

## FURCATE CORD AND UMBILICAL CORD KNOTTING -INCIDENCE & HISTOMORPHOLOGY

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**Abstract**

**Background:** In these trying times of imparting complete obstetric care placental evaluation holds paramount importance. Placental pathology has been a key litigious informant in inferring timing of insult and also for the subsequent steps to be taken for the well-being of the neonate. Umbilical cord is the lifeline of the fetus connecting it to the mother. It provides nutrition, oxygen, various trophic factors, and hormones from the mother to the fetus. Knotting and furcate cord is relatively a rare occurrence. We reported the furcate cord and knots in primigravida and in multigravida along with its microscopy.

**Materials and Methods:** study was done on 200 placentas from and divided separately into primigravida and multigravida. Gross examination was done and shape of placenta, insertion of umbilical cord, the umbilical knots and furcate cord at the connection to maternal surface. Tissue section were taken from the knot and furcate cord area and after processing blocks were prepared, all sections are stained by H & E staining for microscopy.

**Result:** maximum placenta are circular in shape, eccentric umbilical cord insertion in placenta are more in multigravidas Furcate cord is 2.6% in primipara and 3.3 % in multipara and 8 knots (10.3%) in primipara and same 8 (6.6%) in multipara. Histology at knot side the tunica media has been inflated and directly in relation to the mucoid tissue dark colored pyknotic nuclei.

**Conclusion:** It causes a serious condition which can result in fetal distress and catastrophic neonatal complications.

## INTRODUCTION

Human minds were acquainted with the term Placenta since the advent of civilization. The placenta is literally the “Tree of Life”. The viability and existence of foetus depends on the placenta. Structurally the placenta is Hemochorial villous organ.<sup>[1]</sup> The umbilical cord is usually inserted in the centre with blood vessels branching outwards. The cord is twisted spirally to protect the vessels. cord insertion within 2 cm of placental edge is termed as marginal (BATTLEDORE), cord insertion on the placental membrane instead of reaching the chorionic plate (VELAMENTOUS). Fetal development depends largely on the quality and quantity of maternal blood being delivered to the intervillous space of the fetal placenta. Commonest site of umbilical cord insertion in chorionic plate is central. Variation in site of insertion rather migration towards periphery of chorionic plate is due to a phenomenon known as” Trophotropism”.<sup>[2]</sup> Furcate cord insertion is a rare abnormality in which the umbilical vessels split and separate from the cord substance before reaching the surface of the placenta. They may lose the protection afforded by Wharton’s jelly and are thus prone to thrombosis and injury and is associated

with still birth, Intrauterine fetal death, rupture of the umbilical vein resulting to hemorrhage at the site of furcate insertion of the umbilical cord, also prone to early delivery because they are heavier, having more voluminous villi with more trophoblast and syncytial knots.

In our study we have found a rare variant of cord insertion known as furcate cord, where umbilical cord leaves the support of Wharton’s jelly and splits into two before reaching and inserting on the chorionic plate. We also noticed the knots in umbilical cord. The changes in their microscopy is also done.

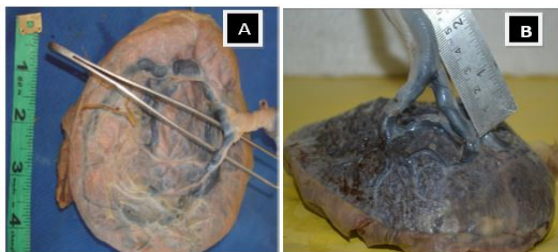
## MATERIALS AND METHODS

This work has been done on a bunch of two hundred placentas which were collected from labor room and Gynecology Operation theatre, Department of Obstetrics and Gynecology, NC medical college Panipat and Saraswati medical college, Unnao. The samples of two hundred placentas were grouped in primipara (78) and multipara (122). Gestational age was obtained from the hospital records. We selected placentas of those mothers who had no history of Diabetes mellitus, hypertension, toxemia of

