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Original Research Article

Evaluation of role of umbilical cord anomalies in fetal death-An institutional experience

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ABSTRACT

Introduction: Umbilical cord plays pivotal role in development and well-being of fetus. Any abnormality in the umbilical cord can affect the viability of the fetus. In spite of present antenatal diagnostic modalities still fetal autopsy plays a vital role in identification and confirmation of the abnormalities which lead to intrauterine fetal death.
Aim: To check for incidence of variety of cord abnormalities in perinatal fetal deaths.
Materials and Methods: It is a retrospective observational study of 26 cases of perinatal deaths due to cord abnormalities taken from Jan 2013 to July 2021 in tertiary care center.
Results: In the study 26 cases of fetal autopsy were included over a period of nine years. Mean maternal age was 26 years. 12 cases (44.3%) were of vessel number defects. In which 11 were two vessel cords and the other was 5 vessel cord, 14 cases showed short cord. 8 cases showed normal cord length. 4 cases showed long cords. True knots were seen in one case. 3 cases (28%) were involving stenosed cords. and 5 cases (28.4%) were of supercoiling 3 twisted cords. Maternal co-morbidities were present in 3 cases.
Conclusion: Umbilical cord anomaly is a major stress factor for fetus playing a key role in feto-maternal perfusion. Cord abnormalities can be clinically insignificant or can be severe leading to foetal death. The present study reemphasizes the importance of umbilical cord and its impact on wellbeing of foetus. Thus there is need to develop special and exclusive antenatal screening for umbilical cord abnormalities needs further research.

1. Introduction

The umbilical cord is an important vascular appendage in the fetal well-being. It is the main portal for entry and exit of blood from the placenta to the fetus during intrauterine life. Fetus is a product of conception. Any abnormality in the umbilical cord can affect the viability and growth of the fetus. Fetal death is defined as death prior to the complete extraction or expulsion from uterus. Perinatal deaths due to umbilical cord abnormality occurs when blood flow through the cord is compromised sufficiently to cause death. Routine antenatal screening modalities aim at detecting the fetal abnormalities rather than placenta and cord anomalies. Understanding the contribution of umbilical cord abnormalities to prenatal deaths is important. Abnormal cord parameters associate with high rate of asphyxia during intrapartum, fetal anomalies challenges fetal survival, respiratory distress, fetal growth restriction and delivery interventions. This study aims to evaluate the role of umbilical cord anomalies in perinatal mortality and to find the incidence of cord anomalies in fetal autopsies.[1–3]

2. Materials and Methods

It is a retrospective observation study done at Kamineni Academy of Medical Sciences and Research Centre from

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Jan 2013 to May 2021. We received 26 cases associated with cord abnormalities out of total 81 fetal autopsies. Brief maternal details, prenatal ultrasound scans were correlated. The autopsies were performed as per standard procedure and findings were recorded. Routine anthropometric measurements, detailed external and internal examination of fetus and placenta was done. Detailed examination of the umbilical cord was done which included length, diameter, insertion into placental disc, coiling and presence of true or false knots. On cut section number of vessels, presence of thrombi, Wharton's jelly, presence of any lesions was examined. Representative sections of the cord, one from the fetal end and one from the placental end were taken. Additional sections were taken if cord showed any abnormalities like presence of thrombi, stenosis etc., Routine H&E staining was done. Rest of the autopsy was done as per standard guidelines.

3. Results

In this study we received 81 fetuses for autopsy over a period of 9 years, out of which 26 cases had umbilical cord anomalies. Majority of cases were reported in second trimester followed by third trimester. First trimester cases are not considered in our study as per MTP Act and fetuses in first trimester are too small to observe grossly.

Majority (76.9%) out of 26 cases were reported in second trimester followed by 6(23.1%) cases were reported in third trimester. 24(92.3%) autopsies were singleton gestations one was of twin gestation, and both twin fetus showed cord abnormalities. 14(53.8%) cases were seen primigravid mothers and 11(42.3%) cases were of multigravida. 9(34.6%) out of multigravida cases showed recurrent abortions.

