is an absolute indication for histological examination of the cord, so histological slides were prepared from the cut sections. For better understanding, slides were prepared from normal umbilical cords also, and both were compared.

All the steps of tissue processing were done – tissue cutting and fixation – A 1 x 1 cm sized tissue was taken from near the center of the cord. These tissues were fixed in 10% formalin in separate containers and were labeled. Tissue fixation was done for 1-2 days.

- Rinsing: The tissue was rinsed in running tap water.
- Dehydration: Tissue was subjected to ascending grades of alcohol, ie, 50%, 70%, 90% and absolute alcohol, for 24 h each.
- Clearing: Clearing was done by methyl benzoate for 24 h.
- Embedding: Impregnation of the tissue by a solid medium, paraffin wax, was done. Wax blocks were prepared and kept on cold plate.
- Trimming: Paraffin embedded blocks were trimmed by a sharp knife leaving an edge of 2-3 mm.
- Section cutting: Sections were cut approximately 7 µm thick and ribbons were made. Ribbons were floated on hot water bath. Sections were taken on a slide and kept on a hot plate for drying. Slides were stored in boxes.
- Staining: Slides were stained routinely by hematoxylin and eosin.
- The stained slides were observed under light microscope.

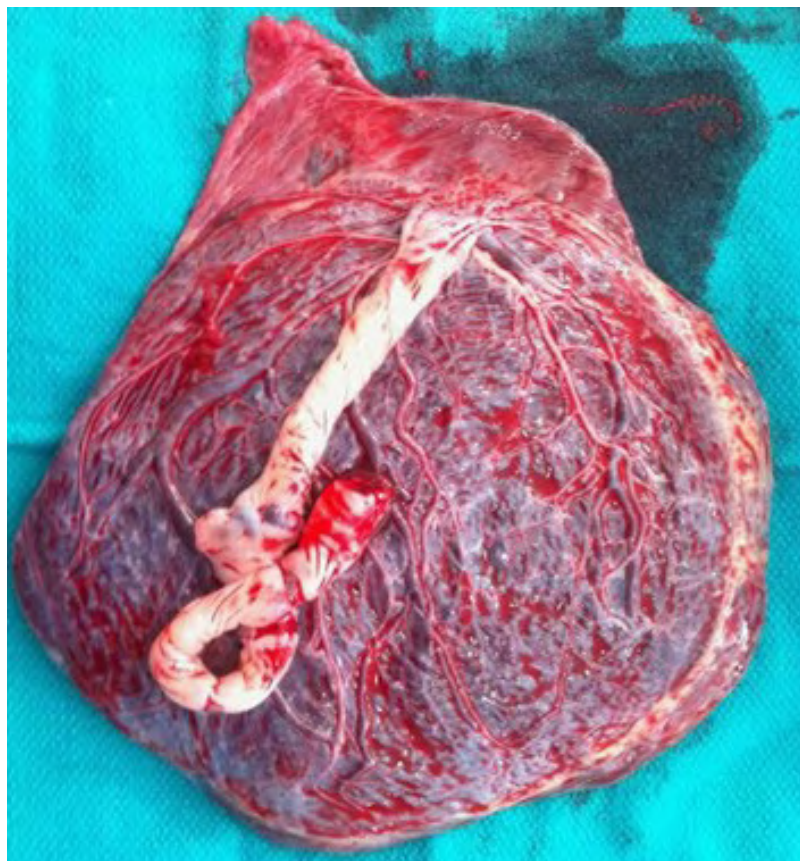


Fig. 1.- Velamentous insertion of cord.

RESULTS

In the present case, both the length of the umbilical cord attached to the fetus and the length of the umbilical cord attached to the placenta were measured and added to calculate the total length of the umbilical cord. The cord was 36 cm long and the diameter of the cord was 1 cm.

Histology slides prepared of the normal case were found to be free of any abnormalities. A cross-section of the umbilical cord of the normal case showed the amniotic membrane (Fig. 2), mucoid connective tissue (Wharton's jelly) (Fig. 3), two umbilical arteries and one umbilical vein (Figs. 2,3,4).

On the other hand, Wharton's jelly was absent in the histology slides prepared of the velamentous cord. But there was no abnormality in the number of vessels. Two umbilical arteries and one umbilical vein were present. Arteries and vein were lined by endothelium. The internal elastic lamina was present in the intima and inner media, both of which were thicker in arteries than in vein.

DISCUSSION

The average length of umbilical cord is 55 cm with the range of 30-100 cm, hence the length of the cord, 36 cm, falls within normal range. Eastman and Hellman (2022) described the diameter of the umbilical cord ranged between 1-1.25 cm. Hence, the diameter, 1 cm, can also be considered to be in a normal range.

