

Velamentous cord insertion - an important obstetrical risk factor

Abstract

A velamentous insertion of the umbilical cord is characterized by the atypical aspect of the placental end of the cord, consisting in divergent umbilical vessels surrounded by fetal membranes and with no Wharton's jelly present, resulting a cord that is inserted rather into membranes than the placental disk. By the divergence of the umbilical vessels as they travers the amnion and the chorion before reaching the placenta this condition associates important obstetrical complications and the diagnosis by ultrasonography as early is possible is important for the guidance of the subsequent management. In this retrospective study we aimed to evaluate the incidence of velamentous cord insertion in University Emergency Hospital of Bucharest for a period of five years and analyze the pregnancies outcome and the obstetrical impact of this condition. Using the statistics department of University Emergency Hospital Bucharest we determined an incidence of 0.23% of pregnancies complicated by velamentous cord insertion. The examined parameters included intrauterine fetal death, small for gestational age, preterm delivery (<37 weeks), single artery umbilical cord and low Apgar score at 1 minute. We chose to exemplify with a case of early diagnosis of this condition, respectively at 15 weeks of gestation. The attempt to visualize cord insertion in the mid-trimester as a routine part of obstetric sonography is recommended. The identification of velamentous cord insertion dictates the mode and timing of delivery and can improve fetal outcome

Keywords: cord insertion, mid-trimester, sonography

Introduction

Normally and physiologically the umbilical cord is inserted into the central portion of the placenta, abnormally variants of placental cord insertion are the edge of the placental disk or velamentous cord insertion.

A velamentous insertion of the umbilical cord is characterized by the atypical aspect of the placental end of the cord, consisting in divergent umbilical vessels surrounded by fetal membranes and with no Wharton's jelly present, resulting a cord that is inserted rather into membranes than the placental disk (Figure 1). By the absence of the Wharton's jelly protection, umbilical cord vessels are susceptible to compression and rupture, risk which is amplified if they are located in the membranes that covers the internal cervical ostium. This particular appearance of the placental insertion of the umbilical cord has been associated with several obstetrical complications such as fetal growth restriction, prematurity, placental abruption, vasa praevia, congenital anomalies and low Apgar score or even intrauterine fetal death⁽¹⁾.

With an occurrence of about 1 percent of singleton gestation and about 15 percent of monochorionic twin gestation⁽²⁾, the pathogenesis of this condition is still unknown. One of the hypothesis, based on the fact that velamentous cord insertion (VCI) occurs more common in placenta praevia than in normally located placentas, suggests that the centrally inserted cord initially is unable to follow the migration of the placenta, becoming progressively peripheral as one half of the

placenta proliferates toward the uterine fundus, and the other half involutes⁽³⁾. Association of velamentous marginal umbilical cord insertion with vasa praevia or praevia/low-lying, bilobed or succenturiate placental lobe is encountered in 90-95% of cases^(4,5). Other presumed risk factors are pregnancies obtained through assisted human reproduction techniques, regarded as amplifying the risk of developing velamentous cord insertion by 10 times, multiparous pregnancies and single artery umbilical cord⁽⁶⁾.

By the divergence of the umbilical vessels as they travers the amnion and the chorion before reaching the placenta this condition associates important obstetrical complications and the diagnosis by ultrasonography as early is possible is important for the guidance of the subsequent management. By ultrasonography this form of the placental insertion of the umbilical cord can be diagnosed with a sensitivity of 67% and a specificity of 100% in the second trimester^(7a), in the third trimester this condition is also reflected through variable decelerations and abnormal fetal heart rate variability in non-stress test.

The most reliable method is the real-time color Doppler transvaginal ultrasound examination, thus being able to emphasize the umbilical vessel pathway, which crosses the internal os or passes at less than 2 cm from it and the study of umbilical artery end-diastolic velocity.

