Dissertation on

MORPHOLOGY AND MORPHOMETRIC STUDY OF PLACENTA AND UMBILICAL CORD WITH ITS VASCULAR PATTERN AND COMPARATIVE ANATOMY

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CERTIFICATE

This is to certify that the dissertation work on **MORPHOLOGY AND MORPHOMETRIC STUDY OF PLACENTA AND UMBILICAL CORD WITH ITS VASCULAR PATTERN AND COMPARATIVE ANATOMY** is the bonafide work done by **Dr.R.SUDHA** in the Institute of Anatomy, Madras Medical College, Chennai – 600 003 during the year 2006 – 2009 under my supervision and guidance in partial fulfillment of the regulation laid down by **The Tamil Nadu Dr.M.G.R Medical University**, for the M.S., Anatomy branch V examination to be held in March 2009.

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CONTENTS

INTRODUCTION

'Chief Nourisher in life's feast'

'Shakespeare: Macbeth II'

The word placenta is a Latin word meaning a flat plate or cake. Placenta represents an extremely intimate parabiotic union of maternal and foetal tissues for the inevitable requirement of the embryo.

After the delivery of the foetus the placenta becomes separated from the uterine wall and is expelled with the membranes as the "after birth". Expelled discoidal mass has two surfaces -maternal and foetal and a peripheral margin.

Maternal surface is finely granular mapped into 15-30 lobes by fissures or grooves. Lobes correspond in large measure to the major branches of distribution of the umbilical vessels.

Fetal surface is smooth, shiny and transparent. It is covered by amnion with the umbilical cord attached to its center. The umbilical vessels radiate out on the fetal surface from the umbilical cord below the amnion.

The peripheral margin is continuous with the fetal membrane, which consists from outside inwards of fused decidua parietalis, decidua capsularis, chorion laeve and amnion. Placenta begins to meet the demand of the embryo as early as the 3rd week of intrauterine life, even before the mother is aware of her pregnancy.

Examination of the placenta in utero as well as post-partum gives us information about the congenital anomalies, its well being and nutritional status that can be anticipated in the fetus.

AIM AND OBJECTIVE

Hospital medical board generally mandate that all tissues removed from patients be sent for examination and a glaring exception has long been placentae, which are usually discarded or reprocessed after at most a cursory examination by the delivering physicians.

It is gratifying now to see improving quality of placental examination. This newfound interest in the placenta is of multiple etiologies.

Malformations and disruptions of placental and body wall development are common. These include body stalk anomalies, limb-body wall complex with cord agenesis (Fig. 1), acardia, malformations related to monozygotic twinning (Fig. 2), conjoined twins, twin-twin transfusion syndrome, limb reduction defects and chorion villous sampling, amnion band syndrome (Fig. 3), early &prolonged rupture of membranes, oligohydramnios sequence, sirenomelia (Fig. 4), confined placental mosaicism and uniparental disomy.

In multiple pregnancies placentation and embryonic development are more complex with twins. Dizygotes would individually develop as singleton each with a distinct chorion, amnion and feto-placental circulation. Monozygotic twins have the potential to develop as dizygotes or share their chorion, amniotic sac or vascular connections.

Examination of the placentae may be very useful in medico legal cases.

The modern era of surgery on the placenta and cord began in 1988 when a team of physicians at university of Utah performed the first fetoscopic laser occlusion of chorioangiopagous vessels (FLOC PROCEDURE) (Fig. 5) in a monochorionic twin pregnancy affected by twin-twin transfusion syndrome.

Three abnormalities of pregnancy, which have their pathogenesis in the placenta rather than the fetus, which need surgical intervention, are (1)

Variations of twin-twin transfusion syndrome (TTTS) in monochorionic (MC) twins (Fig. 8) (2) Heart failure of the normal pump twin in a monochorionic acardius twin pregnancy and (3) Chorioangiomas (Fig. 9) large enough to cause hydramnios and fetal hydrops. The treatment of these placental abnormalities has been proposed by minimally invasive video fetoscopy linked with either the photocoagulative properties of laser light or direct ligation of the vasculature with clamps or suture as well as ultrasound guided transcutaneous placement of intravascular occluding devices and solutions.

Percutaneous umbilical cord blood sampling (Fig.7) is done to analyse the blood gas level of the fetus. Chorionic villous sampling (Fig. 6) at 8-9 weeks of gestation suggests that an early placental hemorrhage can lead to characteristic pattern of malformations in the fetus. It also has taught us that 2% of placentae show confined placental mosaicism that can affect fetal growth and survival.

All these procedures need expert knowledge about the morphological anatomy and vascular pattern of the placenta in a detail manner.

Physicians and surgeons have been hampered to become more familiar with anatomic variations of the placenta and the limitations of working in the intrauterine environment.

Due to the above reasons I have made an effort to study the morphology and morphometric analysis of the placenta and umbilical cord with vascular pattern and comparative anatomy.

The present study is done with the following parameters:

1. Shape, diameter and thickness of the placenta.
2. Maternal surface – number of cotyledons.
3. Placental weight

    -Compared with fetal weight, sex and maturity.

4. Fetal surface

-Vascular pattern of the placenta.

-Type of insertion of the umbilical cord.

5 Length and diameter of the umbilical cord.

6. Spiral turns (twist) of the umbilical cord.

-Umbilical coiling index.

REVIEW OF LITERATURE

1) Shape, diameter and thickness of the placenta: (Fig. 10)

Henry Gray (1858): He quoted that the expelled placenta is a flattened discoidal mass with an approximately circular or oval outline and the average diameter is about 185 mm, range 150 –200 mm and the average thickness is 23mm, range 10-40mm.

Leslie. B. Arey (1924): He stated that the expelled placenta is typically a thick circular disc. Departure from a circular shape is quite common ranging from an oval contour to other variant forms (ie. Spindle, pear, heart, crescent, ring), which are more rarely encountered. The placenta may be notched, lobed or even divided completely. Accessory placentae of smaller size than the main placenta are not unusual. Fused placentae (Fig. 12) result when ordinary twins become too closely implanted. Placenta measures 7 inches (17.5cm) in diameter and one inch (2.5cm) in thickness.

Williams (1930): In his book of obstetrics he described that there are a number of abnormal placental shape variations: -

i) Multiple placentae with a single fetus: Placenta may be separated into lobes when the division is incomplete and the vessels of fetal origin extend from one lobe to the other before uniting to form the umbilical cord, the condition is termed placenta biparita or bilobata (Fig. 13).

ii) Succenturiata placenta: This variation results when one or more small accessory lobes are developed in the membranes at a distance from the periphery of the main placenta to which they usually have vascular connections of fetal origin.

iii) Ring shaped placenta: This is a rare anomaly seen in fewer than 1 in 6000 deliveries. The placenta is annular in shape.

iv) Membranaceous placenta: All of the fetal membranes are covered by functioning villi and the placenta develops as a thin membranous structure occupying the entire periphery of the chorion. Placenta membranacea is also referred to as placenta diffussa (Fig. 14).

v) Fenestrated placenta: In this anomaly the central portion of the discoidal placenta is missing.

vi) Extrachorial placenta - Circumvallate placenta: (Fig. 11) The chorionic plate on the fetal side of the placenta is smaller than the basal plate and the fetal surface of such a placenta presents a central depression surrounded by a thickened grayish white ring, it is called a circumvallate placenta. When the ring coincides with the placental margin the condition is sometimes described as circummarginate placenta.

Bradley. M. Patten (1946): He quoted that the placental portion of the after-birth is a rounded disc. The placenta may exhibit a bilobed shape.

Augero. O (1957): He reported 3.26% of incidence of placenta bi-lobulata or biparita in his study.

Roth .L.G (1957): He had written that succenturiate lobes may occur singly or in multiples.

Scott. J.S (1960): He studied 3,161 cases and observed 18.3% of circumvallate placenta.

Ziel .H.A (1963): He stated that he observed 0.62% of circumvallate placentae when he studied 40,143 cases.

T.W.Sadler (1963): He said that at full term the placenta has a discoid shape and is approximately 3 cm thick.

J. Bazso (1966): He quoted that he found an incidence of 5.8% for circumvallate placenta in his series.

K. Benirschke et al (1967): They had written in their book 'The Pathology of Human placenta' that the average thickness of the placenta in the center is 2.0 cm.

Wilson. D & Paalman R.J (1967): They quoted that in their study of 10,927 placentae, they had observed 1% of circumvallate placenta.

Went worth. P (1968): He reported that when he studied 895 placentae, he observed circumvallate placenta of about 6.5 %.

Torpin.R (1969): He mentioned that full term delivered placenta is in more than 90% of the cases a disc – like flat, round to oval organ .It has abnormal shapes such as placenta bilobata, and placenta succenturiata.

J.D. Boyd & W.J. Hamilton (1970): They described in their book 'The human placenta' that the full term placenta is flat with a round or oval outline. The placenta may be bidiscoidal (i.e., bipartite), trilobed (i.e. tripartite), succenturiate, extrachorial or membranaceous.

A succenturiate placenta is one in which an accessory lobule or lobe or more than one such lobule or lobe is separated by some distance from the placenta or lies close to the main placental mass. Extra chorial placentae may be circumvallate or marginate. In the circumvallate form (complete or incomplete) the lateral edge of the placenta is undercut at its junction with decidua parietalis so that there is a ditch round the periphery of the placenta. In the marginate condition the edge of the placenta is raised to form the so-called closing ring. The average diameter of the placenta is 185 mm (18.5cm) and thickness is 23 mm (2.3cm).

Fujikura et al (1970): They had found bipartite placenta of about 4.2% in 8505 specimens collected in the collaborative perinatal study.

Fox.H & Sen .D.K (1972): They reported 2.4% of circumvallate placenta in a study of 3000 placentae.

Keith. L. Moore & T.V.N Persaud (1973): They said that the shape of the placenta is circular. The placenta measures 15 – 20cm in diameter and thickness of about 2 - 3 cm.

Richard. S. Snell (1973): He described that placenta is flattened and circular in shape. Its diameter is about 8 inches (20cm) and it is one inch (2.5cm) in thickness.

Fox.H (1978): He pointed out that placenta biparita or bilobata's incidence varies widely and it is cited at about 1 of 350(0.2%) deliveries.

Sarojamma (1986): She found that in a study of 100 placentae the thickness of the placenta ranged from 1.5 to 2cm

J.P.E. Judson (1986): He reported in a study of 20 placentae, the average diameter of the placenta to be 169.7mm (16.97cm)

Cynthia. G. Kaplan (1996): She stated the thickness of the placenta to be 2-2.5cm.