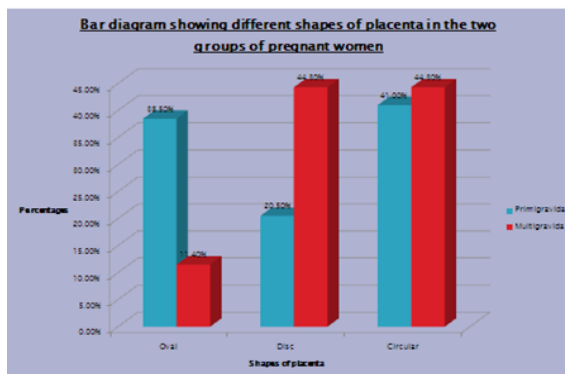
pregnancy, rh- iso immunization and other diseases even new-born had no detectable congenital abnormalities of these females.

Placentas were collected in plastic bags which were properly labeled. Collected placentas were procured in separate clean container filled with 10% formalin. We noticed (a) Shape of placenta, (b) Site of cord insertion through placing the placenta over a flat cardboard keeping the maternal surface in contact with the cardboard and the fetal surface above, the cords was held vertically straight and its site of insertion over the chorionic plate of placenta. (c) Knots- The cord was held vertically straight and presence of knots along the length of cord. (d) Furcate cord. Tissues were collected from knots and processing and staining were done by Hematoxylin and Eosin stain, Masson's trichrome stain for microanatomy under the microscope.

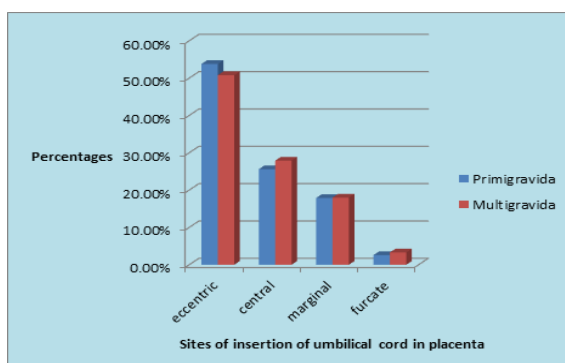
## RESULTS



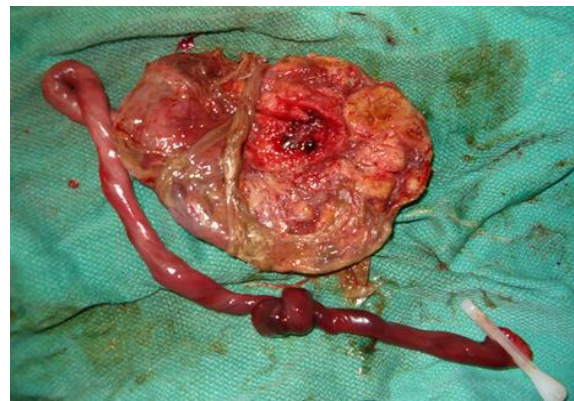
**Figure 1: Furcate Cord (A)- Primipara (B)- Multipara**