On ultrasound can be observed the ending of the cord on several centimeters from the placenta that

**Monica Mihaela Cirstoiu^{1,2},
Natalia Turcan²,
Elvira Brătîlă^{1,3},
Octavian Munteanu^{1,2},
Oana Bodean²,
Diana Voicu²,
Roxana Elena Bohilțea^{1,2},
Simona Vladareanu¹**

1. "Carol Davila" University of Medicine and Pharmacy, Bucharest, Romania
2. University Emergency Hospital Bucharest, Romania
3. "St. Pantelimon" Clinical Emergency Hospital, Bucharest, Romania

Correspondence:
Dr. Roxana Bohilțea
e-mail: r.bohiltea@yahoo.com

Received:
May 06, 2016
Revised:
June 17, 2016
Accepted:
August 25, 2016

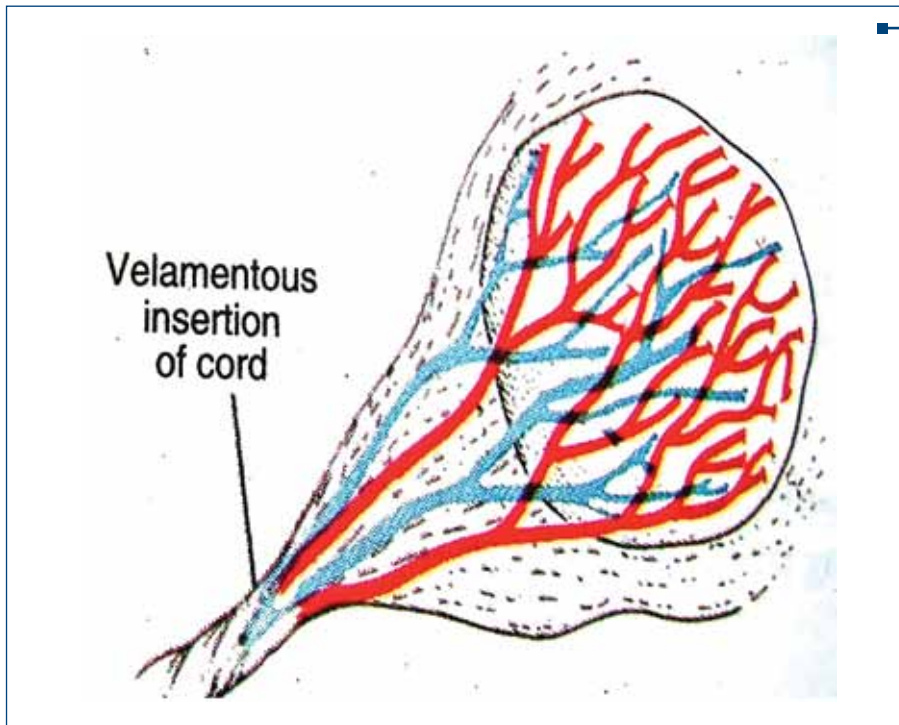


Figure 1. Schematic representation of the velamentous insertion of umbilical cord

most often occur at the margin of the placenta but the presence at the apex of the gestational sac is also possible. Typically, the umbilical vessels lie parallel to the uterine wall as they penetrate the placental pole. Although these are high percentages, and the possibility for intrapartum diagnosis of various pathological changes evolves daily, VCI is one of the most undiagnosed conditions in obstetrics^(7b, 8).

The American College of Radiology, the American Institute of Ultrasound in Medicine, and the American College of Obstetricians and Gynecologists⁽⁹⁾ do not recommend the evaluation of the placental insertion of the cord by routine but “the umbilical cord should be imaged, and the number of vessels in the cord should be evaluated when possible”⁽⁹⁾.

