

## A STUDY OF CORRELATION BETWEEN PLACENTAL AND UMBILICAL CORD ABNORMALITIES AND FOETAL OUTCOME OF PATIENTS DELIVERING AT A TERTIARY CARE HOSPITAL

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### ABSTRACT

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#### INTRODUCTION

It has been estimated that 30% of births have some type of umbilical cord abnormalities. Disruption of the umbilical cord supply line is a major source of harm to the developing foetus. It is estimated that every third to fourth delivery has an identifiable umbilical cord abnormality or anomaly. What is unknown is how these findings affect the foetus and to what extent. Hence, the placenta and umbilical cord needs to be evaluated.

#### AIM OF THE STUDY

To study the correlation between the foetal outcome and the different types of abnormalities of placenta and umbilical cord.

#### METHODS AND MATERIALS

This descriptive study was done during the period October 2010 to December 2011 in a tertiary care centre. All consecutive patients who delivered at the institution during this period were included in the study. Those placentas where the anatomy of the cord could not be clearly identified were excluded from the study.

#### RESULTS

26.6% of the placentas examined showed some abnormality. Abnormalities of the cord was present in 78 cases (7.8%). One cord had five vessels – four arteries and one vein. Foetal abnormalities were more common in those who had a placental or cord anomaly also.

#### CONCLUSIONS

No significant correlation between placental abnormalities and foetal anomalies could be obtained. There was a higher incidence of adverse foetal outcome with cord abnormalities. An accurate antenatal evaluation could be of help in anticipating adverse perinatal outcomes in selected cases.

#### KEYWORDS

Placental Abnormalities, Umbilical Cord Anomalies, Foetal Outcome.

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**INTRODUCTION:** The clinical importance of the placenta lies not only in its primary function in the exchange of nutrients. Oxygen and fluid from mother to foetus but also in the fact that it reflects the foetal genotype. The placenta is derived from foetal genes. In addition, the placenta provides a narrative of intrauterine life and also the foetal well-being.

The placenta can provide both diagnostic and prognostic information on mother and infant. This includes information on infection, causes of foetal distress or demise, congenital malformations, zygosity in twins, twin-to-twin transfusions,

and disorders such as maternal vascular disease, haematologic disorders and storage diseases.

It has been estimated that about one-third of births have some type of umbilical cord abnormalities. Disruption of the umbilical cord supply line is a major source of harm to the developing foetus. It is estimated that one in every three or four deliveries has an umbilical cord abnormality or anomaly which can be identified. However, what remains unknown is the magnitude of its effect on the foetus if any. Hence, the placenta and umbilical cord needs to be investigated.

Japan's statistics of maternal and child health showed that perinatal deaths were more frequent in pregnant women who had abnormalities of the placenta, umbilical cord, and foetal membrane. Even though there have been advances in perinatal medicine, approximately 2% of low-risk pregnant women still required an emergency caesarean section after the onset of labour. This has been attributed to the fact that half of these cases could be associated with placental and/or umbilical cord abnormalities. Detailed

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evaluation and prenatal detection of abnormalities if any would likely reduce the number of emergency caesarean sections in otherwise low-risk women. Hasegawa et al found abnormalities of cord insertion were associated with some abnormalities of the placenta and umbilical cord. They observed that a reduction in the number of emergency caesarean sections could occur if in low-risk women the prenatal detection of velamentous cord insertion was done.<sup>1</sup> Little measurable correlation between placental shape and a non-central cord insertion was observed in placentae. In contrast placentas with a cord attached away from the centre, of a placenta, show a markedly reduced transport efficiency. This reflects a larger value of beta and consequently a smaller birth weight for a given placental weight.<sup>2</sup> Yampolsky et al noted that placentae with a non-central cord insertion have a sparser chorionic vascular distribution. This was measured by the relative vascular distance. They concluded that even though a placenta with a non-central insertion is of a normal shape in cross-section, its vasculature is less metabolically effective. These findings suggest an alternative aetiology by which altered placental structure may affect the foetal environment and influence the birth weight. This could potentially contribute to consequent health risks.<sup>2</sup>

Single Umbilical Artery is a relatively rare finding. When a single umbilical artery is identified, the routine checks of karyotyping and kidney sonography for possible chromosome and associated renal anomalies may be unnecessary. According to Mu et al a placenta with a lower than expected weight with an isolated single umbilical artery should be carefully monitored for evidence of foetal growth restriction in the antenatal period.<sup>3</sup>

Laberke described a completely uncomplicated pregnancy which ended with an intrauterine foetal death. It was observed to have been caused by foetus haemorrhaging into the amniotic fluid as a consequence of a rupture of the umbilical vein. The rupture occurred at the site of furcate insertion. This insertion anomaly accompanied by rupture of a vessel occurs has been very rarely reported. It represents a placental cause of a rather abrupt and undesirable end to an otherwise healthy pregnancy. Although trauma must have been involved, there was no sign of external impact and death. Hence, from a medico-legal point of view, the cause should be classified as natural.<sup>4</sup>

