



## Original Research Article

## The incidence of structural anomalies in term placentae and umbilical cords of parturients: A gross and microscopic study

Srividya Sreenivasan<sup>1,\*</sup>, Satyam Khare<sup>2</sup>, Manisha Nakhate<sup>1</sup>

<sup>1</sup>Dept. of Anatomy, Dr. D Y Patil Medical College, Navi Mumbai, Maharashtra, India

<sup>2</sup>Dept. of Anatomy, Subharti Medical College, Uttar Pradesh, India



## ARTICLE INFO

## Article history:

Received 11-07-2019

Accepted 02-09-2019

Available online 12-10-2019

## Keywords:

Succenturiate lobe

Dilated umbilical vein

Single umbilical artery

Velamentous insertion

## ABSTRACT

**Introduction:** Examination of the placenta after the third stage of labour, is something oft mentioned in textbooks but often neglected in the clinical setting. Placental examination can give the clinician important insights as to events and exposures the fetus has been subjected to in –utero.

**Aims & Objectives:** To assess the incidence of anomalies observed in term placentae and umbilical cords of parturients in a teaching hospital.

**Design:** We collected term placentae from parturients in the labour ward, and subjected them to a thorough gross examination with a view to pick up anomalies. We subjected the umbilical cord to histologic examination in cases where an anomaly in the cord was detected on gross examination.

**Participants:** Placentae of 92 term parturients.

**Setting:** Anatomy department of a Medical College in Western Uttar Pradesh, India. Main Outcome Measure: To report the incidence of placental and cord anomalies.

**Results:** We found 1 succenturiate lobe of placenta, one dilated umbilical vein, one case of single umbilical artery and 2 velamentous insertions of the umbilical cord (both as one of the two in a monochorionic diamniotic twin pregnancy).

**Conclusion:** Anomalies of the placenta and umbilical cord were observed in 5.43% of parturients. Our study emphasises the importance of careful observation of the umbilical cord and placenta after delivery.

© 2019 Published by Innovative Publication.

### 1. Introduction

In the Old Testament, the placenta was considered as the external soul, and sometimes was described as being tied up in the so called “ bundle of life” , which probably included the umbilical cord. This is almost prophetic in the light of current knowledge. The characteristic placenta is discoid with a centrally inserted umbilical cord.

Anomalies of the placenta may be with respect to shape of the disc, number of lobes, accessory or succenturiate lobes, and anomalous implantation. There may be an anomalous placental site insertion of the umbilical cord. The cord insertion is considered anomalous if it is marginal (within 2 cm from the placental margin) or velamentous (membranous insertion). The normal umbilical cord measures between 40 to 70 cm in length at term (Heifetz

1996; Benirschke *et al*, 1990; Kaplan 1996).<sup>1-3</sup> The umbilical cord may be unduly long or short. It may have true or false knots. There may be anomalies with respect to the vessels in the cord. Single umbilical artery is the most common anomaly of the umbilical cord reported with an incidence of 0.2-1.1% in singleton and 4-11% in twin pregnancies; while dilated umbilical vein has scant mention in literature (Klatt *et al*, 2012).<sup>4</sup> Most anomalies are incidental findings and do not have clinical significance. However, a bout 15.4% of SUA (single umbilical artery) is associated with major structural or chromosomal abnormality in the newborn (Friebe-Hoffmann *et al*, 2019).<sup>5</sup>

A velamentous insertion of cord (VCI) could manifest as variable decelerations on NST (non-stress test) suggesting fetal distress due to compression of the vessels in labour. A detached succenturiate lobe could cause post-partum

\* Corresponding author.

E-mail address: [srividyasreenivasan@yahoo.com](mailto:srividyasreenivasan@yahoo.com) (S. Sreenivasan).

haemorrhage.

## 2. Aim and Objectives

To observe and report the incidence of structural placental and umbilical cord anomalies in a cohort of 92 term parturients, delivered in a teaching hospital in Western Uttar Pradesh, India.

## 3. Materials and Methods

92 term placentae donated to the department of Anatomy were subjected to a detailed gross examination, along with examination of the umbilical cord. Relevant history was taken and fetal outcome recorded. The umbilical cord was subjected to histological examination as well, if a structural anomaly was observed on gross examination.

### 3.1. Inclusion criteria

Placentae of 92 consecutive term parturients who consented to donate their placenta for examination after delivery.

### 3.2. Exclusion criteria

Placentae of preterm deliveries.