Regarding the management of pregnancies with VCI, Lockwood et al. in a recent published article⁽¹⁰⁾ recommends the following:

1. Detailed fetal anatomic survey, including evaluation for coexistent vasa praevia,
2. Serial assessment of fetal growth, every four to six weeks,
3. Fetal heart rate tracings weekly, beginning at 36 weeks of gestation, to look for recurrent variable decelerations from kinking or compression,
4. Counseling patients to call their providers as soon as labor begins,
5. Delivery by 40 weeks of gestation,

In this paper we aimed to evaluate the incidence of VCI in University Emergency Hospital of Bucharest for a period of five years and analyze the pregnancies outcome and the obstetrical impact of this condition.

Methods

In this retrospective study, 18 500 pregnancies were analyzed between January 1 2010 and July 1 2016, using the statistics Department of University Emergency Hospital Bucharest, of which, 43 were complicated by VCI.

The examined parameters included intrauterine fetal death, small for gestational age, preterm delivery (<37 weeks), single artery umbilical cord and low Apgar score at 1 minute.

Results

From 2010 to 2016, 18.500 women delivered at our Department.

The study group includes 43 (prevalence 0.23%) pregnancies that were diagnosed intrapartum or postpartum with VCI. Among the cases studied no cases of intrauterine fetal death was registered.

The smallest gestational age at birth was 30 weeks and 5 cases of birth at 40 weeks of gestation (Figure 2).

In over 50% of pregnancies complicated with VCI birth occurred at 38-39 weeks of gestation, and in 14 cases (32.54%) preterm birth was registered. For assessing the weight of newborns in accordance with gestational age we used international conventional values.

The highest recorded weight of a new born delivered at term of a pregnancy with velamentous insertion of the umbilical cord was 4050 g and the lowest weight of a delivered at term newborn was 2450 g. In preterm cases, the lowest weight was 1100 g at 31 weeks of gestation preterm newborn.