Frequently, placental or cord abnormalities are a leading cause of perinatal deaths. An emergency cesarean section is still needed in a lot of uneventful pregnancies. More than half cases of uneventful pregnancies are associated with placental or umbilical cord abnormalities (Hasegawa et al., 2006). A recent report indicated that 85% of obstetricians in England and Wales stated that velamentous cord insertion is not routinely screened during anomaly scanning (Ioana and Wayne, 2010).

According to Pal (2013) in his Textbook of Histology, the umbilical cord extends between placenta and fetus. It brings the oxygenated blood

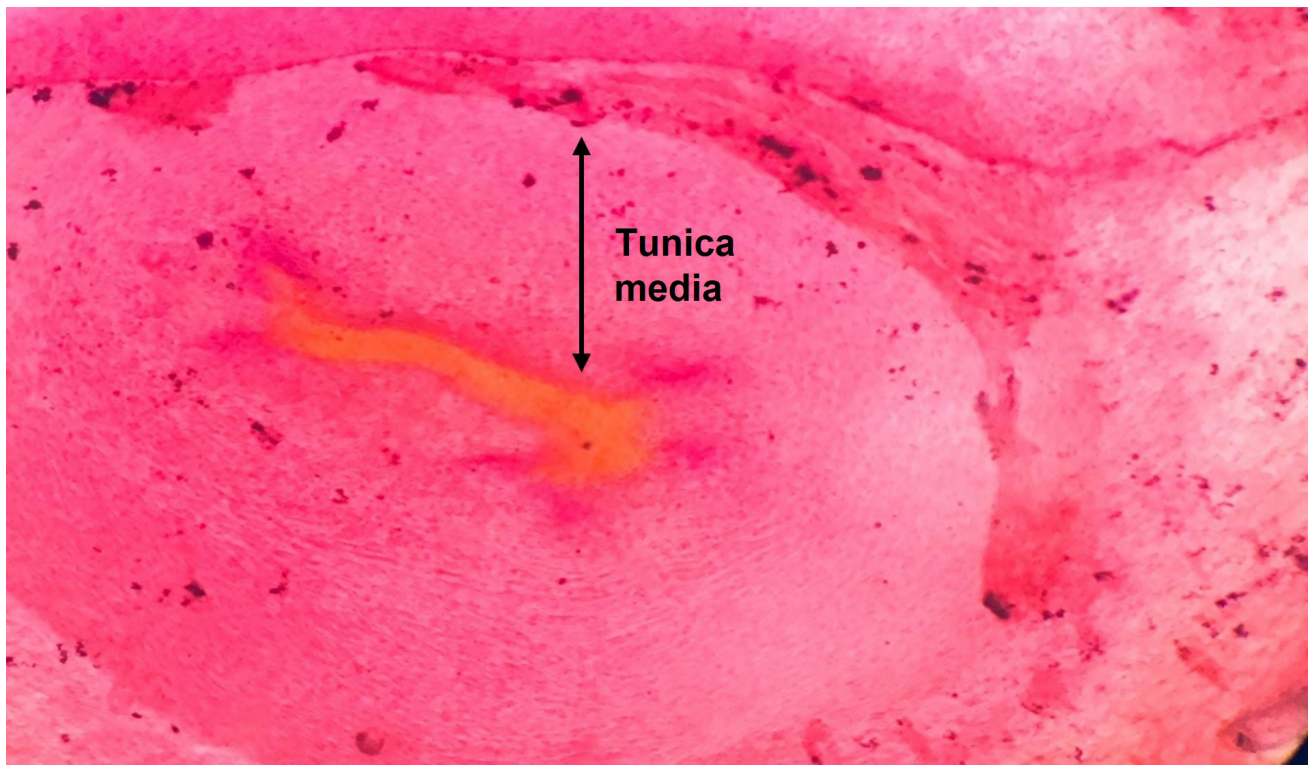


Fig. 2.- Slide of umbilical cord showing umbilical artery with thick tunica media.

from placenta to fetus through a single umbilical vein, and carries deoxygenated blood to placenta through two umbilical arteries. A cross-section of the umbilical cord shows the amniotic membrane covering the umbilical cord (Hasegawa et

al., 2006). Thus, the cord is lined by flattened amniotic epithelial cells (Pal, 2013).

Deep to epithelial lining, umbilical cord contains mucoid connective tissue (Wharton's Jelly). The Wharton's Jelly consists of highly branched fibro-



Fig. 3.- Slide of normal umbilical cord showing Wharton's Jelly.