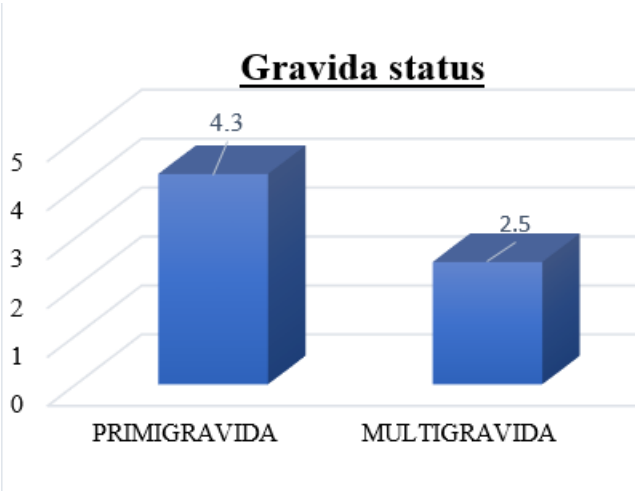

Chart 1: Gravida status

Maternal age of mothers of fetuses showing cord anomalies were in between 20-25 years 14(53.8%),

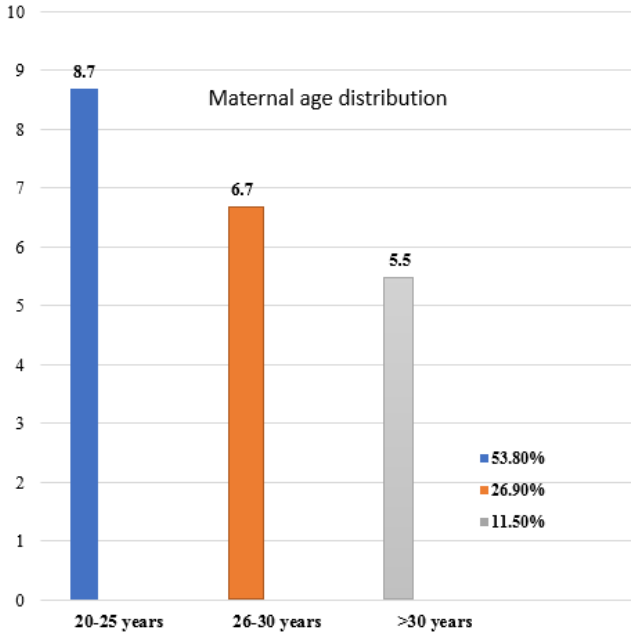

Chart 2: Maternal age distribution

7(26.9%) in between 26-30 years and 3(11.5%) above 31 years of age.

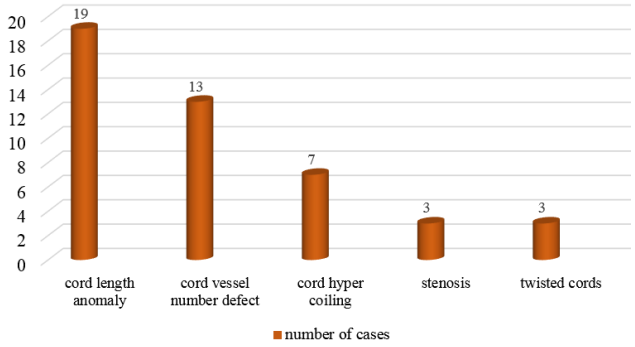

Chart 3: Incidence of umbilical cord anomalies

Most common anomaly in our study was length anomaly,14 (53.8%) cases showed short cord. 8(30.7%) cases showed normal cord length (average 50-60cm). 4(15.3%) cases showed long cords. True knots were seen in one case (3.8%). There were 13(50%) cases of cord vessel number defects in which majority that is 12(46.1%) showed 2 vessels cord of which one is vein and one is artery. Only 2 cases showed either two arteries or two veins. One case (3.8%) showed 5 vessel cord one artery and four veins. 11(42.3%) cases of vessel number defect cases showed other associated organ anomalies such as imperforate anus, cystic dysplasia of kidneys, cardiac, cerebellum anomalies, cystic hygromas respectively.