## 4. Results

We received 86 placentae of singleton pregnancies, and 6 placentae of twin pregnancies. We observed one case of dilated umbilical vein (average diameter 9.32 mm) (Figures 1, 2 and 3), one case of SUA associated with meningocoele in the baby (Figures 4 and 5), 2 umbilical cords with velamentous insertion (VCI), both seen as one of the 2 cords in a monochorionic diamniotic twin placenta. In one case of VCI, the umbilical cord was inserted in the membrane beyond the placental disc margin, and the blood vessels could be seen traversing the membrane, before reaching the disc (case 1) (Figure 6). In the other case of VCI, one of the umbilical cords was inserted onto the septal membrane (case 2) (Figure 7). Case 1 with VCI had 30% difference in umbilical cord diameter of the 2 twins and they showed 20% discordance in birth-weight. Case 2, showed 28% and 25% discordance respectively in umbilical cord diameter and birth weight of the twins. The cord having velamentous insertion having lesser diameter, and the corresponding twin having lower birth-weight in both cases. We found a succenturiate lobe of placenta in one case (Figure 8).

We therefore report an incidence of 1.08 % for dilated umbilical vein, single umbilical artery, and succenturiate lobe of placenta. We report an incidence of 2.17% for velamentous insertion of umbilical cord.



**Fig. 1:** Internal diameter of umbilical vein –measured with vernier calliper.

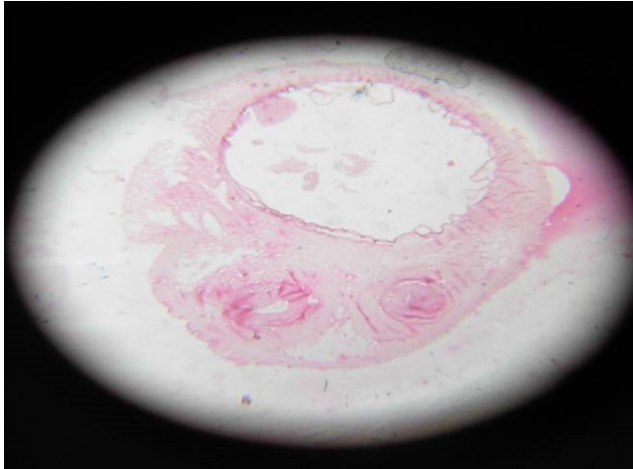


**Fig. 2:** Dilated umbilical vein seen in transverse section of umbilical cord

## 5. Discussion

The umbilical vein in the umbilical cord of the neonate is 4-5mm in diameter when passively distended (Standring, 2016).<sup>6</sup> Before birth there is sub-intimal proliferation of connective tissue in the umbilical vein. This combined with contraction of the umbilical vein on severance of the cord (to a lesser extent than the arteries) is responsible for the effective reduction in diameter of the umbilical vein at birth.

Increase in diameter of the umbilical vein has been reported in a case of placental chorioangioma due to volume



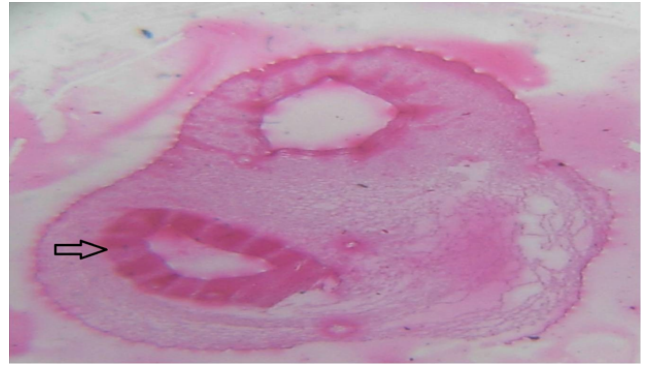
**Fig. 3:** Photomicrograph of umbilical cord showing dilated umbilical vein (dv) (H&E 4x)



**Fig. 4:** Section of umbilical cord showing single umbilical artery

overload in the fetus (Mara *et al*, 2002).<sup>7</sup> It has also been reported in a study performed by Singh SD (1986) on gestational diabetics possibly due to endothelial damage in the umbilical vein.<sup>8</sup> There is also degeneration of smooth muscle fibers in the tunica media of umbilical vein in these cases. We were not able to pin-point the possible cause of dilatation of the umbilical vein in our case.

SUA is characterised by absence of one of the umbilical arteries. It may occur due to one of the 3 aberrations occurring during development: a. Primary agenesis; b.