Over the years the pathologic features of the umbilical cord have drawn little attention. There are features which might fatally damage the foetus. Horn et al<sup>5</sup> determined the association of hypercoiling, defined as more than 1 coil per 5 cm, and thinning in relation to the consecutive constriction of the umbilical vessels (Thin Cord Syndrome) and intrauterine foetal death. His study done over a five-year period consisted of 303 cases of consecutive foetal autopsies. They included spontaneous and induced abortions of the 2nd trimester of pregnancy and the placentae and cords were examined using a standardised protocol. They found that pathologies of the umbilical cord as the cause of intrauterine foetal death in 10.2% of the cases examined most of them (15/17) involved a Thin Cord Syndrome. They

reported that the cause for intrauterine death in 9% of cases (15/167) was determined to be a Thin Cord Syndrome. They have concluded that a careful pathologic examination of the umbilical cord is recommended to detect the thin cord syndrome and possibly reduce the cases with unexplained intrauterine death.<sup>5</sup>

**OBJECTIVES:** To study the correlation between the foetal outcome and the different types of abnormalities of placenta and umbilical cord.

**METHODOLOGY:** This descriptive study was done from October 2010 to December 2011. All patients delivering at this tertiary care centre during this period were included in the study. Those placentas where the anatomy of the cord could not be clearly identified were excluded from the study. This study was cleared by the Institutional Ethics Committee - After delivery of placenta macroscopic examination of the placenta and umbilical cord were done. The relevant details were entered into the proforma. The placenta along with umbilical cord tagged with serial numbers were kept in a container filled with 10% formalin. The placenta and cord were dissected and the insertion pattern was studied. It was then correlated with the clinical details previously obtained.

**RESULTS:** The placenta and umbilical cord were collected from 1001 patients who delivered during the study period. About 50% of the patients were in the age group 21-25 years and 27% were in the age group 26- 29 years. Only 18 patients were above 36 years of age. Most of the patients were primigravida 47.2%, while 29.9% of the patients were secundigravida. Only 18 pairs of twins were included in the study. The foetoplacental ratio was found to increase from  $2.99 \pm 0.56$  at 28 weeks to  $5.92 \pm 0.74$  for gestations beyond forty weeks.

266 of the placentas (26.6%) showed some abnormality. 263 of them had calcification, one was circum-marginate and two were bilobed. 763 of the single placenta had a central cord insertion while 208 were eccentric insertions (20.8%), battledore insertion was noted in 11 cases (1.1%) and velamentous insertion in one. However, a slightly higher incidence was noted in twin gestations, eccentric insertions (3/18), battledore (2/18) and velamentous (2/18).

Abnormalities of the cord were present in 78 cases (7.8%). Most of them (62/78) were false knots. The distribution of the remainder of the observed abnormalities are given in Table 1.

Type	No. of Cases	Percentage
Single Umbilical Artery	7	43.75
True Knot	3	18.75
Velamentous Insertion	3	18.75
Cord Stricture	1	6.25
Five Vessel Cord	1	6.25
Cord Cyst	1	6.25

**Table 1: Abnormalities Observed in the Cord (N= 16)**

It was interesting to find one case with five vessels – four arteries and one vein (Figure 1). No anomalies were detected in this case.



**Figure 1: A Five-Vessel cord**

The predominant anomaly associated with the single umbilical artery was of renal origin. One case each of Dysplastic kidney, Polycystic kidney, Renal agenesis noted. One case of sacral agenesis was also noted.

The only patient with the cord stricture also had hypercoiling. The patient presented with an intrauterine foetal demise. No other anomaly was detected.

**DISCUSSION:** The findings were in consonance with those of other authors. The incidence of single umbilical artery has been variably reported between 0.2% to 3.1%.<sup>6,7</sup> DeFigueiredo D<sup>8</sup> reported the incidence of anomalies associated with a single umbilical artery as 9.3% while Catanzarite D et al<sup>9</sup> has reported an associated abnormality rate of 47.5%. We found that 57% of the cases (4/7) had a associated anomaly. In one of our cases, a hypoplastic right thumb was also noted in addition to the renal abnormality. A similar finding could not be found during a detailed literature search.

In 2012, Vasanthalakshmi GN et al<sup>10</sup> performed a prospective study and found that the incidence of associated foetal anomalies in single umbilical artery cases was 37.2% (22/59 cases) and incidence of isolated single umbilical artery was 62.7% (37/59 cases).

True knots of the cord have been reported by Corkill et al to occur with an incidence of 0.04% while Joura et al reported an incidence of 1.3%. Our study showed an incidence of 0.3% which was similar to the study done by Sepulveda et al.<sup>11</sup> However, in these patients, no anomaly was observed.

Neither the presence of the cord cyst or a true knot was associated with foetal anomalies. The only case which had a five vessels cord – four arteries and one vein was associated a healthy term baby with no detectable congenital anomalies. Neither this baby nor any one of the babies referred to above required neonatal intensive care.

A slightly higher incidence of eccentric cord insertions was noted in twin gestations-eccentric insertions (3/18), battledore (2/18) and velamentous (2/18) as compared to singleton pregnancies. No foetal anomaly or adverse outcome was noted in any of them.

None of the abnormal placentae were associated with foetal anomalies.

**CONCLUSIONS:** No significant correlation between placental abnormalities and foetal anomalies could be obtained. There was a higher incidence of adverse foetal outcome with cord abnormalities. An accurate antenatal sonographic evaluation may be of help in anticipating perinatal adverse outcomes in selected cases.

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