GunaPriya.R (2001): She quoted that in a study of 100 placentae, she observed 93% circular and 7% oval shapes of placentae. The average diameter of the placenta was 17.4cm, range 12 - 22.5cm and the thickness was 2.1cm, range 1.5 - 2.7cm.

2. Maternal surface: Cotyledons

Henry Gray (1858): He quoted that the maternal surface of the placenta is finely granular and mapped into some 15-30 lobes.

T.W.Sadler (1963): He described that when the placenta is viewed from the maternal side 15-20 slightly bulging areas, the cotyledons, covered by a thin layer of deciduas basalis are clearly recognizable.

K.Benirschke et al (1967): They said that an incomplete system of grooves subdivides the basal surface of the placenta into 10 to 40 slightly elevated areas called maternal cotyledons (lobes or lobules).

Allan C.Barnes (1968): He mentioned that the cotyledons are indistinct lobulations about 30 in number, visible on the maternal surface of the placenta.

J.D. Boyd &W.J.Hamilton (1970): They had written that the mature placenta shows a variable number of cotyledons from 10 to 38 of slightly elevated convex areas called lobes or when small, lobules.

Sarojamma (1986): she found in a study of 100 placentae, that the average number of cotyledons to be 18 with a range 3 - 24.

Gunapriya.R (2001): She stated that in her study of 100 placentae, the number of cotyledons in the maternal surface varies from 12 to 24. The average being 18 in number.

Majumdar et al (2005): They studied 100 placentae and reported mean number of cotyledons in normal control group to be 19 and 18 in hypertensive group.

Sultana. S et al (2007): In a study of total 45 placentae, they found that compared to the controls there was less placental diameter and cotyledon number in eclampsia.

3) Weight of the placenta:

Henry gray (1858): He stated that the average weight of the expelled placenta is 470 gms, range 200-800gms.

Adair.F.L & Thelander.H (1940): They found that in general, a normal placenta is about one seventh of the weight of the fetus with which it is associated.

Ghosh.L & Chandrasekhar.C (1948): They reported that the weight of the placenta of mature male and female infants on an average was 486.3gms and 479 gms in contrast to premature infants where the figures were 391.1gms and 379.1 gms respectively.

Little (1960): He studied the placentae of 956 mature infants and concluded that a placental co-efficient of less than 0.10 and greater than 0.18 should be considered to indicate a relatively small or large placenta and that less than 0.08 and more than 0.2 should be considered definitely abnormal.

Wiggles worth (1962): He found that the placental weight ranged from 360 - 570 gms.

Dockery, J.L (1960): He reported a case of giant placenta weighing 1,984 gms with hemoglobin value of 4.1 gms per 100ml due to severe iron deficiency.

Wong, T.C.& Lartour, J.A.P (1966): They reported a lower placental weight of 399gms for growth retarded infants as compared to 463gms for normal infants.

K.Benirschke et al (1967): They reported that the average weight of the placenta was found to be of 470 gms.

N.A. Beischer et al (1968): They found that in a study of 490 patients with anaemia, the incidence of placentae weighing more than 900gms was 2%. In diabetes mellitus and erythroblastosis approximately 10 percent of the placenta weighed over 900gms.

Saigal. S & Srivastava, J.R (1970): They reported that the weight of the placenta was 531.5gms at 38 weeks and 475.9gms at 42 weeks and above.

J.D.Boyd &W.J.Hamilton (1970): They studied over 1000 placentae delivered at term and quoted that the average weight of the placenta was 508 gms.

Fujikura et al (1970): They examined a total of 8505 placentae and reported that biparitite placenta represented 4.2% and the placental weight was greater in the bipartite group (mean weight 473.3 gms) than in other groups (mean wt 448 gms).

Gupta et al (1972): In a study of 469 placentae the mean weight of the placenta was found to be higher for males as compared to females. The mean placental weight of infants below 37 weeks gestation was 449.9 gms and 405.3 gms for males and females respectively, while it was 521.9gms and 510.4gms respectively in babies of 37 weeks gestation and above.

Keith. L. Moore & T.V.N.Persaud (1973): They had written that placenta weighed 500 to 600 gms, which is about one sixth of the weight of the average conceptus.

Richard S.Snell (1973): He stated that the placenta weighs about 1 lb (500 gm).

Singla P.N et al (1978): They quoted that in a study of 69 anaemic mothers (hemoglobin < 110g/l) and 16 mothers without anaemia (hemoglobin ≥ 110 g/l) the birth weight and placental weight were significantly reduced in

the severely anaemic mothers and it had direct relationships with the maternal hemoglobin levels.

Shameer singh et al (1979): They reported in a study of 3500 placentae that the mean weight of the placenta was found to be 475 gms.

Kher & Zawar (1981): They mentioned that a significant reduction in foeto-placental weight ratio was observed in toxemia of pregnancy.

Godfrey, K.M et al (1991): In a study of 8684 pregnant women they observed large placental weight, which was associated with a low maternal hemoglobin.

Lurie.S et al (1999): In study of human feto-placental ratio in 431 deliveries, they reported the mean newborn weight was 3,382gms and the mean placental weight was 613 gms. Mean feto placental weight ratio was 5.6 and this ratio did not differ in male (5.7) and female (5.6) infants.

J.P.E. Judson (1986): He found that in a study of 20 placentae, the average weight of the placenta was noted to be of 479.17gms.

Damania et al (1989): They had studied sixty placentae of hypertension disorders of pregnancy and they had reported that the birth weight, placental weight and feto placental ratio were less in hypertensive cases than in the normotensive controls.

Rath.G et al (2000): They studied 218 hypertensive mothers and stated that the weight of the placenta and the infant in hypertensive group were found to be lower than the normal group.

Majumdar et al (2005): They observed that in a study of 100 placentae the mean placental weight in control group was found to be 485.85 gms and in

hypertensive group to be 399.10gms. The mean foetoplacental weight ratio was found to be 5.89 in control group and 6.23 in hypertensive group.

Swanson.L.D& Bewtrac.C (2008): They studied the placenta of live singleton deliveries and reported that the mean weight of the mature term placenta has increased over years from 499 to 537gms.

Kucuk. M, Doymaz. F (2008): They stated that placental weight and placental weight to birth weight ratio are increased in diet and exercise treated gestational diabetes mellitus (GDM) subjects. They observed that birth weight in GDM to be 3288.3 gms and 3207.06 gms in control group. Placental weight in GDM was found to be 694.8gms and 610.2gms in control group. Placental coefficient (PW/BW) was noted to be 0.21 in GDM and 0.18 in control group.

4. Foetal surface: - a) Vascular pattern of placenta

Shordania. J (1929): He considered that the arteries in all human placenta can be subdivided into two main groups according to the pattern followed by their branching and he introduced the terms disperse and magistral to describe them. In the disperse type with approximately central attachment of the cord, the two arteries divide dichotomously several times into a number of smaller vessels rapidly diminishing in caliber (Fig. 15). In the magistral type the two arteries extend almost to the margin of the placenta before diminution in their caliber occurs (i.e. longer undivided branches) (Fig. 19).

P.Bacsich & C.F.V. Smout (1937): They studied the foetal vessels of 50 human placentae with corrosion technique (Fig. 17). According to the pattern made by the arteries, vascular pattern of placenta can be divided into two groups (i) a disperse type in which the blood vessels divide dichotomously (Fig. 15) and (ii) a magistral type in which the two main arteries extend as far as the margin of the placenta and give off branches of small size only.

Edith. L. Potter (1952): He pointed out that normally the umbilical cord contains 2 arteries and 1 vein embedded in Wharton's jelly.

Keith.L.Moore (1973): He quoted that umbilical cord contains two arteries and one vein and they are surrounded by mucoid connective tissue.

Paul Wentworth (1965): He reported in his study of 642 placentae that he had observed in 20 placentae (3.1%) the foetal veins crossed over the foetal arteries.

Kishore.N & Sarkar. S.C (1967): They viewed that the disperse type of vessel distribution is more commonly present (61.8%).

Andrade. A (1968): He had mentioned that disperse type of vascular pattern to be more frequently found in placentae with centrally inserted cords.

Bhargava.I & Raja.P.T.K (1969): They suggested that foetal veins may occasionally cross over foetal arteries and this pattern is correlated significantly with abnormal fetal development.

Z.Gordon et al (2007): They studied the anthropometry of fetal vasculature in 15 placentae and revealed that the branching architecture of the chorionic vessel is a combination of dichotomous (disperse) and monopodial (magistral) pattern i.e. mixed type (Fig. 16). He also stated that the vascular architecture was mostly monopodial for the marginal cord insertion and mostly dichotomous for the central insertion (Fig.18).

Fox. H (1997): In his study he found increased number of vascular profiles more commonly in cords from stillbirths and he associated this anomaly with a history of maternal cigarette smoking.

Foetal surface- b) Insertion of the umbilical cord:

Hyrtl.J (1870): He observed 16% central type (Fig. 20), 54% eccentric type, and 19% marginal type of cord insertion.

Chiari et al (1895): They reported 3.3% central type, 91.2% eccentric type, 5% marginal type and 0.5% velamentous type of cord insertion.

Lefevre.G (1896): He stated out of 15,894 placental specimens, he observed 0.84% velamentous type of cord insertion (Fig. 21).

Noldeke.H (1934): In a study of 10,000 placentae of singleton pregnancies, he found 1.1% of velamentous type of cord insertion.

Grieco.A (1936): He said that in a study of 23,469 placentae of singleton pregnancies, he observed 0.41% of velamentous type of cord insertion.

Earn A.A. (1951): He stated that out of 5412 specimens, he found 56% central, 28% eccentric, 15% marginal and 1.1% velamentous type of cord insertions.

Simon Brody & David.A.Frenkel (1953): They quoted that out of 512 deliveries, they observed 6.2% of marginal insertion of the cords.

Diterlizzi &Rossi G.R. (1955): They had found that in a study of 15,416 placentae of singleton pregnancies, 1.0% of velamentous type of cord insertion.

Shanklin D.R (1958): He observed that out of 500 specimens, he observed 11% central type, 89% eccentric type (Fig. 15), 1.9% marginal type and 0.78% velamentous type of cord insertion.

Scott.J.S (1960): He reported in a study of 3,161 placentae of singleton pregnancies, 2% of marginal type and 1.5% velamentous type of cord insertion.