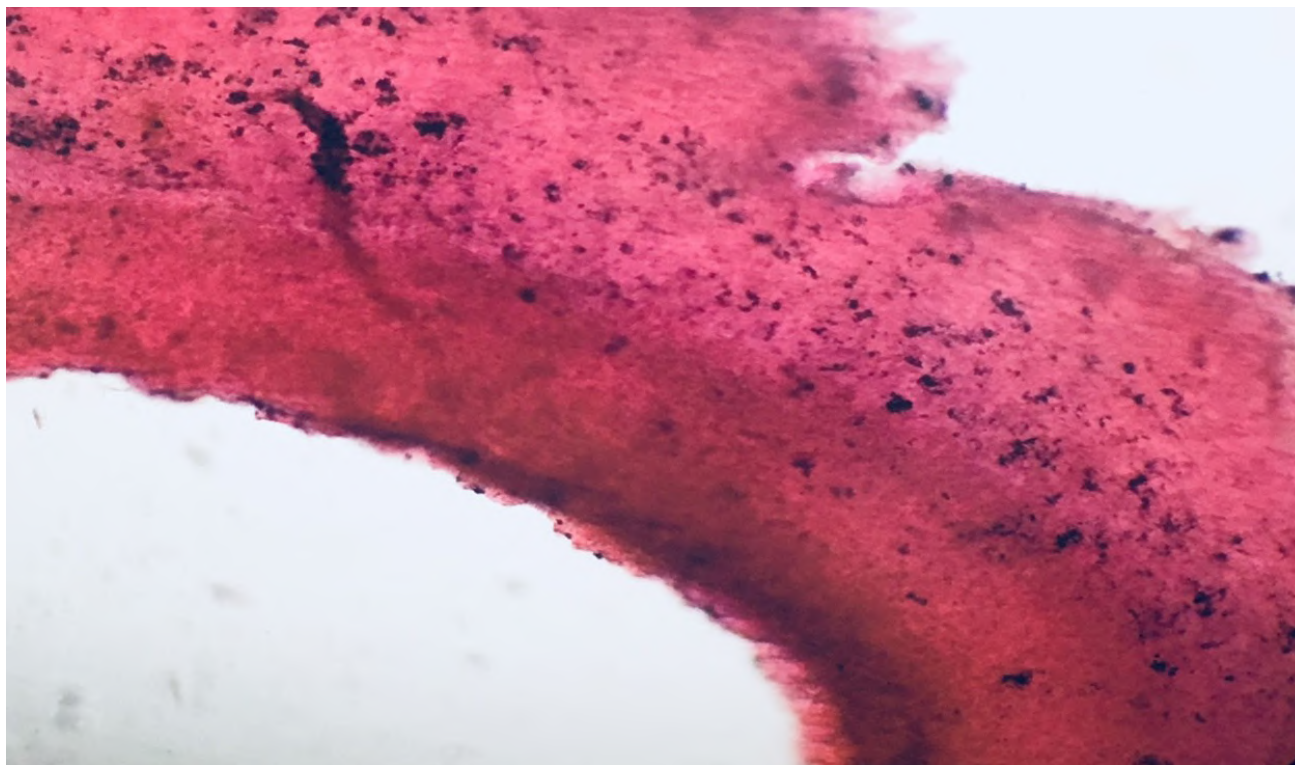


Fig. 4.- Slide of umbilical cord showing umbilical vein with thin tunica media.

blasts, collagen fibers and ground substance. The fibroblasts are widely separated from each other because of ground substance. In the connective tissue, there is presence of two umbilical arteries and one umbilical vein. The umbilical arteries are thick walled and show wavy internal elastic lamina and narrow lumen. The vein is thin walled with wide lumen (Pal, 2013).

Abnormal cord insertion is usually associated with adverse neonatal outcomes. In velamentous cord insertion, vessels from the umbilical cord run through part of the chorionic membrane rather than directly into the placenta. Thus, the blood vessels are not protected by Wharton's jelly within the cord, making fetal hemorrhage more likely to occur when the fetal membranes rupture (Antonette, 2022).

With the help of the present case study, the author tries to throw some light on the importance of pre-diagnosis of velamentous cord insertion. In this particular case, velamentous cord insertion was not identified prenatally, and it was diagnosed only during the intrapartum period. The author strongly recommends transvaginal ultrasound along with color Doppler scan in every pregnancy to avoid any unexpected consequences. On his-

tological evaluation, it was confirmed that Wharton's jelly was absent from the cord, which makes it more vulnerable to hemorrhage. Although this case had a favorable outcome, velamentous cord insertion must be ruled out in early gestation itself. Women diagnosed with velamentous cord insertion may be counseled about the condition and potential courses of action, including preterm delivery or caesarean section.

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