**Fig. 5:** Photomicrograph of umbilical cord showing single umbilical artery (→) (H&E4x)

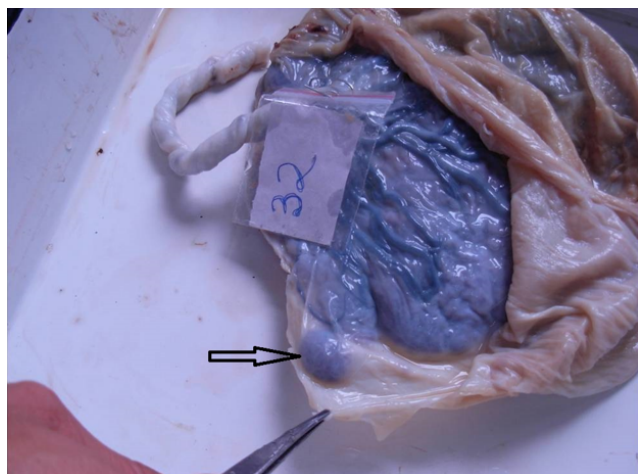


**Fig. 6:** Velamentous insertion of umbilical cord showing cord insertion in membrane, and vessels traversing membrane to reach placental disc.



**Fig. 7:** Velamentous insertion of umbilical cord, showing septal insertion





**Fig. 8:** Succenturiate lobe of placenta (→)

Secondary atrophy of a developed artery or c. Due to persistence of original allantoic artery of the body stalk. The presence of occluded remnants of the 2<sup>nd</sup> umbilical artery in some fetuses has led researchers to believe that the secondary atrophy theory is the most likely explanation (Heifetz, 1984; Monie, 1970; Nyberg *et al*, 1991).<sup>9–11</sup> According to Heifetz (1996) SUA has an incidence of 0.2–1.1% in singleton pregnancies.<sup>1</sup> Kondi-Pafiti *et al* (2011) reported an incidence of SUA as 1.6%.<sup>12</sup> Lynn Murphy Kaulbeck *et al* in 2010 reported an incidence of SUA as 0.44%.<sup>13</sup> Nyberg *et al* in 1991 reported an incidence of single umbilical artery as 0.2–1%.<sup>11</sup> The incidence of SUA in our cohort of singleton pregnancies is 1.16% which is comparable to the incidence reported in literature. SUA is associated with structural anomalies in the cerebrum in about 2.1% of cases (Friebe-Hoffmann *et al*).<sup>5</sup> In our case, the presence of single umbilical artery in the umbilical cord was associated with meningocele in the baby. In fact, assessment of the number of cord vessels during the 12th week ultrasound is useful because SUA can be considered a marker of fetal malformations diagnosable at this gestational age (Cristina Martínez-Payo *et al*, 2014).<sup>14</sup> The obstetrician should count the number of blood vessels near the fetal end of the cord or in the middle third of the cord, because the vessels are sometimes fused near the placental end and difficult to differentiate (Yetter, 1998).<sup>15</sup>

Velamentous insertion of the umbilical cord (VCI) is found in about 1% of singleton pregnancies (Baergen, 2011).<sup>16</sup> Robinson *et al* (1983) reported incidence of VCI as 1.53% in 4677 consecutive placentae examined by them.<sup>17</sup> VCI is 8 times more common in twin pregnancies, with doubling of the incidence in monozygotic twins, and triple the incidence in twin pregnancies complicated by IUGR (intra-uterine growth restriction) (Hubinont *et al*, 2015).<sup>18</sup> Malinowski (2003) reported VCI in 15.9% of monozygotic twin pregnancies.<sup>19</sup> We have reported VCI in 33% of our twin pregnancies, (the ratio of

monozygotic: dizygotic being 1:3) in our study. This could be explained by the fact that both our cases were monozygotic diamniotic twin pregnancies showing significant discordance in both umbilical cord diameter and birth weight. This finding, corroborates the conclusion reached by Kalafat *et al* (2018) that VCI in monozygotic twin pregnancies, is associated with an increased risk of birth weight discordance.<sup>20</sup>

Succenturiate lobe of placenta is reported in approximately 5% of pregnancies (Benirschke *et al* 2000).<sup>21</sup> This is way above the incidence observed by us, for which we do not have an explanation.

## 6. Conclusion

Anomalies of the placenta and umbilical cord were observed in 5.43% of parturients. Our study emphasises the importance of careful observation of the umbilical cord and placenta after delivery. A limitation of this study is its sample size. A larger sample size would give us a more accurate incidence of placental anomalies in the population under consideration.

## 7. Source of funding

None.