Krone.H.A (1961): In a study of 5214 specimens, he observed 25% of central type, 64% eccentric, 10% marginal and 1% velamentous types of cord insertion.

Corkill.T.F (1961): In a study of 12,695 placentae obtained from singleton pregnancies, he reported 0.024% of velamentous type of cord insertion.

Thomas. J (1963): He stated that of 18,316 placentae he studied, he observed 5.2% marginal type, 1.3% velamentous type of cord insertion.

Monie I.W (1965): She reported that out of 183 specimens, she observed 70% eccentric type of cord insertion, 14.7% marginal and 15.3% velamentous type of cord insertion.

Torpin.R. & Barfield.W.E (1968): They found that in one third of bilobed placenta the cord inserts on the larger lobe and in two thirds it has velamentous insertion.

Eastman N.J & Hellmann.L.M (1966): They reported that out of 200 specimens they studied, they found central type of cord insertion in 18%, eccentric in 73%, marginal in 7% and velamentous types of cord insertion in 1.25%.

Scheffel.T & Ranganke. D (1970): They quoted that out of 37,963 placentae obtained from singleton pregnancies, they observed 0.22% of velamentous type of cord insertion.

Uyanwah et al (1977): They mentioned that in a study of 1000 placentae obtained from singleton pregnancies, they found 5.6% marginal type of cord insertion and 1.6% velamentous type of cord insertion.

Robinson et al (1983): They stated that in a study of 44,677 placentae, they observed 8.5% marginal type, 1.5% velamentous type of cord insertion

Sarojamma (1986): She studied 100 placentae and observed 40% central type of cord insertion, 53% eccentric, 2% marginal and 4% velamentous type of cord insertions.

J.P.E. Judson (1986): He reported that in a study of 20 placentae, he observed 20% central type of cord insertion, 70% eccentric, 10%marginal and 0% velamentous type of cord insertion.

Nordenvall et al (1988): In a study of 330 placentae, they observed that marginal cord insertions were correlated to extrachorial and bilobate placentae.

Gunapriya.R (2001): In 100 placentae she observed 86% eccentric, 5% central, 9% battle dore and 0% velamentous type of cord insertion.

5. Length and diameter of the umbilical cord:

Henry Gray (1858): He **s**aid that the fully developed umbilical cord measures on an average of about 50cm in length and 1-2 cm in diameter. Its length varies from 20-120 cm.

Gardiner J.P (1922): He obtained an average length of 55 cm for normal cords. He considered cord length less than 32 cm as absolutely short and length more than 32 cm as relatively short.

Shordania J. (1929): He recorded an average length of 60 cm in a series of 421 cords with range of about 35 -104 cm and the cord diameter to be 1-2 cm.

Williams (1930): He quoted that the average length of the cord was observed to be 55 cm, range 30 to 100 cm, and the diameter to be 0.8 to 2.0 cm.

Fog. J (1930): He measured an average cord length of 54.8cm for 1,467 premature infants and 60.7 cm for 6,533 full term infants. The average cord length for the 8000 cases in the combined series was 59.6 cm.

Schmidt -Elemndorf. H.R (1952): They stated that the length of the mature umbilical cord ranged from 50 to 70 cm and the diameter from 15 to 20 mm.

Edith L.Potter (1952): He measured the length of the umbilical cord to be around 50 cm and the diameter to be 1-2 cm.

W.F.Rayburn et al (1981): They had observed 536 term deliveries and defined a short cord as all cords measuring less than 35 cm in length.

Mossinger et al (1986): They quoted that the infants with Down syndrome have significantly shorter cords (45.1 cm, versus 57.3 cm for controls) and they speculated this to be due to the reduced fetal activity in uterus.

Soernes.T & Bakke.T (1986): They reported that in breech presentation the cord length measures 53.78cm in males and 52.51 cm in females.

Sarojamma (1986): In a study of 100 placentae she found the average length of the cord to be 38.5 cm and range to be 25 - 85 cm.

Gunapriya.R (2001): In a study of 100 placentae she observed the average length of the cord in both sexes to be 53.5cm, range 30 - 70cm. The average length of the cord in male baby was 54.6 cm and in female baby it was 52.1cm. The diameter of the umbilical cord ranged from 0.6 - 1.1 cm.

6. Spiral turns (twist) of the umbilical cord:

Neugebauer L.A (1858): He reported in a total of 160 cases the direction of the spiral twist of the umbilical cord was noted to be sinistral type (Left) in 114 cases (71%), dextral type (right) (24%) in 39 cases and nil type in 7 cases (4.3%).

Read. W (1860): He stated that in total cases of 54, the direction of the twist of the umbilical cord is sinistral in 42 cases (77%), dextral in 8 cases (14%), nil in 7 (4.3%) cases. He reported 1 case of complicated twist (1.85%).

Henry.W.Edmonds (1954): He observed in a series of 100 umbilical cords from singleton pregnancies that the major twist was found to be sinistral in 82%, dextral in 12% and nil in 6% (Fig. 22).

Ronald Lacro (1987): In a study of 2801 live born singletons, he observed left twist of the umbilical cord to be 83%, right twist of the umbilical cord to be 12% and he noted absent twist of the umbilical cord in 5%.

Thomas. H et al (1993): They reported that 38 (4.3%) of 894 fetuses were born with non-coiled umbilical vessels and they were at increased risk for perinatal morbidity and mortality.

Rana et al (1995): They evaluated 635 placentae and reported that the umbilical coiling index in their study was found to be 0.19coils /cm.

ANIMAL PLACENTA (Fig. 23)

1.Domestic cattle-Cow Placenta

KurtBenirschke (2007):

He quoted that the polycotyledonary cow placenta weighed around 4 - 5 kg. The umbilical cord has 4 large blood vessels, two arteries, two veins and an allantoic duct.

2.Domestic Pig Placenta

KurtBenirschke (2007):

He found that the umbilical cord of the domestic pig contains three blood vessels and a widely patent allantoic duct.

3.Sheep Placenta

Reynolds.S.R (1952):

He had written that the umbilical cord of the sheep has no spirals.

Kleeman et al (2001):

He provided the weight of the sheep placenta to be around 600 gms.

KurtBenirschke (2007):

He quoted that the sheep placenta is polycotyledonary in shape with 60 to 100 cotyledons. The umbilical cord has four large allantoic blood vessels (2Artery, 2Vein) and a large patent allantoic duct. The umbilical cord measures 27 cm in length.

4.Goat Placenta (Fig. 24)

KurtBenirschke (2007):

He says that the goat placenta at term weighs around 200gms and the umbilical cord measures around 10cm in length and 1 cm in diameter with four blood vessels and a large allantoic duct. There were no spirals found in the cord.

5.Domestic Rabbit Placenta

Martensson. L (1984):

He stated that the average placental weight of the rabbit is 4gms.

KurtBenirschke (2007): (Fig. 25)

He says that there are two umbilical arteries and an umbilical vein in the cord. The umbilical cord is 2 cm long and has no spirals.

DEVELOPMENT OF PLACENTA AND UMBILICAL CORD

The placenta and the fetal membranes develop from the blastocyst wall and the embryo from the inner cell mass. Syncytial and cytotrophoblastic elements may be distinguished by the time the conceptus is embedded in the endometrium, 7½ days after conception. Lacunar spaces appear within the syncytium at 9 days; these are the forerunners of the intervillous space (Fig. 26).

Formation of the villi begins at 11-12 days. Finger like projections of the cytotrophoblast push out into the lacunar spaces, carrying a head of them a covering of the syncytium. By 13 days the villi contains shallow cores of mesoblast and angioblastic cells and by 16 days the villi have become branched. Villi develop over the entire surface of the conceptus but greatest development occurs basally which persists to form the definitive placenta and the villi on the superficial portions of the conceptus degenerate. The fetal blood vessels develop from the angioblasts in the villous core and they grow rapidly and co-alesce.

Communications between the intra embryonic vascular system and the vessels in the developing placenta is established and the heart starts to beat on about 22 days of life. Development of the maternal circulation in the placenta begins with the development of the lacunar spaces in syncytiotrophoblast, which are filled with the maternal blood by 11½ days, and they communicate with endometrial capillaries and venous sinusoids. By 22 days some spiral vessels open into the labyrinth of the clefts in peripheral cytotrophoblastic shell and they communicate indirectly with the intervillous space. Placenta attains its definitive architectural form by the end of the 1st Trimester.

By Day 13 of post conception, the embryo is composed of two cavities, an aminotic cavity lined by ectoderm and a primary yolk sac lined by

endoderm. By 18th day endoderm fully surrounds the yolk sac and an exocoelm has cavitated within the extra embryonic mesoderm, which lines the trophoblastic shell and the two embryonic cavities. The two portions of the extra embryonic mesoderm are connected basal to the amniotic cavity. This mesenchymal bridge forms the connecting stalk or the umbilical cord (Fig.27).

The embryo rotates and the yolk sac faces the implantation site. Amniotic cavity enlarges and surrounds the embryo. Embryonic disc bends in the antero-posterior direction and rolls up in the lateral direction thus herniating into the amniotic cavity, which divides the yolk sac into an intra embryonic part (intestinal) and an extra embryonic part (Omphalomesentric duct) with accompanying vessels and secondary yolk sac, forming the umbilical cord. 2 allantoic arteries and 2 allantoic veins are initially formed, later the right umbilical vein disappears at 6mm stage (end of 2 months). Wharton's jelly derived from the extra embryonic mesoderm surrounds the blood vessels.

MATERIALS AND METHODS

A total number of 100 freshly delivered placentae with umbilical cord were collected from the Institute of Obstetrics and Gynaecology, Egmore, Chennai, after obtaining consent from the individuals.

The placentae were collected soon after their expulsion from normal deliveries and caesarean section.

Placenta and umbilical cord were collected from

1) Normal uncomplicated primigravida and multigravida cases – 69 specimens of which male conceptus placentae were 33 and female conceptus placentae were 36.

2) Pathological conditions and factors complicating pregnancies – 31 specimens of which 14 are male conceptus and 17 are female conceptus.

i) Pregnancy induced hypertension –

a) Mild hypertension with blood pressure: 120/90 – 130/99 mm of Hg – 5 specimens (2 male, 4 female).

b) Moderate hypertension with blood pressure: 140/100 –170 /110 mm of Hg – 3 specimens (1 male, 2 female).

c) Severe hypertension (Eclampsia) with blood pressure: ≥ 170/120mm of Hg – 3 specimens (2 male, 1 female).

ii) Diabetes mellitus – 2specimens (1 male, 1 female).

iii) Anaemia – 2 specimens with Hb 8 & 7 gms % (2 male).

iv) Rh-isoimmunisation – 1 specimen from an Rh-negative mother with a Rh- postive conceptus (1female).

v) Prematurity – 6 specimens (including intrauterine death) (2 male, 4 female) from 28-36 weeks.

vi) Post maturity – 3 specimens (1 male, 2 female) from 41 - 42 weeks of pregnancy.