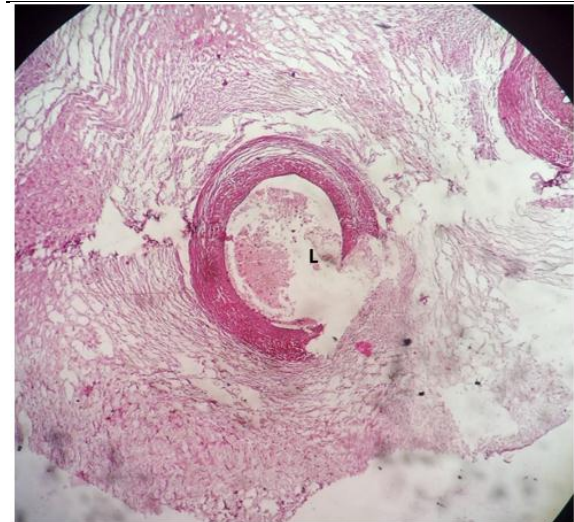
**Figure 2: ?**



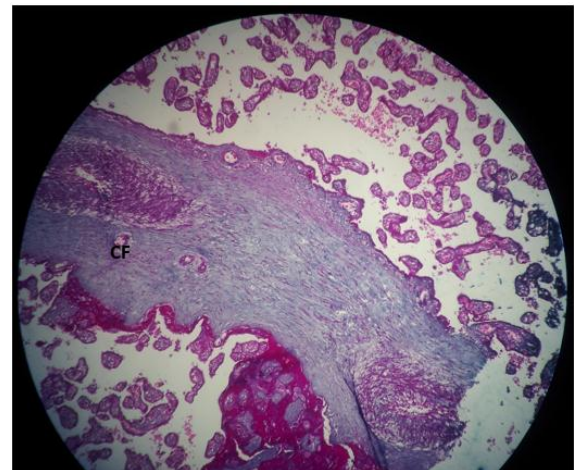
**Figure 3: Bar diagram showing umbilical cord insertion in placenta in the two groups of pregnant women**



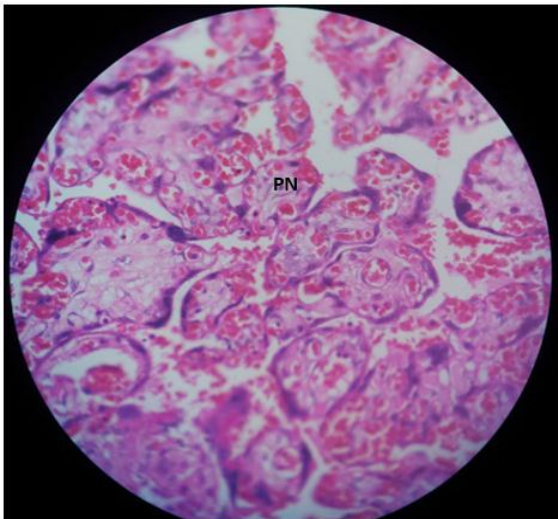
**Figure 4**



**Figure 5: Umbilical knot artery**



**Figure 6: Placenta villus masons trichrome**



**Figure 7: Pathological Syncytial Knots**

Shape of the placenta was noted in both primipara and multipara groups, in primipara Circular (41.0%), Oval (38.5%), and Discoid (20.5%) and in multiparas' group out of 122, placental shape was Circular (44.3%), Discoid (44.3%), Oval (11.5%), shapes of both is compared in [Figure 1].

Primipara have site of insertion of umbilical cord over the placental chorionic plate is Eccentric (53.8%), Central (25.6%), Marginal (17.9%), Furcate (2.6%), while among multipara, it is Eccentric (50.8%), Central (27.9%), Marginal (18.0%), Furcate (3.3%) as shown in [Figure 2]. There was presence of 8 knots (10.3%) in primipara and same number (6.6%) of knots in [Figure 3] also in multipara. we also came across with a rare variety of cord insertion (Furcate cord) in both groups, in primipara among 78 placenta we got 2 (2.6%) and in 122 multipara there were 4 (3.3%) placenta with furcate cord.