Fig. 1: Gross image of hyper coiled cord

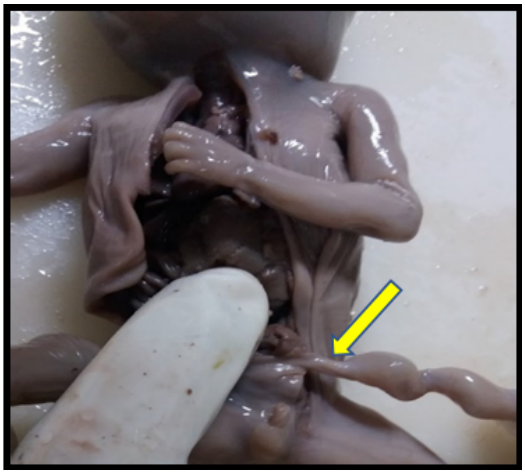

Fig. 2: Gross image of stenosed cord

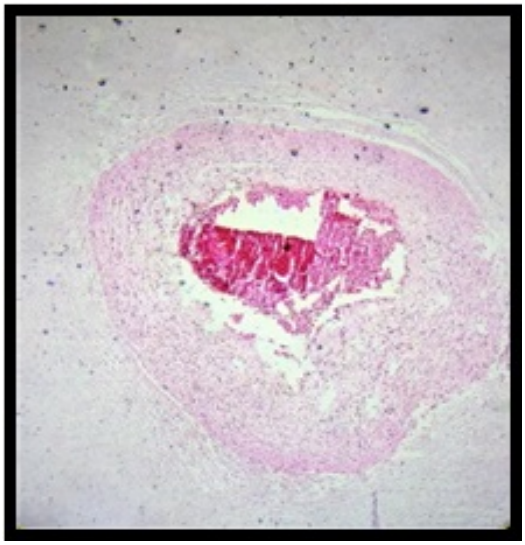

Fig. 3: H&E Section showing thrombosed vessel at 40x10 magnification.

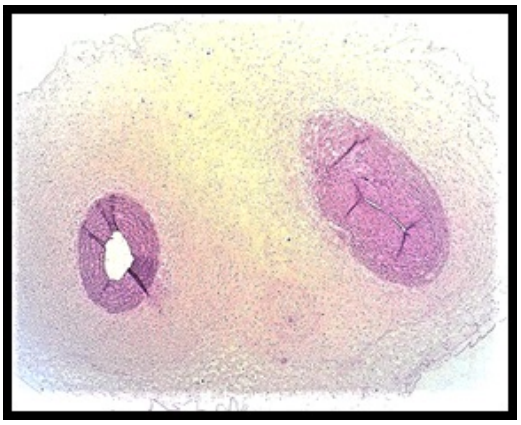

Fig. 4: H&E Section showing two vessel cord at 4x10 magnification.

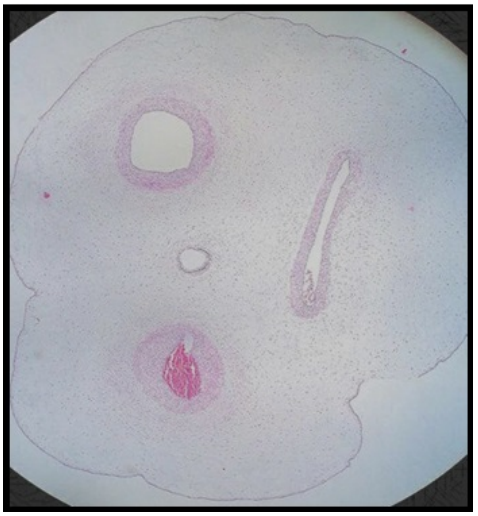

Fig. 5: Showing 4 vessel umbilical cord in H&E at 4x10 magnification.

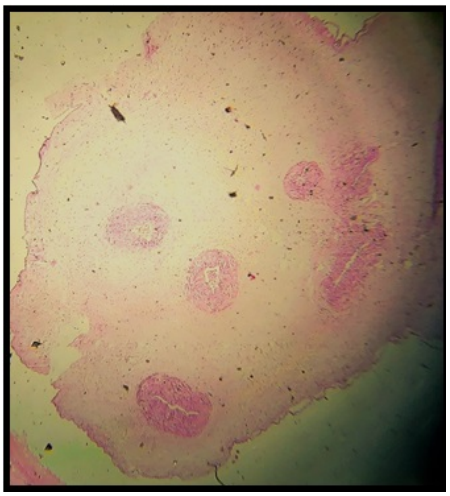

Fig. 6: Showing 5 vessel umbilical cord with thrombus in H&E at 4x10 magnification.

Table 1:

Number of vessels present	Number of cases	Other anomalies present
2 vessel cord	1	Hypoplastic kidney
2 vessel cord	2	Multi cystic kidney changes
2 vessel cord	3	Abdominal and chest wall defects
2 vessel cord	1	Super coiling
2 vessel cord	1	Absent anal orifice and absent pancreas
4 vessel cord	1	Hypoplastic kidney and absent bladder
5vessel cord	1	Absent left kidney and hydrocephalus
2 vessel cord	1	Hydrocephalus
Total	11	

5(19.2%) cases were of supercoiling, 3(11.5%) twisted cords and another 3(11.5%) cases showed stenosed cords. One case of stenosed cord associated with situs inversus. True knots were present in 1 case (3.8%). Amniotic band syndrome was present in 1 case. Vestigial remnants were absent in cord study in our 26 cases. 15(57.6%) fetuses showed male gender 9(34.6%) showed female gender and 2(7.6%) showed ambiguous genitalia.