Vii) Abruptio placentae –2 specimens (2 male)

viii) Twin pregnancy –1 specimen of fused placenta of dichorionic-diamniotic pregnancy (2 male)

ix) Abnormal presentations (Breech, Transverse lie) – 2 specimens (2 female)

x) Placenta praevia – 1 specimen (1 female)

In each case a preliminary history was elicited from the mother regarding:

1. Age
2. Parity
3. Period of amenorrhoea
4. History of bleeding per vaginum
5. Previous obstetric history
6. H/o hypertension, diabetes mellitus and toxaemia of pregnancy.

A neat tabulation of all the above parameters was made for all the specimens collected.

The conceptus whose placentae were obtained were also examined for the following facts:

1. Sex of the baby
2. Weight of the baby
3. Any visible anomalies of the baby
4. Maturity of the baby

The collected placentae were washed in tap water; membranes were examined and then trimmed. The specimens were then transported to the Institute of Anatomy, Madras Medical College, Chennai, in formalin filled plastic containers.

Fresh animal placentae of cow, pig, sheep, goat, and rabbit were examined in Live Stock Research Station, Katupakkam, Kanchipuram district. They were washed in tap water and membranes were trimmed. These placentae were examined and their morphometric values were recorded and photographs were taken.

Methods

I. Morphometric values of the placenta were recorded.

1) Shape, diameter and thickness:

i) Shape - was noted and recorded.

ii) Diameter - of the placenta was measured with an inch tape.

iii) Thickness - was noted by vernier calipers.

Initially the vernier calipers were checked for zero error with jaws closed. The jaws of the calipers were placed on either side of the peripheral margin of the placenta with firm pressure on the placental surface. When both the locking screws of the calipers were tightened the calipers was removed from the placenta and the readings were recorded after the measurement in the main scale of the calipers was read to the nearest tenth of the centimeter.

2) Maternal surface: The number of cotyledons were counted and recorded.

3) Placental weight: Weight was recorded using a weighing scale. Babies (conceptus) whose placenta were obtained were also examined for the following facts-

i) Sex of the baby was recorded.

ii) Weight of the baby recorded by weighing scale.

iii) Maturity of the baby was noted.

Preterm conceptus is babies born before 37 weeks of gestation. Term conceptus is babies born from 38 - 40 wks of gestation. Post term conceptus is babies born beyond 40 week of gestation.

4) Fetal surface: Vascular pattern – disperse; magistral and mixed pattern was recorded. Type of insertion of the umbilical cord was noted. Number of umbilical arteries and umbilical vein were noted.

5) Length and diameter of the umbilical cord: Cord was measured in the delivery room with an inch tape and they were recorded. The segments attached to the baby and to the placenta were measured and the results were added.

-Diameter of the umbilical cord was recorded by vernier calipers.

6) Spiral turns (twist) of the umbilical cord: The vessels of the cord are wound as cylindrical helices. They remain equidistant from its central axis and retain a constant curvature. In a dextral spiral held vertically the portions of the spiral lying between the axis and observer, as the observer might say, "in front of the axis"-will appear to slant from point above on the right to a point below on the left.

In a sinistral spiral so held the reverse will appear; the anterior parts of the spiral will course from left above to right below. In other words, the course

of the anterior portion of a dextral spiral will be parallel to the right-hand limb of a letter V, while the course of the corresponding portions of a sinistral special will be parallel to the left-hand limb of a letter V. This will be true no matter in which position a spiral is held for consideration. Spiral turns were counted and recorded (Fig.22).

-Presence of true knots and false knots were recorded.

II Histological study of placenta and the umbilical cord:

Two bits of tissues from the placenta and the umbilical cord from normal pregnancy as well as pathological cases such as hypertension, diabetes mellitus, and anaemia were taken. Tissue bits from the animal placenta and cord were also taken. The bits of tissues were fixed with 10% formalin. Dehydration of the tissues was done with ascending grades of alcohol, clearing done with xylol, impregnation and embedding of tissues were done with paraffin wax. Section cutting was done with microtome. Thin sections of tissues were mounted on the slides by using albumin solution (glycerin + egg white). Fixed section were stained with eosin and haematoxylin stain and mounted on the slide with dpx and the covering was done with a cover slip. The tissues were examined under a microscope and the photographs were taken after examination under photomicroscope with the help of a computer.

III. Silicone Gel Cast technique to study the placental vasculature:

Materials required:

1. Silicone gel 100ml – Black colour -1 & White colour -1.
2. Heparin Injection (5000) - 1 Amp
3. Butterfly needle No: 17 - 3
4. Caulking gun to instill the silicone gel by shooting with force - 1

Method:

Five placentae were taken from IOG, Egmore, Chennai, washed in tap water, and the membranes were trimmed. The umbilical cord was cut close to its site of insertion and the vessels were flushed with first tap water and then with heparinised solution using a butterfly needle. Then 20-30ml of silicone gel black colour for vein and white colour for artery was injected through the butterfly needle with the help of a caulking gun into the vessels one by one. The cast was allowed to set for 24 hrs. The specimens were kept in plastic containers and placed under thin stream of running water for 24 hrs. After 24 hrs the specimens were boiled for three hours in an aluminium vessel. The macerated tissues were removed and the cast was studied.

IV. Contrast study of the placental vasculature by Angiogram:

5 placental specimens were taken to the Radiology department, Government General hospital, Chennai-3, from Institute of Obstetrics and Gynaecology, Egmore, Chennai-8. The specimens were washed thoroughly and blotted dry with cloth. 3 - 17 no: butterfly needle was introduced into each umbilical vessel. 5ml - 10ml of omnipaque (contrast) was injected into each umbilical vessel one by one and then they were clamped. The entire procedure was done under fluoroscopic guidance and serial radiological pictures were taken and studied.

OBSERVATION

In the present study of 100 placental specimens, 69 specimens were collected from uncomplicated pregnancies and 31 specimens from complicating pregnancies (Table 1 &2).

1. Morphology and Morphometry of the placenta:

I) Shape, diameter and thickness of the placenta:

1) Shape of the placenta:

(Table 3) (Chart: A) (Chart: 14)

a. Circular: (Pic: 1) In the present study of 100 specimens, 55 circular shape placentae were observed. Out of 55 circular placentae, 42 circular shape placentae was found in uncomplicated pregnancies (17 male, 25 Female) and 13 circular shape placentae was observed in complicating pregnancies such as mild pregnancy induced hypertension, prematurity, post maturity in male conceptus and diabetes mellitus, Rh isoimmunisation, prematurity, and post maturity in female conceptus.

b. Oval: (pic: 2) In the present study 30 oval shape placentae were noted, of which 24 oval shaped placentae were observed in uncomplicated pregnancies (12 Male, 12 Female) and 8 from complicating pregnancies such as moderate pregnancy induced hypertension, anaemia, abruptio placentae in male conceptus and mild pregnancy induced hypertension, abnormal presentations from female conceptus.

c. Triangular:(pic: 3) 8 triangular placentae were observed in this study of which 4 from uncomplicated pregnancies (4 male) and 4 from complicated pregnancies (2 Male, 2 Female) such as moderate and severe pregnancy induced hypertension.

d. Placenta succensuriata: (pic: 4 &10) Accessory lobe or lobules found in the membrane or close to the placenta, which receives blood, supply from the main placenta.

In the present study 2 succenturiata placentae were observed in male conceptus from mothers suffering from mild pregnancy induced hypertension.

e. Placenta circumvallata: (pic: 5) **A**n anomaly of the chorionic plate of the human placenta in which transition from membranous chorion to villous chorion takes place not at the edge of the placenta but with in some distance from the circumference of the fetal surface. Marginal ring has double fold of amnion and chorion and the margin is raised and plicated.

In the present study one placenta circumvallata was observed from a case of abruptio placentae. Villous chorion on the fetal surface was observed. A double fold of amnion and chorion with raised edges were noted. The placenta and the conceptus were low in weight.

f. Fused placenta: (pic: 6) In the present study in a case of dichorionic -diamniotic (didi) twin pregnancy a fused placenta was observed. The placenta was not found to be associated with any malformations.

g. Kidney shape:(pic: 7) One specimen of kidney shape placenta with hyper-coiled cords was observed in a complicated case of a severe pregnancy induced hypertension from a female conceptus.

h. Heart shape:(pic:8) In the present study one heart shape placenta (female conceptus) was observed from a normal uncomplicated pregnancy.

i. Placenta biparita / bilobed shape :(pic: 9) Placenta may be separated into lobes and when the division is incomplete, the vessels of fetal origin extend from one lobe to the other before uniting to form the umbilical cord.

In the present study one specimen of placenta biparita was observed from a case of placenta praevia. Division of the lobes was incomplete and the

fetal vessels extended from one lobe to the other before they formed the umbilical cord. No congenital malformations were observed. The cord inserted marginally in one lobe.

2) Diameter of the placenta:

(Table 4 &14 a) (Pic: 11&12) (Chart: 14)

In the present study of 100 specimens the average diameter of the placenta was observed as 17.73 cm, range being (11-28) cm. In male fetus placenta the average diameter was 17.72 (11-28) cm. In female fetus placenta the diameter averaged 17.74 (12-26) cm.

In 69 uncomplicated cases the average diameter of the placenta was observed to be 17.97 cm, range being (14-22) cm. In male conceptus the diameter averages 18.13 (14-22) cm and in female conceptus it is 17.81 (14-22) cm.

In 31 complicated pregnancies the diameter averages 17.16 (11-28) cm. In male conceptus placenta the average diameter is 16.75 (11-28) cm and in female conceptus the diameter is 17.58 (12-26) cm.

The least diameter was observed in severe pregnancy induced hypertension (11 cm) and the maximum diameter were noted in twin (didi) pregnancy (28cm). Male placental diameter is increased in uncomplicated cases and decreased in complicated cases.

3) Thickness of the placenta:

(Table 5 &14 a) (Pic: 13 &14)(Chart-14)

The average thickness of the placenta in the present study is 1.9 cm, range being 1- 3.1 cm. In male conceptus placenta the average is 1.9 (1-3) cm and in female conceptus it is 1.9 (1-3.1) cm.