We find Histological features of umbilical vessels in the region of umbilical knot under the microscope. There were two umbilical arteries were in the region of knot, widely opened patent lumen (L) was containing blood [Figure 4]. This clearly stands in contrast with the observation that the lumen of umbilical artery elsewhere in the cord is narrow or collapsing, as the pregnancy progresses towards term while tunica intima lined by endothelium. while Lumen of the umbilical vein appears to be larger and contains more blood than the lumen of the umbilical artery. Tunica intima was lined by endothelium. Tunica media is more concentrated having circularly arranged muscular fibers and it is not divisible into 2 parts as in artery of the umbilical cord. At the site of knot, due to twisting, the tunica media has been inflated. Tunica media is directly in relation to the mucoid tissue. With Masson's trichrome stain [Figure 5] the smooth muscles appear more distinct and seem reddish in color, collagen fibers in the mucoid connective tissue appear bluish green in color (CF). We analyzed and counted the number of syncytial knots present in villous. Around 100 villi were observed and their syncytial knots were

counted, each villous on an average contained syncytial knots as seen in full term placental chorionic villous. In each villous syncytial knot appears at three places and it indicates that the villous is slowly losing the power of exchange phenomena. In each villous two or three areas of syncytial knot are present over the syncytial surface [Figure 8] revealing dark colored pyknotic nuclei (PN) indicative of gradual loss of power of exchange from the maternal pool of blood.

## DISCUSSION

We have focused on the incidence of furcate cord mostly because its occurrence is very rare and it impose hazards such as early delivery, rupture of umbilical vessels, varices and torrential hemorrhage during parturition. We observed difference in frequencies of different types of umbilical cord insertion in the two groups of pregnant women is statistically non-significant.

Approximately, 4% of all the complications of umbilical cord are due to true knots.<sup>[3]</sup> Marginal and velamentous insertions are suggested to result from disturbances of implantation and considered a marker of placental insufficiency.<sup>[4]</sup>

Furcate cord insertion is a rare abnormality affecting approximately 0.1% of all pregnancies. inserted at the placenta centrally, eccentrically, or marginally. Furcate cord insertion occurred in 0.16% pregnancies, among 132 cases, seven cases of intrauterine fetal deaths were observed with three were linked to the furcate cord insertion and two identified of single umbilical vessel rupture leading to fetal death.<sup>[5]</sup> The non-reassuring foetal status, Short for gestational age and intrauterine foetal demise were significantly associated with abnormal insertion which may reflect intrauterine hypoxia Olaya recorded the incidence of furcate cord 0.43%.<sup>[6,7]</sup>

Syncytial knots are a common histologic feature of the placenta with four specific subtypes of syncytial knots, syncytial sprouts, true knots, false knots and syncytial bridges. Wavy syncytial knots are found at earlier gestational ages,<sup>[8]</sup> and are aggregations of pyknotic nuclei which accumulate at the syncytial surface before being lost into the maternal circulation as membrane bound entities.<sup>[9]</sup> placental parenchymal tissue just under the cord insertion was deficient and had been changed to white, elastic hard tissue. Pathological examination of the white tissue revealed fibrin deposition and focal infarction resulting decreased perfusion through vascular membrane leading to hypoxia.<sup>[10,11]</sup> True umbilical cord knots are associated with an increased risk of small for gestational age infants, premature births, need for neonatal intensive care, and fetal deaths.<sup>[12,13]</sup> 4-fold increase in fetal loss have been reported to result from true knot, seemingly because the umbilical cord vessels can be compressed when the knot tightens.<sup>[14]</sup>

Increased syncytial knots are associated with adverse pregnancy outcomes such as preeclampsia and fetal growth restriction, feature of maternal vascular malperfusion with hypoxic or hypoxia-reperfusion injury to the placenta,<sup>[8,15]</sup> also possible complication resulting from these knots in the cord is fetal distress or abruption.<sup>[10,16]</sup>

## CONCLUSION

The common site of insertion of umbilical cord over chorionic plate is Eccentric both in multipara and primipara group, next is central followed by marginal and furcate.

We were fortunate to report a rare variety of furcate cord. The neonate delivered was perfectly healthy without any evidence of congenital anomalies, while it is mostly associated with Still birth, fatal hemorrhage, varices, thrombosis of fetal vessels and IUGR and precautions will be taken during delivery and better care will be given to female for healthy delivery. Knots were also noticed in furcate cord but the outcome of pregnancy was a healthy neonate.

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