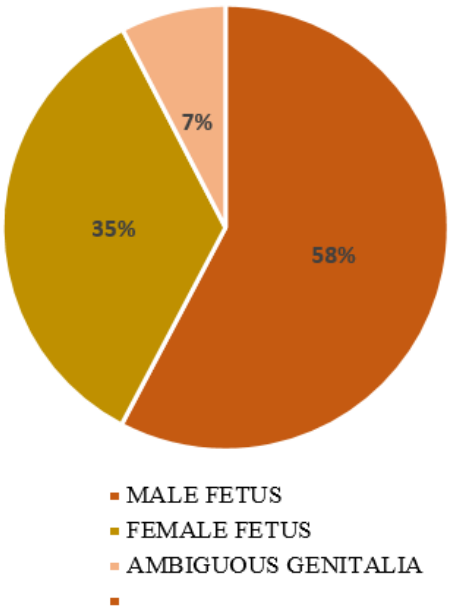

Fig. 7: Gender distribution

4. Discussion

The umbilical cord is the conduit between fetus and the mother's placenta. It supplies nutrients and oxygen to the developing baby, hence any abnormality in umbilical cord will affect the development, well being and growth of the fetus.[4] The umbilical cord contains three blood vessels: two arteries and one vein. The umbilical arteries carry deoxygenated blood whereas oxygenated blood is carried to the fetus through the umbilical vein.[5]

Umbilical cord abnormalities can be varied from cord prolapse, compression, entanglements, thrombosis, rupture of blood vessels, number of blood vessels are some, which can cause fetal death.[5]

Advanced maternal age is usually associated with several outcomes throughout pregnancy. However, as shown in our study there was no correlation between advanced maternal age and umbilical cord abnormalities. Whereas a study done by Vanda F. Torous stated that advanced maternal age is associated with high frequency of fetal vascular malformations.[6,7]

Normal umbilical cord measured 30-70 cm long.[8] Less than 30 is denoted as short cord and more than 70cm is said to be long cord. Cord length has a positive correlation with birth weight. But long cords may be directly associated with poor fetal outcome and umbilical cord accidents such as entanglements, multiple knot formation and torsion. Yadav, et al.[9] found high perinatal mortality associated with long cords. As the incidence of long cords was very low in our study it is not appropriate to comment on the associated abnormalities of long cords. Georgiadis et al.[9] and Becall stated that short cord were associated with abruptio where as in our study there was no evidence of abruptio although most of our cases were associated with short cords.

About 1 percent of singleton and about 5 percent of multiple pregnancies (twins, triplets or more) have an umbilical cord that contains only two blood vessels, instead of the normal three. The cause of this abnormality, called single umbilical artery, is unknown.[2] Studies suggest that babies with single umbilical artery have an increased risk for organ malformations and chromosomal abnormalities which were evident in our study. S Nayak, et al. Abuhsmad, et al[2,10] both studied the presence of single uterine artery in fetus and stated that it is associated with poor outcome. All the 9 cases of single artery defect showed associated various malformations in our study. Froehlich and Fujikura found that incidence of single umbilical artery was present in 53% of their study cases. which is coinciding with this study. Presence of umbilical number abnormalities association with other malformations where reported by Rittler et al[3] and Y Heifetz. Our study also found other malformations along with umbilical vessel number defects in 11 cases.[3] A degree of cord twisting is normal but with excessive twisting, the protective effects are lost, and the risk of fetal hypoxia abounds.[11,12] In literature, there are studies stating that long cords are associated with greater incidence of hyper coiling and twisting of cords. Which is correlating with our study although the incidence of long cords in our study is minimal and presence of hyper coiling is also evident in short cord's as well. Kuiava, et al[13] found that

umbilical cord constriction / stenosis lead to intrauterine growth retardation with increased perinatal mortality. He also found the highest rate of cord stenosis were diagnosed in second trimester and mostly in male babies which is aptly coinciding with this study.[14] Recurrent pregnancy losses were observed in 9 cases which showed umbilical cord defects. Cord insertion anomalies, rupture of cord, torsion, strictures, hematomas, cysts, tumors, ulcerations were absent in our study may be due to small sample size.[15,16]

5. Conclusion

Cord abnormalities can be clinically insignificant or can be severe leading to fetal death. This study confirms the umbilical cord importance in outcome of pregnancy. Even though the prenatal ultrasonography reasonably predicts the malformations, fetal autopsy is essential to confirm the ultrasonogram diagnosis and also look for additional malformations. It helps the parents by giving the information regarding recurrence risk of fetal anomaly so that regular antenatal checkups with specific diagnostics help to avoid congenital anomalies in subsequent newborns. The present study reemphasizes the need to develop special and exclusive antenatal screening for detecting umbilical cord abnormalities.[17,18]

6. Conflict of Interest

The authors declare no relevant conflicts of interest.

7. Source of Funding

None.

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