In 69 uncomplicated pregnancies the average thickness is 1.931 cm (1-3.1). In male conceptus the average thickness is 1.96 (1-3) cm and in female conceptus it is 1.9 (1.2-3.1) cm.

In 31 uncomplicated pregnancies the average thickness is 1.8 (1-2.8) cm. In males it is 1.7 (1-2.5) cm and in female it is 1.9(1-2.8) cm.

The thickness of the placenta is increased in factors complicating pregnancies such as diabetes mellitus, post maturity and twin pregnancy. The thickness is reduced in severe pregnancy induced hypertension, anaemia, and prematurity (including intra uterine death).

II. Maternal surface - Cotyledons:

(Table 6 & 14a) (Pic: 15 & 16)(Chart-14)

The average cotyledons in the present study is 18, range being (8-30). In male conceptus the average cotyledon number is 18 (8-30) and in female conceptus it is 18 (9-28).

In 69 uncomplicated pregnancies the average cotyledon number is 19 (12-26). In male conceptus placenta it is 19 (13-25) and in female conceptus it is 19 (14-26).

In 31 complicated pregnancies the average cotyledon number is 17(8-30). In male conceptus the cotyledon number averaged about 17 (8-30) and in female conceptus about 17(9-28).

The cotyledon number is reduced in factors complicating pregnancy such as severe pregnancy induced hypertension (least), prematurity, anaemia, and placenta praevia. Cotyledon number is increased in post maturity and twin pregnancy (maximum). In anaemia the cotyledons were ill defined **(pic: 21).**

III. a) Weight of the placenta:

(Table: 7 & 14 b) (Pic: 17 & 18) (Chart-14)

In the present study of 100 specimens the average weight of the placenta is 472.49 gms, range being (150-850) gms. In male conceptus the average weight in the present study is 468.29 (150-850) gms and in female conceptus the average is 476.69 (275-675) gms.

In 69 uncomplicated pregnancies the average weight of the placenta is 490.58 (375-625) gms. In male conceptus the average weight in uncomplicated pregnancies is 487.42 gms, range (400-625) gms. In female conceptus the average weight is 493.75 gms, range (375-575) gms.

In 31 complicated pregnancies the average weight of the placenta is 432.74 gms, range (150-850) gms. In male conceptus it is 423.21 gms, range (150-850) gms and in female conceptus the average weight is 440.5 (275-675) gms.

The average weight of the placenta in complicated pregnancies like moderate and severe pregnancy induced hypertension, anaemia, Rh isoimmunisation and prematurity (IUD-least) were decreased and the average weight of the placenta were increased in diabetes mellitus, postmaturity and twin pregnancy (maximum).

b) Weight of the conceptus:

(Table- 8a, 8b & 14 b) (Pic: 17) (Chart: B &C) (Chart-14)

The average weight of the conceptus in the present study is 3.16 (0.475 - 4) kg. The average weight of the male conceptus is 3.005(0.475 - 3.9) kg and female conceptus is 3.247 (2.1- 4) kg.

In 69 uncomplicated pregnancies the average weight is 3.28 (2.2- 3.8) kg. Average weight of the male conceptus is 3.13(2.2-3.75) kg and female conceptus is 3.4 (2.4-3.8) kg.

In 31 complicated pregnancies the average weight of the conceptus is 2.6 (0.475 - 4) kg. In male conceptus the average is 2.71 (0.475 - 3.9) kg and female conceptus is 2.85 (2- 4) kg. The baby weighed 475 gms in prematurity (IUD)(Least) and 4 Kg (maximum) in diabetes mellitus.

c) Fetoplacental Ratio (F: P):

(Table 8 c &14 b) (Chart-14)

Fetoplacental ratio is calculated by the ratio of fetal weight by placental weight. J.D. Boyd & W.J. Hamilton (1970) says it is 6:1.

The average Fetoplacental ratio in the present study is 6.6:1. Fetoplacental ratio is male conceptus is 6.6:1 and in female conceptus is 6.7:1.

In 69 uncomplicated pregnancies the average fetoplacental ratio is 6.7: 1 and in male conceptus the ratio is 6.6:1 and is female conceptus it is 6.7:1.

In 31 complicated pregnancies the average fetoplacental ratio is 6.5:1. In male conceptus it is 6.6:1 and in female conceptus the ratio is 6.5:1. The feto placental ratio is increased in Rh isoimmunisation (7.2) and decreased in twin pregnancy (5.76)

d) Placental coefficient:

(Table 8 d &14 a) (Chart-14)

The placental coefficient is calculated by the ratio of placental weight by fetal weight.

Little (1960) states "values less than 0.8 and more than 0.2 as abnormal".

The average placental coefficient in the present study of 100 cases is 0.15. In males conceptus it is 0.14 and in female conceptus it is 0.15.

In 69 uncomplicated pregnancies the average placental coefficient is 0.14 and in the male and female conceptus also it is 0.14.

In 31 complicated cases the average placental coefficient is 0.16. In the male conceptus it is 0.19 and in female conceptus it is 0.14. Placental coefficient is reduced in Rh isoimmunisation (0.13), and increased in twin pregnancy (0.17).

IV. Foetal surface: a) Vascular pattern of the placenta:

(Table 9) (Pic: 27 & 28) (Chart-14)

Vascular pattern of the placenta was studied by silicone gel cast technique in 5 specimens and in other 95 specimens the vascular pattern was observed after the removal of the amnion.

i) Disperse pattern: (Pic: 27) The two arteries divide dichotomously several times into a number of smaller vessels rapidly before diminishing in caliber.

In the present study of 100 cases with 101 cords, 41 cases (40%) showed disperse pattern of which 3 were studied by corrosion cast technique and 38 from naked eye examination.

ii) Magistral pattern: (**Pic: 27)** The two arteries extend almost to the margin of the placenta before diminution in their caliber occurs (longer undivided branches). In the present study 15 cases (14%) were observed to

have magistral pattern of which 2 were studied by corrosion cast technique and 13 by naked eye examination.

iii) Mixed pattern : (Pic: 28) a combination of disperse and magistral pattern was observed in 45 (44%) cases by naked eye examination.

In (didi) twin pregnancy (fused) placenta, vascular anastomoses between the vessels of both the umbilical cord were not observed. In all the 100 specimens 2 umbilical arteries and 1 umbilical vein was present.

b. Insertion of the umbilical cord:

(Table 10) (Chart-14) (Pic: 29,30,31,32)

i) Central insertion: (Pic: 29) In this study of 10 placentae with 101 umbilical cords (99 +1 didi) central type of cord insertion was observed in 10 specimens (9%) (Where the umbilical cord attaches to the center of the placenta in the fetal surface).

ii) Battledore insertion: (Pic: 30) Battledore type of cord insertion (Marginal) was observed in 11 placental specimens (10%) (Where cord inserts to the margin of the placenta).

iii) Velamentous insertion: (Pic: 31) Velamentous type of cord insertion was observed in 2 placental specimens (1.9%) (Where the cord fails to reach the placenta ends in the membranes and the branches traverse the membrane before they reunify on the placenta). Velamentous type of cord insertion in one specimen had a short umbilical cord of 30 cm length.

iv) Eccentric insertion: (Pic: 32) Eccentric type of cord insertion was observed in 78 placental specimens (77%) (Where the cord attaches any where other than the center or the margin of the placenta)

V. Umbilical cord: (a) Length of the umbilical cord:

(Table 11 & 14 a) (Pic: 33) (Chart: 14)

In the present study of 100 placentae with 101 cords (99+1) the average length of the cord is 47.95 cm, range being (30-60) cm. In male conceptus the average length of the cord is 46.5cm, range (32- 55) cm and in female conceptus the average length is 49.23 cm, range being (30-60) cm.

The average length of the cord in 69 uncomplicated cases is 48.07 cm range being (30-60) cm, in male conceptus the average length is 46.54 cm range (32-55) cm and in female conceptus it is 49.48 (30-60) cm.

The length of the cord in 31 complicated pregnancies averages about 47.68 cm, range (35 -57) cm. In male conceptus the average length is 46.46 cm, range (35-55) cm and in female conceptus the length is 48.76 (38-57) cm. Mean umbilical cord length in complicated pregnancies is 57cm in Rh-isoimmunisation and 43cm in abruptio placentae.

b. Diameter of the umbilical cord:

(Table 12 &14 c) (Pic: 34)(Chart-14)

In the present study the average diameter of 101 cords is 1.132 cm, range being (0.85-1.6) cm. In male conceptus the average diameter is 1.128 cm, range being (0.85-1.5) cm and in female it is 1.136 (0.85-1.6) cm.

In the 69 uncomplicated pregnancies the average diameter of the cord is 1.138 cm, range (0.86-1.6) cm. In male conceptus the average diameter of the cord is 1.120 cm, range (0.86-1.5) cm and in female conceptus the average is 1.156 cm, range (0.87-1.6) cm.

In 31 pregnancies with complication the average diameter of the cord is 1.112 cm, range being (0.85-1.5) cm. In male conceptus the average diameter is

1.146 (0.85-1.5) cm and in female conceptus the average is 1.094cm, range (0.85-1.4) cm. The diameter of the complicated pregnancy is less than the uncomplicated pregnancies. The umbilical cord diameter is increased in severe hypertension (1.26cm) and decreased in post maturity (0.91cm). The umbilical cord diameter of diabetes mellitus and anaemia is 1.2cm and 1.15cm.

VI. Spiral turns (twist) of the umbilical cord:

(Table-13 a &14 c) (Pic: 35)(Chart-14)

In the present study of 100 placentae with 101 cords in 96 (95%) specimens, sinistral (left) twist of the umbilical cord was observed. In 3 specimens (2%) dextral (Right) twist of the umbilical cord was observed. In 2 specimens (1.9%) compound (Both) twist was observed and in 1 specimen (0.9%) nil (absent) twist was observed.

1) Umbilical cord coiling index (UCI):

(Table-13 b &14 c) (Chart-14)

This is calculated by the formula -

$$\frac{\text{Number of coils in an umbilical cord}}{\text{Length of the cord}} = \text{Umbilical coiling index}$$

Coils /cm.

In this study the average umbilical coiling index in 100 cases is 0.134 coils/cm.

In 69 complicated cases of pregnancy the average umbilical coiling index is 0.131 coils/cm.

In 31 complicated cases of pregnancy the average coiling index is 0.139 coils/cm.