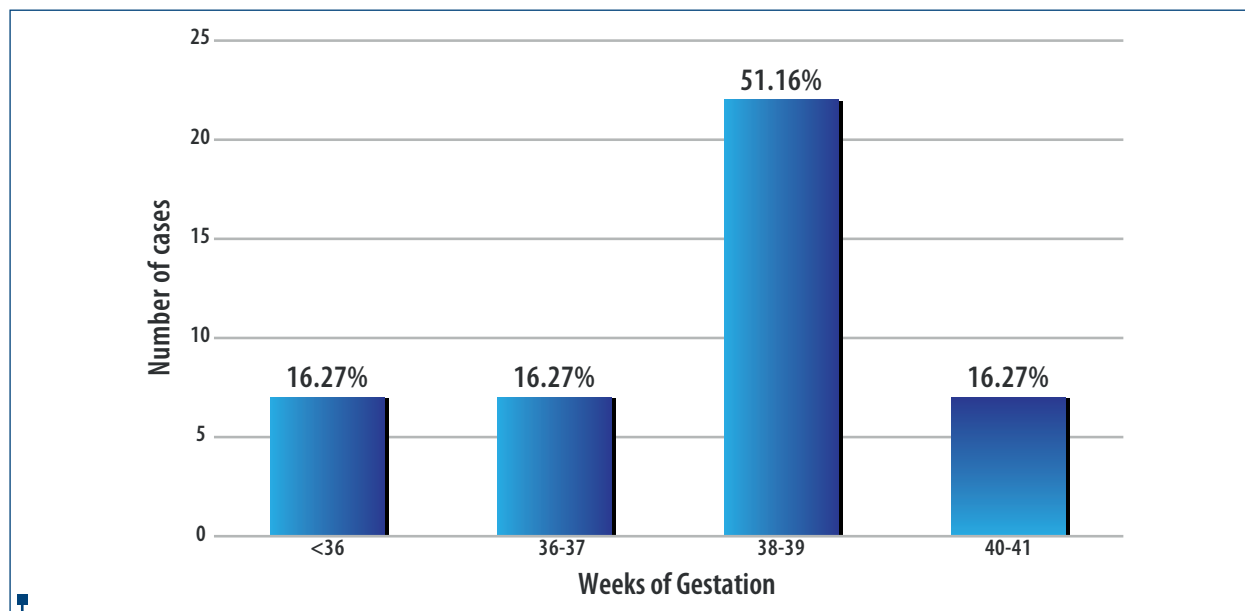


Figure 2. Classification by gestational age

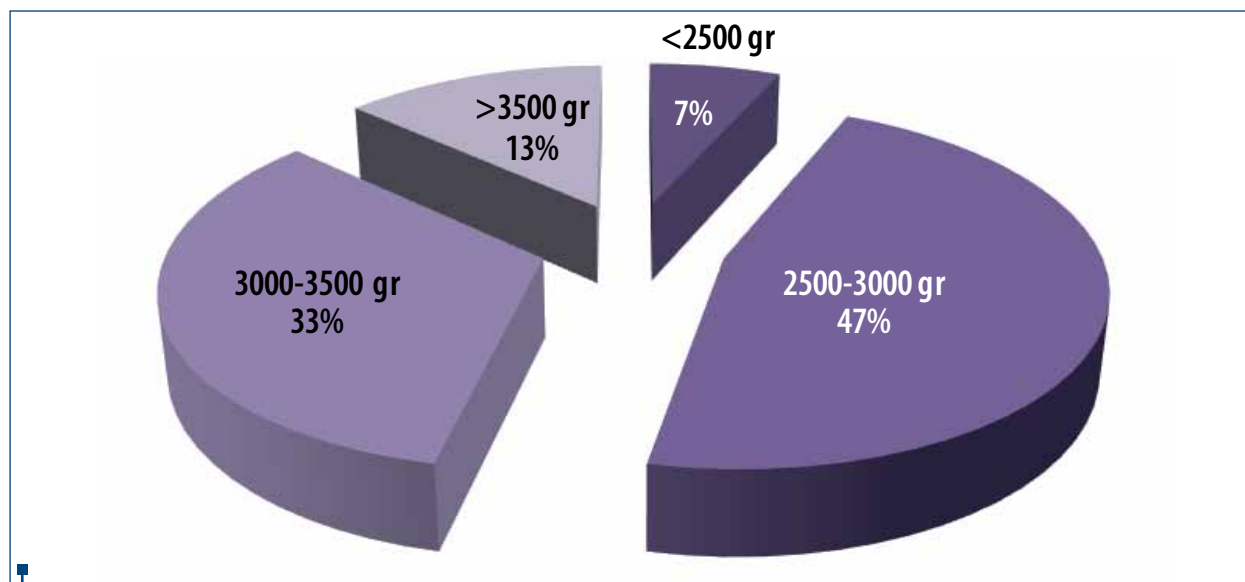


Figure 3. Delivery weight at term

Over 50% of the newborns delivered at 38 to 41 weeks of gestation weighed under 3000 g at birth (Figure 3).

All of preterm newborns had the delivery weight within the appropriate for gestational age limits (Figure 4).

In the course of studying the collected data, we noticed a slight predominance of single artery umbilical cord associated with VCI, respective 12 cases (27.9%) with VCI associated single artery umbilical cord, and the reason of this association is unknown.

The lowest value of the Apgar score at 1 minute was "3" and obtained by a 36 weeks of gestation new-

born with a 3000 g weight and the mother associated preeclampsia. Only 3 newborns at term received the maximal score at delivery. The lowest score for this category was 8.

Only 5 cases of natural delivery were registered (Figure 5), the Apgar score for all this cases was 8 and above.