## 8. Conflict of interest

None.

## References

1. Heifetz SA. The umbilical cord: obstetrically important lesions. *Clin Obstet Gynecol.* 1996;39:571–587.
2. Benirschke K, Kaufmann P. Pathology of the human placenta. New York: Springer-Verlag; 1990., p. 183–185. 2nd ed.
3. Kaplan CG. Postpartum examination of the placenta. *Clin Obstet Gynecol.* 1996;39:535–548.
4. Klatt J, Kuhn A, Baumann M, Raio L. Single umbilical artery in twin pregnancies. *Ultrasound Obstet Gynecol.* 2012;39:505–509.
5. Hoffmann U, Hiltmann A, Friedl T, Lato K, Hammer R, *et al*. Prenatally Diagnosed Single Umbilical Artery (SUA) - Retrospective Analysis of 1169 Fetuses. *Ultraschall Med.* 2019;40(2):221–229.
6. Standring S, Anatomy G. The Anatomical basis of Clinical Practice. New York: Elsevier; 2016., 41st ed.
7. Mara M, Calda P, Zizka Z, Sebron V, Eretova V, *et al*. Fetal anemia, thrombocytopenia, dilated umbilical vein, and cardiomegaly due to a voluminous placental chorioangioma. A case report. *Fetal Diagn Ther.* 2002;17(5):286–292.
8. Singh SD. Gestational diabetes and its effect on the umbilical cord. *Early Hum Dev.* 1986;14(2):89–98.
9. Single umbilical artery: a statistical analysis of 237 autopsy cases and review of the literature. *Perspect Pediatr Pathol.* 1984;8:345–378. Heifetz SA.
10. Monie IW. Genesis of single umbilical artery. *Am J Obstet Gynecol.* 1970;108(3):400–405.
11. Nyberg DA, Mahony BS, Luthy D, Kapur R. Single umbilical artery: prenatal detection of concurrent anomalies. *J Ultrasound Med.* 1991;10(5):247–253.
12. Kondi-Pafiti A, Kleantithis KC, Mavrigiannaki P, Iavazzo C, Bakalianou K, *et al*. Single Umbilical Artery: Fetal and Placental

- Histopathological Analysis of 24 cases. *Clin Exp Obstet Gynecol.* 2011;38(3):214–216.
13. Murphy-Kaulbeck L, Dodds L, Joseph KS, den Hof MV. Single Umbilical Artery risk factors and Pregnancy outcomes. *Obstet Gynecol.* 2010;116(4):843–850. Michiel Van den Hof.
  14. Martnez-Payo C, Cabezas E, Nieto Y, de Aza MR, Garca-Benasach F, Iglesias E. Detection of Single Umbilical Artery in the First Trimester Ultrasound: Its Value as a Marker of Fetal Malformation. *BioMed Res Int.* 2014;2014:548729–548729.
  15. Yetter JF. Examination of the Placenta. *Am Fam Physician.* 1998;57(5):1045–1054.
  16. Baergen RN. Pathology of the Umbilical Cord. Manual of Pathology of the Human Placenta. New York: Springer Science & Business Media ; 2011., p. 16–16. 2nd ed.
  17. Robinson LK, Jones KL, Benirschke K. The nature of structural defects associated with velamentous and marginal insertion of the umbilical cord. *Am J Obstet Gynecol.* 1983;146(2):191–193.
  18. Hubinont C, Lewi L, Bernard P, Marbaix E, Debieve F, Jauniaux E. Anomalies of the placenta and umbilical cord in twin gestations. *Am J Obstet Gynecol.* 2015;213(4):91–102.
  19. Malinowski W. Umbilical cord complications in twin pregnancies. *Ginekol Pol.* 2003;74(10):1208–1212.
  20. Kalafat E, Thilaganathan B, Papageorghiou A, Bhide A, Khalil A. The Significance of Placental cord insertion site in twin pregnancy. *Ultrasound Obstet Gynecol.* 2018;52(3):378–384.
  21. Benirschke K, Kaufmann P. Placental shape aberrations. Pathology of the Human Placenta. New York: Springer-Verlag ; 2000., p. 399–414.

### Author biography

**Srividya Sreenivasan** Assistant Professor

**Satyam Khare** Professor and Head

**Manisha Nakhate** Professor and Head

**Cite this article:** Sreenivasan S, Khare S, Nakhate M. The incidence of structural anomalies in term placentae and umbilical cords of parturients: A gross and microscopic study. *Indian J Clin Anat Physiol* 2019;6(3):348-352.