In complicated pregnancies the average umbilical coiling index is slightly more than normal cases. In complicated pregnancies the umbilical coiling index is increased in placenta praevia and minimum in diabetes mellitus.

2) False knots:

(Table-13 c) (Pic: 36)

In the present study of 100 placentae, 15 false knots were observed. True knots were not encountered.

2. Histological study of the placenta and the umbilical cord:

1) Normal Human Placenta: (pic: 37)

Human placenta showed chorionic villi with outer synctiotrophoblast and inner layer of cytotrophoblast. Chorionic villi were separated from each other by wide intervillous spaces. Blood vessels were seen.

Umbilical cord showed 2 arteries and 1 vein embedded in the amniotic epithelium. In the vessels tunica intima, media and adventitia were well appreciated.

2) Hypertension placenta: (pic: 38)

Showed pale villi with numerous syncitial knots and few blood vessels. Intervillous spaces were reduced and fibrin deposits were observed.

Umbilical cord showed 2 arteries and 1 vein. Tunica media of the arteries showed hypertrophy.

3) Diabetes mellitus: (pic: 39)

Large hypo vascular immature villi with wider intervillous spaces were observed. Fibrin deposits were also found.

4) Anaemia: (pic: 40)

Villi with reduced intervillous spaces were observed .Few blood vessels (reduced vascularity) with congestion and dilation of the vessels were noted. Tunica media of the umbilical artery showed extravasated blood.

3. Corrosion cast technique – Silicon gel cast method:

(Table: 15) (Pic: 41,42,43,44)

By silicone gel cast technique in 5 specimens the vascular pattern of the placenta was studied. Out of 5 specimens 3 had eccentric type of cord insertion and 2 specimens had marginal type of insertion of cord. Observations revealed 3 disperse (dichotomous) type of vascular pattern and 2 types of magistral (monopodial) pattern.

4. Contrast study of the placental vasculature by angiogram method: (Table: 16) (pic: 45 & 46)

5 fresh specimens (3 had central cord insertion and 2 had marginal cord insertion) were washed and injected with omnipaque (contrast). The placental vessels showed a well delineated branching pattern. The branching pattern was disperse in 3 specimens and magistral in 2 specimens.

OBSERVATION ANIMAL PLACENTA (Table-17)

1. Cow Placenta: (pic: 47,48, 57)

Cow placenta was observed to be polycotyledonary in shape. Placenta measured 13 cm in breadth, 40 cm in length, 0.9 cm in thickness and 4 kg in weight. Cotyledons were around 80 in number and concave in shape. The umbilical cord measured 35 cm in length, 1 cm in diameter and contained 4 blood vessels, 2 umbilical arteries and 2 veins with an allantoic duct. No spiral twist of the cord was observed.

2. Pig placenta: (pic: 49, 50, 58)

The pig placenta was observed to be diffuse in shape. It was fused placentae of 4 piglets weighing 1.2 kg. Placenta measured averagely 15 cm in diameter, 35 cm in length, and 1.2 cm in thickness. The placenta on the surface formed small tufts compared to cotyledons in other group. The umbilical cord measured 30 cm in length, 0.95 cm in diameter with 2 umbilical arteries, 1 vein and an allantoic duct. The spiral turns were absent.

3. Sheep placenta: (pic: 51,52,59)

Polycotyledonary shaped sheep placenta was observed in this study. The sheep placenta was 35 cm in length; 10 cm in breadth, 0.8 cm in thickness and it weighed 800gms. Convex cotyledons around 60 were observed. The umbilical cord measured averagely 20 cm in length, 1 cm in diameter with 2 umbilical arteries, 2 umbilical veins and an allantoic duct. There was no spiral turns present in the cord.

4. Goat placenta: (pic: 53, 54, 60)

In this study Goat placenta was found to be polycotyledonary in shape, breadth of the placenta was 13 cm, length 30 cm and thickness 0.75 cm. Goat placenta weighed around 400gms. Cotyledons were convex shaped around 70

in number. The length of the umbilical cord measured 18 cm in length, 1cm in diameter, with 2 umbilical arteries, 2 umbilical veins and an allantoic duct. Spiral turns were absent.

5. Rabbit: (pic: 55,56,59)

Rabbit like the human placenta is discoidal in shape. The diameter of the placenta was 5.5 cm and thickness 1.2 cm. Rabbit placenta weighed 5 gms. Cotyledons were 4 in number. The umbilical cord was short, 2 cm in length with diameter 0.75 cm. The umbilical cord contained 2 umbilical arteries and 1 umbilical vein. Allantoic duct was not visualized in this specimen. Spiral turns of the cord were absent.

DISCUSSION

I. Shape, diameter and thickness of the placenta

1. Shape of the placenta

a) Circular shape: (Chart: 1) (Table: 18 a)

Leslie. B. Arey (1924), Bradley. M. Patten (1946), T.W. Sadler (1963), Keith. L. Moore & T.V.N. Persaud (1973), Richard S. Snell (1973) have mentioned placenta to be circular in shape.

Sarojamma (1986) says 57% placenta to be circular in shape, **Gunapriya. R (2001)** reported the same to be 93%.

In the present study of 100 placentae 55 (55%) were circular shaped which coincides with the statements of the above scientists. The incidence of percentage is similar to Sarojamma (1986) and varies from Gunapriya R. (2001).

b) Oval shape: (Table: 18 b)

Leslie B. Arey (1924) stated the placentae could be oval in shape.

Sarojamma (1986) observed 36% oval shaped placentae.

Gunapriya.R (2001) reported 7% oval shaped placenta.

In the present study of 100 placentae, oval shape placentae were observed in 30 specimens (30%). This finding concurs with the statements of the above authors but the percentage value is greater than Gunapriya. R (2001) and less than Sarojamma (1986).

c) Circular or oval shape:

Henry Gray (1858) quoted that the placenta is a flattened discoidal mass approximately circular or oval in outline.

J.D. Boyd and W.J. Hamilton (1970) stated that the placenta is a flat, round to oval in outline.

Torpin R (1969) mentioned 90% of the placentae were disk like flat round to oval organ.

In the present study of 100 placentae 55 (55%) were circular in shape, 30 (30%) were oval in shape. This finding agrees with the statements of Henry Gray (1858), Torpin.R (1969) and J.D.Boyd & W.J.Hamilton (1970). The percentage value (55+30 = 85%) is closely similar to Torpin. R (1969).

d) Triangular shape: (Table: 18 c)

Sarojamma (1986) observed 7% triangular shaped placenta in her study of 100 placentae.

In the present study 8 (8%) placental specimens were triangular in shape, which perfectly coincides with the finding of Sarojamma (1986).

e) Placenta succensuriata: (Table: 18 d)

Leslie. B. Arey (1924), Williams (1930), Roth L.G. (1957), J.D. Boyd & W.J. Hamilton (1970) and Torpin R. (1969) have mentioned about accessory placentae and **Gunapriya. R (2001)** quoted 3% incidence of placenta succensuriata in her study.

In this study 2 (2%) placentae succensuriata was observed. This finding corresponds with above scientists and the percentage value is close to Gunapriya R. (2001).

f) Extrachorial placenta - placenta circumvallata: (Chart: 2) (Table: 18 e)

Williams (1930) stated about the placenta circumvallata as one of the abnormal shapes.

J.D. Boyd &W.J. Hamilton (1970) quoted in circumvallate form; the lateral edge of the placenta is undercut at its junction with decidua parietalis. A double fold of amnion and chorion is present.

Scott J.S. (1960) observed 18.3% of circumvallate placenta, **Wentworth. P (1968)** reported 6.5%, **J. Bazso (1966)** 5.8%, **Fox. H & Sen. D.K. (1972)** 2.4%, **Wilson D. & Paalman R.J (1967)** 1% and **Ziel H.A. (1963)** reported 0.62% of circumvallate placenta.

In this present study 1 (1%) circumvallate placenta was observed from 100 specimens with double fold of amnion and chorion. This finding concurs with the statement of Williams (1930) and J.D. Boyd &W.J. Hamilton (1970). The incidence is in confirmity with Wilson D & Paalman. R.J. (1967) and is of higher value than Ziel H.A. (1963) and less than Scott J.S. (1960), J. Bazso (1966), Wentworth P (1968) and Fox. H& Sen D.K. (1972).

g) Other forms:

Leslie B. Arey (1924) encountered variant forms of placentae rarely (spindle, pear, heart, crescent, ring) and also mentioned about fused placenta.

In the present study of 100 placentae other variant forms observed were 1(1%) kidney shape, 1(1%) heart shape and 1(1%) fused placentae. This finding agrees with Leslie B. Arey (1924).

h) Placenta Biparita (Bilobed shape/ Bilobata): (Chart: 3) (Table: 18 f)

Leslie B. Arey (1924), Williams (1930), Bradley .M. Patten (1946), Torpin R. (1969), J.D. Boyd & W.J. Hamilton (1970) have mentioned about placenta biparita, while **Augero. O (1957)** reported 3.26% and **H .Fox (1978)** 0.2% of placenta biparita.

In the present study of 100 placentae the incidence of placenta biparita is 1 (1%). This observation concurs with statement of the above authors but the incidence value is greater than H. fox (1978) and less than Augero. O (1957).

2. Diameter of the placenta:

a) Average diameter of the placenta :

(Chart: 4) (Table: 19 a)

The average diameter of the placenta stated by **Henry Gray (1858), J.D. Boyd & W.J. Hamilton (1970)** is 185 mm (18.5 cm), **Leslie B. Arey (1924)** stated 7 inches (17.5 cm), **Gunapriya R. (2001)** 17.4 cm, **J.P.E. Judson (1986)** 169.7mm, and **Richard S. Snell (1973)** reported 8 inches (20cm).

In the present study of 100 placentae, the average diameter of the 100 placentae is 17.73 cm. This finding coincides with Leslie. B. Arey (1924) and Gunapriya.R. (2001). This finding is elevated than that of J.P.E. Judson (1986) and less than Henry Gray (1858), J.D. Boyd & W.J. Hamilton (1970) and Richard.S. Snell (1973). The average placental diameter in 69 uncomplicated normal pregnancies is 17.97 cm and in other 31 complicated pregnancies it is 17.20 cm. The average diameter of the complicated pregnancies is similar to the normal uncomplicated pregnancies.

b) Range of placental diameter: (Table: 19 b)

The Range of diameter of the placenta quoted by **Henry Gray (1858)** is 150-200mm, **T.W.Sadler (1963)** 15-25cm, **Keith L.Moore & T.V.N. persaud (1973)** 15-20 cm and **Gunapriya. R (2001)** is 12 -22.5 cm.