Discussion

We report a case of velamentous insertion of the umbilical cord observed at 15 weeks gestation in a primiparous woman, with no significant antecedents, during a routine ultrasound scan (Figure 6). These

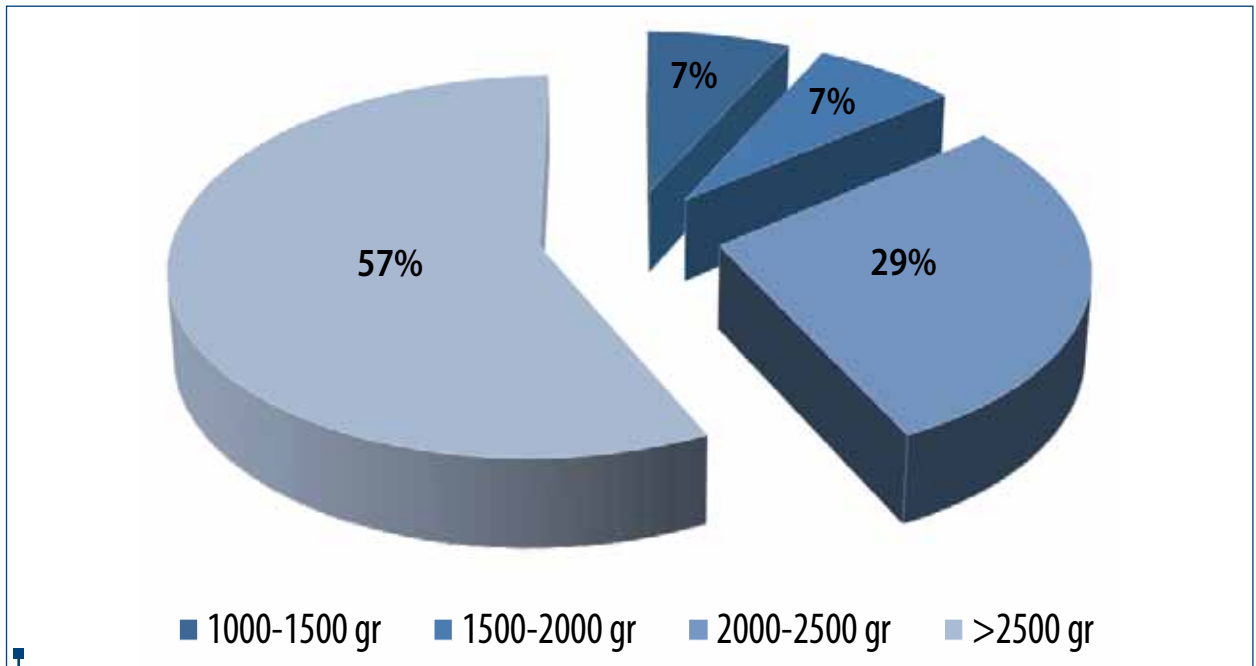


Figure 4. Delivery weight in preterm newborns

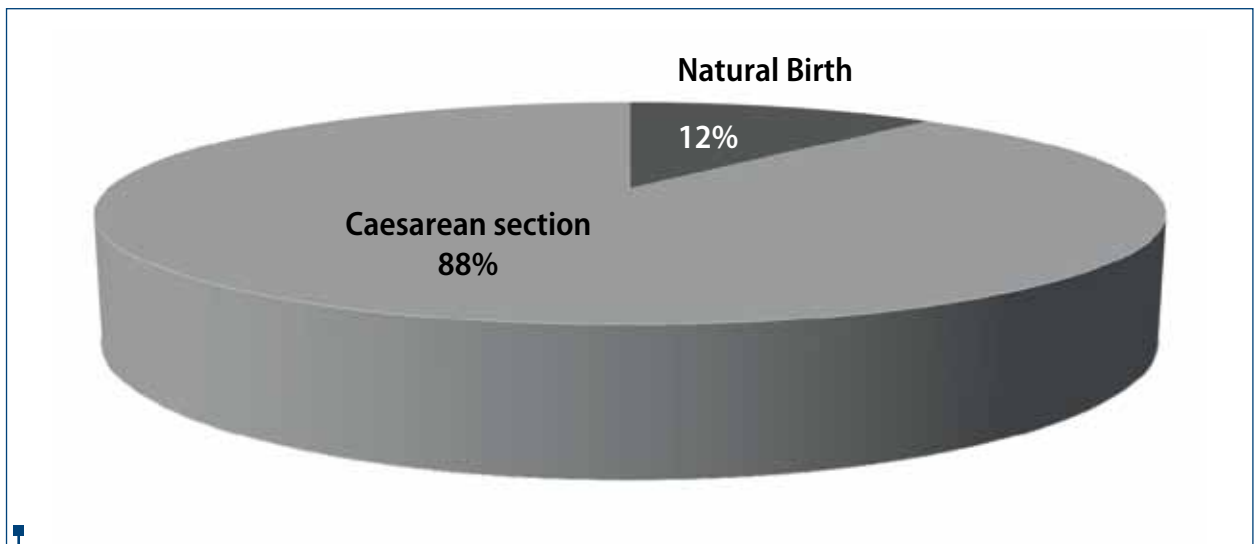


Figure 5. Type of delivery

findings placed this pregnancy to be one with high risk, requiring special monitoring. The suspected diagnosis was confirmed at 24 weeks of gestation, being associated with placenta praevia.

During this period on several ultrasound scans the placental insertion of the umbilical cord was not identified, this fact being specified on each pregnancy ultrasound.

The pregnancy had an uneventful course until 34 weeks of gestation, when the patient presented at the emergency room accusing painful uterine contractions.

In these conditions the patient was hospitalized for appropriate monitoring, investigations and tocolysis. Having a good general state and improved symptoms, the patient was discharged after three days.

She presents at the clinic at 36 weeks gestation with the same painful uterine contraction, losing blood vaginally on minimal amount. After one week of monitoring and tocolysis, in context of fetal distress, emergency caesarean section is decided and performed, extracting a feminine live fetus, of 2750 g with Apgar score at one minute of 9.

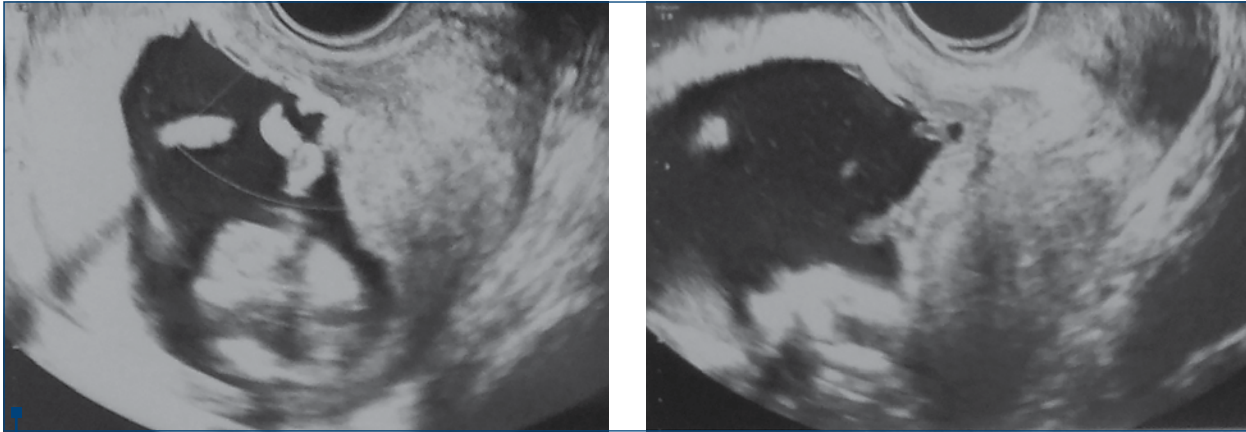


Figure 6. Ultrasound aspect of velamentous insertion of the umbilical cord, 15 weeks gestation

Macroscopically, the placenta presented areas of calcifications and the umbilical cord inserted into the chorioamniotic membranes (Figure 7). Post-surgery recovery was quick and uneventful.