In the present study of 100 placentae the diameter of the placentae ranges from 11-28 cm. This findings is close to T.W.Sadler (1963), Gunapriya.R (2001) and similar to other scientists.

The diameter of the placenta in 69 uncomplicated pregnancies ranges from 14-22 cm and in other 31 complicated pregnancies ranges from 11-28cm, which has wider range, compared to the uncomplicated pregnancies.

c) Average diameter in Eclampsia:

Sultana. S et al (2007) observed less placental diameter in eclamptic group compared to normal group in a study of 45 placentae.

In the present study of 100 placentae, the average diameter of the placentae in severe (Eclampsia) hypertension was found to be 14 cm which is less than the value of the normal uncomplicated pregnancies 17.97 cm. This finding is in conformity with Sultana. S et al (2007).

3. Thickness of the placenta:

a) Average thickness of the placenta: (chart: 5) (Table: 20 a)

T.W. Sadler (1963) quoted the average thickness of the placenta to be 3 cm, **Leslie, B. Arey (1924) and Richard. S. Snell (1973)** stated the average thickness to be l inch (2.5 cm), **Henry Gray (1858)** says 23mm, **J.D. Boyd & W.J. Hamilton (1970)** and **Gunapriya.R (2001)** stated 2.1 cm (21 mm) and **K. Benirschke et al (1967)** observed it as 2cm.

In the present study the average thickness of the placenta in 100 specimens was observed as 1.9cm. This finding is closely similar to K. Benirschke et al (1967), J.D. Boyd & W.J. Hamilton (1970), and Gunapriya.R. (2001) And varies from the rest of the other authors. The average thickness of the placenta in 69 uncomplicated pregnancies is 1.9 cm and in 31 complicated pregnancies it is 1.89 cm. The average thickness of the complicated pregnancies is less than the normal pregnancies.

b) Range of thickness of the placenta: (Table: 20 b)

Henry Gray (1858) stated the thickness of the placenta ranges from 10-40 mm; **Keith L. Moore & T.V.N.Persaud (1973)** says 2-3 mm, **Guna Priya. R (2001)** found 1.5-2.7 cm, **Cynthia G. Kaplan (1996)** said 2 - 2.5 cm and **Sarojamma (1986)** states the thickness ranges from 1.5 - 2 cm.

In the present study the thickness of the placenta ranges from 1 - 3.1 cm. This finding coincides with Henry gray (1858), Gunapriya. R (2001) and varies from others.

The thickness ranges from 1 - 3.1 cm in 69 uncomplicated pregnancies and 1 - 2.8 cm in 31 complicated pregnancies. The thickness range in complicated pregnancies is slightly less than the uncomplicated pregnancies.

II. Maternal surface-cotyledons:

a) Average cotyledon number: (Table: 21 a)

The average number of maternal cotyledons of the placenta quoted by various authors like **Allan C. Barnes (1968)** is 30, **Majumdar et al (2005)** 19, **Sarojamma (1986)** and **Gunapriya. R (2001) is** 18.

In the present study of 100 placentae, the average number of maternal cotyledon is 18. This finding is in confirmity with Sarojamma (1986), Gunapriya. R (2001), Majumdar et al (2005) and less than Allan C. Barnes (1968).

The average number of cotyledon in 69 uncomplicated pregnancies is 19 and in 31complicated pregnancies are 17. The cotyledon number is less in complicated pregnancies as compared to normal pregnancies.

b) Range of cotyledon Number: (Table: 21 b)

K.Benirschke et al (1967) quoted the cotyledon number ranges from 10 - 40, **J.D.Boyd & W.J.Hamilton (1970)** says 10-38, **Henry Gray (1858)** says 15-30, T.W.Sadler **(1963)** 15-20, **Gunapriya. R (2001)** stated it as 12 - 24 and **Sarojamma (1986)** quoted the range of the cotyledon number as 3 - 24.

In the present study the cotyledon number ranges from 8 - 30. This finding is similar to Henry Gray (1858) and differs from others.

The range of cotyledon in 69 uncomplicated cases is 12 - 26 and in 31 complicated cases is 8 - 30. The cotyledon number has a wider range in uncomplicated pregnancies compared to normal pregnancies.

c) Cotyledon number in Hypertension: (Table: 21 c)

Majumdar et al (2005) observed mean number of cotyledons in hypertension group to be 18. **Sultana S. et al (2007)** reported less cotyledon number in eclamptic group when compared to normal group.

In the present study the mean number of cotyledon in hypertension group is 14. (Mild-17, moderate-14, and severe (eclampsia)-11). The mean number of cotyledon in normal group (69 uncomplicated cases) is 19. The mean number of cotyledon in hypertension group is less than the normal group. This finding corresponds with Majumdar et al (2005) but the value is less compared to them. The mean cotyledon number in eclamptic group is 11, which is less than the normal group 19. This finding is in confirmity with Sultana S. et al (2007)

III. WEIGHT OF THE PLACENTA:

a) Average weight of the placenta: (Chart: 6) (Table: 22 a)

The average weight of the placenta quoted by **Lurie. S et al (1999)** is 613 gms, **Kucuz M Doymaz. F (2008)** is 610 gms, **Swanson. LD, Bewtrac. C (2008)** is 537 gms and **Saigal. S & Srivastava J.R. (1970)** is 531.5 gms.

Majumdar et al (2005) quotes the average weight to be 485.85 gms, **Shameer Singh et al (1979)** 475 gms, **Henry gray (1858)** 470 gms, **Wong T.C. & J.A.P. Lartour (1966)** 463 gms, **Fujikura et al (1970)** 448 gms and **Rath G et al (2000)** says it is 382.148 gms.

In the present study the average weight of the placentae in 100 specimens is 472.49 gms. This finding is similar to Henry Gray (1858), Shameer Singh et al (1979) and Majumdar et al (2005). This finding is greater than Wong T.C., & J.A.P.Lartour (1966), Fujikura et al (1970), Rath. G et al (2000) and less than Lurie. S et al (1999), Kucuz M; Doymaz. F. (2008), Saigal S & Srivastava. J.R. (1970) and Swanson LD, Bewtrac.C (2008).

The average weight of placenta in 69 uncomplicated pregnancies is 490.58 gms and in 31 complicated pregnancies it is 432.74 gms. Average weight in complicated cases in less than the normal uncomplicated group.

b) Range of Placental Weight: (Table: 22 b)

The range of the placental weight quoted by various authors is

Henry Gray (1858) 200-800 gms, **Wiggles Worth. J.S. (1962)** 360-570 gms and **Hoseman. H (1949)** 400-1000 gms.

In the present study of 100 placentae the placental weight ranges from (150-850) gms. This finding is similar to Henry Gray (1858) and varies from other authors.

The placental weight ranges from 375-675 gms in 69 uncomplicated pregnancies and 150-850 gms in 31 complicated pregnancies. Complicated cases have a wider range of placental weight compared to the normal cases.

c) Placental weight of Male and Female mature conceptus: (Table: 22 c)

Gosh L.V. & Chandrasekhar. C (1948) reported the average weight of the placenta in mature male and female conceptus to be 486.3 gms and 479 gms.

S.P.Gupta et al (1972) reported the same to be 521.9 gms and 510.4 gms. He also stated that the male placentae are heavier than the female placentae.

In the present study of 100 placentae, the average weight of the placenta in mature male and female conceptus is 468.29 gms and 476.69 gms. This finding is closely similar to Gosh. L.V.& Chandrasekhar. C (1948) and varies from S.P.Gupta et al (1972) and similarly the female placentae in this study weigh more than the male placentae.

The average placental weight in male and female placenta in 69 uncomplicated pregnancies is 487.42 gms and 493.75 gms, which are higher than the average placental weight of male and female conceptus in 31 complicated pregnancies, which is 423.21 gms, and 440.5 gms.

Female placentae weigh more than the male placentae.

d) Placental weight in Relation with fetal weight:

Adair.F.L. &Thealander.H (1946) stated the normal placental weight is about one seventh the weight of the conceptus.

Keith L. Moore & T.V.N. Persaud (1973) quoted that the placental weight to be about one sixth the weight of the average conceptus.

In the present study the average weight of the placenta and conceptus is 472.49 gms and 3.13 kg. Placental weight is 1/6.6 the weight of the conceptus. This finding coincides with Adair.F.L & Thelander.H (1925) and is slightly more than Keith L. Moore & T.V.N.Persaud (1973). The placental weight in 69 uncomplicated pregnancies is 1/6.6 of the weight of the conceptus and in 31 complicated pregnancies it is 1/6.3 of the weight of the conceptus.

e) Feto placental (F: P) Ratio in Normal cases: (Table: 22 d)

Lurie. S et al (1999) observed feto placental ratio as 5.6 in his study and mentioned it did not vary much in male (5.7) and female (5.6)

Majumdar et al (2005) reported feto placental ratio to be 5.89 in normal pregnancies.

In the present study the average fetoplacental ratio is 6.6. It is 6.6 in male and 6.7 in female. This finding is greater than the both the authors. Male and female feto placental ratio does not vary much and this finding agrees with Lurie. S et al (1999). Fetoplacental ratio in 69 uncomplicated pregnancies is 6.7 and it is 6.5 in 31 complicated pregnancies. They also do not differ much.

f) Feto placental ratio is Hypertension: (Table: 22 e)

Kher A.V and Zawar M.P. (1981) reports reduction in fetoplacental (F: P) ratio in toxemia of pregnancy, **Damania K.R. et al (1989)** states that F: P ratio is less in hypertensive pregnancies when compared to the normal uncomplicated pregnancies.

Majumdar et al (2005) observed F: P ratio 6.23 in hypertensive pregnancies as compared to 5.89 in norm tension pregnancies.

In the present study the fetoplacental ratio in normal pregnancies is 6.6. In mild, moderate and severe hypertension feto-placental ratio is 6.4, 6, and 6.98.The average F: P ratio in hypertension is 6.47, which is less than the normal uncomplicated pregnancies. This finding corresponds with Damania K.R. et al (1989).

The F: P ratio in severe hypertension is greater than the normal. The value and the finding coincide with Majumdar et al (2005) and vary from Kher A.V.& Zawar M.P (1981). Feto-placental ratio in premature, post mature placenta is 6.6, 6.3 and in diabetes mellitus it is 6.7.

g) Placental coefficient in normal pregnancies: (Table: 22 f)

Little (1960) reported the placental coefficient <0.08 and >0.2 as abnormal. **Kucuk. M. Doymaz. F (2008)** stated the placental coefficient to be 0.18 in normal cases.