In our study, the incidence of VCI corresponds with previously reported incidences⁽¹¹⁾. We chose to exemplify with a case of early diagnosis of this condition, respectively at 15 weeks of gestation.

The attempt to visualize cord insertion in the mid-trimester as a routine part of obstetric sonography is recommended.

The identification of VCI dictates the mode and timing of delivery and can improve fetal outcome⁽¹²⁾.

From our collected data we observed that mostly the pregnancies complicated with VCI reach to 38-39 weeks of gestation.

Prematurity cases presented as associated pathologies placenta previa, significant intrauterine growth restriction and pre-eclampsia.

As regards the weight of delivered fetuses, the proportion of the fetuses small for gestational age is low,

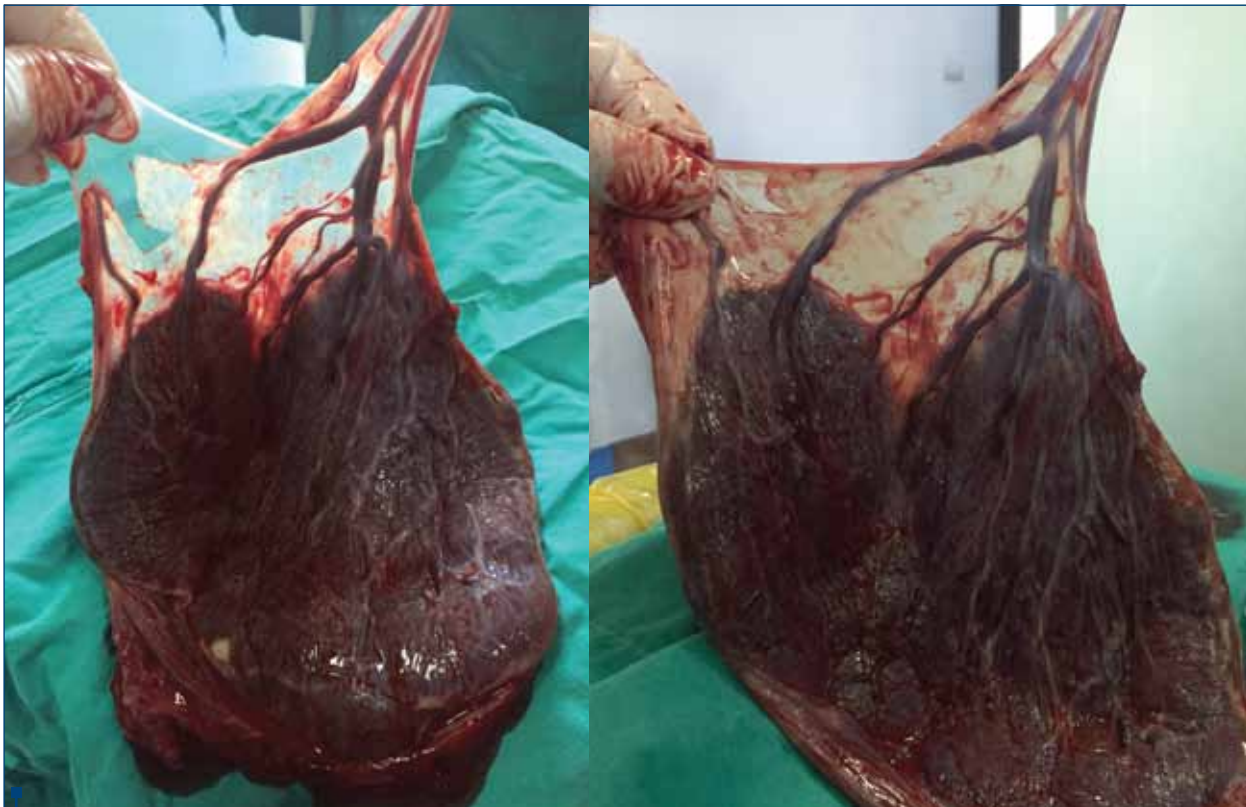


Figure 7. Macroscopic intraoperator aspect of velamentous insertion of umbilical cord

complying with reported data for fetuses resulted from pregnancies with normal insertion of the umbilical cord.

The type of delivery was preferential by caesarean section (88%). It is recommended that the obstetrician observe closely a pregnancy with VCI, paying attention to the presence of vasa previa. If vasa previa are present, the delivery way is recommended to be via caesarean section before the beginning of the labor, that is associated with a high infant mortality⁽¹³⁾.

Räisänen et al.⁽¹⁴⁾ in his study published in 2012 correlates maternal obesity and fertility problems with an increased incidence of VCI.

Conclusions

In our study we intended to determine the impact of this condition on the pregnancy course, remaining for the futures objectives to analyze the impact of the maternal risk factors. ■

References

1. Kent EM, Breathnach FM, Gillan JE et al. Placental cord insertion and birthweight discordance in twin pregnancies: results of the national prospective ESPRiT Study. *Am J Obstet Gynecol* 2011, 205, 376e1-376e7.
2. Lopriore E, Sueters M, Middeldorp JM, et al. Velamentous cord insertion and unequal placental territories in monochorionic twins with and without twin-to-twin-transfusion syndrome. *Am J Obstet Gynecol* 2007, 196,159.e1.
3. Kouyoumdjian A. Velamentous insertion of the umbilical cord. *Obstet Gynecol* 1980, 56, 737.
4. Lijoi AF, Brady J. Vasa previa diagnosis and management. *J Am Board FamPract* 2003, 16(6), 543-8.
5. Bronsteen R, Whitten A, Balasubramanian M. et al. Vasa previa: clinical presentations, outcomes, and implications for management. *Obstet Gynecol* 2013, 122(2 Pt 1), 352.
- 7a. Sinkey RG, Odibo AO, Dashe JS. Society of Maternal-Fetal (SMFM) Publications Committee.Diagnosis and management of vasa previa. *Am J Obstet Gynecol* 2015, 213(5), 615.
- 7b. Hasegawa J, Matsuoka R, Ichizuka K, Sekizawa A, Okai T. Velamentous cord insertion: significance of prenatal detection to predict perinatal complications. *Taiwanese Journal of Obstetrics and Gynecology* 2006, 45(1), 21-5.
- 8.Kouyoumdjian A. Velamentous insertion of the umbilical cord. *Obstet Gynecol* 1980, 56(6), 737-42.
- 9.http://www.acr.org/SecondaryMainMenuCategories/quality_safety/guidelines/us_obstetrical.aspx (Accessed on February 08, 2012).
10. Lockwood C, Russo-Stieglitz K et al. Velamentous umbilical cord insertion and vasa previa. uptodate.bidmc.org 2016.
11. Kouyoumdjian A. Velamentous insertion of the umbilical cord. *Obstet Gynecol* 1980, 56, 737-42.
12. Nomiya M, Toyota Y, Kawano H. Antenatal diagnosis of velamentous umbilical cord insertion and vasa previa with color Doppler imaging. *Ultrasound Obstet Gynecol* 1998, 12, 426-9.
- 13.Hasegawa J, Matsuoka R, Ichizuka K, Sekizawa A, Okai T. Velamentous cord insertion: significance of prenatal detection to predict perinatal complications. *Taiwan J Obstet Gynecol* 2006, 45 (1), 21-5.
14. Räisänen S, Georgiadis L, Harju M et al. Risk factors and adverse pregnancy outcomes among births affected by velamentous umbilical cord insertion: a retrospective population-based register study. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 2012, 165(2), 231-4.