In the present study the placental coefficient is 0.15. This value is within 0.08-0.2 as stated by Little (1960). This finding coincides with Little (1960). The observed value is less than Kucuk. M. Doymaz. F (2008). The placental coefficient in 69 uncomplicated pregnancies is 0.14, which is less than the value of 31 complicated pregnancies 0.16.

h) Placental coefficient in Diabetes Mellitus: (Table: 22 f)

Kucuk. M. Doymaz F (2008) stated the placental coefficient in gestational diabetes mellitus to be 0.21.

In the present study the average placental coefficient in 2 cases of diabetes mellitus is 0.14. This is less than the value of Kucuk.M Doymaz. F (2008).

i) Placental weight in Hypertension pregnancies:

(Chart-7a) (Table: 22 g)

Damania K.R. et al (1989) mentioned the placental weight to be less in hypertension pregnancies as compared to the normal pregnancies.

Rath G. et al (2000) observed mean placental weight in mild, moderate and severe hypertension as 351.308 gms, 338.024 gms and 332.410 gms.

Majumdar et al (2005) reported the mean placental weight in hypertension as 399.10 gms.

In the present study the average placental weight observed in mild hypertension (5 cases), moderate (3 cases) and severe hypertension (3 cases) is 475 gms, 375 gms and 316 gms. The mild and moderate hypertension value is greater than Rath G. et al (2000) and the severe hypertension value is less than Rath G. et al (2000).

The average weight of the hypertensive placenta is 388.6 gms, which is less than the weight of the normal pregnancies (490.58 gms). This finding coincides with Damania K.R. et al (1989) and Majumdar et al (2005).

j) Placental weight in Diabetes Mellitus: (Table: 22 h)

N.A. Beischer et al (1968) observed approximately that the weight of the placenta to be more than 900 gms in diabetic pregnancy.

Kucuz. M, Doymaz. F (2008) stated the average placental weight from Gestational diabetes mellitus to be 694.8 gms.

In the present study the mean placental weight in 2 specimens from gestational diabetes case was observed as 587.5 gms. This value is closer to Kucuz .M. Doymaz .F (2008) and differs from N.A. Beischer et al (1968).

k) Placental weight in Anaemia: (Table: 22 i)

Dockery J.L (1960) reported a placental specimen of weight 1,984 gms from anaemia complicating pregnancy with Hb% 4.1.

Singla P.N. et al (1978) observed the placental weight to be reduced in severe anaemia and the quoted that it is related directly to the hemoglobin levels.

N.A. Beischer et al (1968) reported 2% of the placentae weigh more than 900 gms in 420 cases of anaemia.

Godfrey KM et al (1991) mentioned that anaemic cases have larger placental weight with low hemoglobin value.

In the present study of 100 placentae, 2 placentae obtained from anaemia pregnancies with hemoglobin percentage 8 and 7 measured mean weight of 387.5 gms which was less compared to the normal weight of 490.58 gms in 69 uncomplicated pregnancies. This finding is similar to Singla. P.N. et al (1978) and varies from Dockery J.L (1960), N.A.Beischer et al (1968) and Godfrey KM et al (1991)

l) Placental weight in Rh-isoimmunisation: (Table: 22 j)

N.A. Beischer et al (1968) reported erythroblastosis placental weight to be approximately more than 900 gms.

In the present study the average weight of the placental specimen from Rh-ve mother with Rh+ve baby without complications was observed to be 400 gms, which is much less than the author.

m) Placental weight in premature male and female conceptus:

(Chart-7b) (Table: 22 k)

Gosh L.V. & Chandrasekhar (1946) stated that the placental weight of the male and female premature conceptus is 391.1 gms and 379.1 gms

S.P.Gupta et al (1972) reported the same to be 449.9 gms and 405.3 gms. He also stated that the male placentae are heavier than female placentae.

In this study of 100 placentae, in 6 premature placentae the average placental weight in 2 male and 4 female conceptus is 237.5 gms and 341.25 gms.

This finding differs from both the authors and in this study premature weight of the placenta in the female is greater than that of the male.

n) Placental weight in post mature placenta: (Table: 22 l)

Saigal. S & Srivastava J.R. (1970) observed the average placental weight at 42 wks and above to be 475.9 gms.

In the present study the average placental weight in 3 post mature placentae is 583.5 gms. This weight is much higher than the finding of Saigal. S & Srivastava J.R. (1970).

o) Weight of the placenta in bipartite (bilobed) placenta: (Table:22 m)

Fujikura et al (1970) stated the weight of 4.2% of bipartite placenta to be 473 gms.

In the present study 1 (1%) placenta biparita was observed with placental weight 475 gms. This finding is in confirmity with Fujikura et al (1970).

IV) Foetal surface: a) vascular pattern of the placenta:

Shordania. J (1929) mentioned about the disperse and magistral type of vascular pattern. He also stated that centrally attached cords have disperse pattern. **P.Bascish& C.F.V.Smout (1937)** also observed magistral and disperse type. **Andrade. A (1969)** quoted disperse type was frequently associated with centrally inserted cords. **Z.Gordon et al (2007)** mentioned a combination of dichotomous (disperse) and monopodial (magistral) pattern. He stated dichotomous (disperse) pattern was seen in centrally inserted cords and monopodial (magistral) pattern in marginal inserted cords.

In present study of 100 placentae (99+1 didi) disperse type was observed in 41 specimen (40%) in which central insertion of cord was observed in 9% and Eccentric cord insertion in 30%. Magistral type was observed in 15 specimen (14%) with 11(10%)marginal cord insertion and 4(3%) with eccentric cord insertion. Mixed type was seen in 45 (44%) specimens with eccentric type of cord insertion. This finding coincides with Shordania J. (1929), P.Basich and C.F.V.Smout (1937), and Z.Gordon et al. (2007) and is less similar from Andrade. A (1969) as disperse type is also seen in eccentric cords apart from centrally inserted cords.

Kishore. N & Sarkar. SC (1967) observed disperse type in 61.8% but in the present study disperse type was observed only in 40% which varies from Kishore N & Sarkar.sc (1967). **(Table: 23 a)**

Bhargava.I &Raja P.T.K. (1969) quoted that foetal veins occasionally cross-fetal arteries and it is correlated with abnormal fetal development.

Paul Wentworth (1965) reported 3.1% fetal veins crossing foetal arteries. In the present study of 100 placentae 1 specimen (1%) showed foetal veins crossing arteries and it was observed with normal development of the foetus. **(Pic: 56)(Table 23 b)**

Foetal surface: b) Insertion of the umbilical cord:

1) Central type: (Chart:8) (Table: 24 a)

Sarojamma (I986) observed 40% central type of cord insertion, **Earn A.A. (1951)** in 28%, **Krone H. A. (1961)** in 25% and **J. P.E.Judson (1986)** in 20%.

Eastman N.J.& Hellmann L.M. (1966) reported in 18% central type, **Hyrtl.J (1870)** in 16%, **Shanklin D.R (1958)** in 11%, **Gunapriya.R (2001)** 5% central type and **Chiari et al (1895)** observed 3.3% central type of cord insertion.

In the present study of 100 specimens (99+1(didi) with 101 cords) in 10 specimens (9%) central type of cord insertion was observed. This incidence value is similar to Shanklin D.R. (1958), higher than Gunapriya R. (2001) and Chiari et al (1895). This value is less than the other authors.

2) Battle Dore (marginal) Type: (Chart: 9) (Table: 24 b)

The following are authors who observed battledore (Marginal) type of cord insertion - **Hyrtl. J (1870)** in 19%, **Earn A.A (1951)** in 15%, **Monie I.W** (1965) 14.7%, **Krone H.A. (1961)** in 10%, and **J. P.E.Judson (1986)** in 10%.

Gunapriya. R (2001) reported marginal type in 9%, **Eastman N.J. and Hellmann L.M (1966)** in 7%, **S.Brody & D.A.Frenkel (1953)** in 6.2% **Uyanwah et al (1977)** in 5.6%, **Chiari et al (1895)** in 5%, and **Thomas. J. (1963)** in 5.2%.

Scott J.S (1960) observed 2% marginal type insertion, **Sarojamma (1986) 2**%, **Shanklin D.R (1958)** 1.9% and **Robinson et al (1983)** reported in 1.5% marginal type of cord insertion.

In the present study 13 specimens (12%) were observed to have battledore/marginal type of cord insertion in 101 cords. This incidence value is similar to Krone. H.A. (1961), J.P.E.Judson (1986) and is less than Earn A.A. (1951), Monie I.W (1965), and higher than the other authors.

3) Velamentous type of cord insertion: (Chart: 10) (Table: 24 c)

Monie I.W (1965) reported 15.3% velamentous type of cord insertion; **Sarojamma (1986)** mentioned the same to be 4%.

Uyanwah et.al (1977) observed 1.6%, **Robinson et al (1983)**, **Scott J.S (1960)** each reported 1.5%, **Thomas. J (1963)** 1.3%, **Eastman N.J. & Hellmann L.M (1966)** 1.25% of velamentons type of Cord insertion.

Noldeke.H (1934), Earn A.A (1951), Diterlizzi.G & Rossi.G.F (1955) and Krone.H.A (1961) each reported 1% of velamentous type of Cord insertion, **Lefevre.G (1896)** stated 0.84%, **Shanklin J.R. (1958)** 0.78%, **Greico. A. (1936)** 0.4%, **Scheffel T. & Langanke. D (1970)** 0.22% and **Cork ill T.F (1961)** found 0.024% of velamentous type of cord insertion.

In the present study of 100 placentae in 2 specimens (1.9%) velamentous type of cord insertion was observed. This finding is almost similar to Uyanwah et al (1977), Robinson et al (1983), Scott J.S (1961) and it is less than Monie.I.W (1965) and Sarojamma (1986). This incidence value is greater than other scientist.

4) Eccentric type of Cord insertion: (Chart: 11) (Table: 24 d)

Eccentric type of Cord insertion was found by **Chiari et al (1895)** in 91.2%, **Shanklin J.R (1958)** in 89%, **Gunapriya R (2001)** in 86%, **Eastman N.J&Hellmann L.M (1966)** in 73%, **Monie.I.W (1965)** in 70%, **J.P.E.Judson (1986)** in 80% and **Krone H.A (1961)** in 64%.

Earn A.A (1951) reported Eccentric type in 56%, **Hyrtl. J (1870)** in 54% and **Sarojamma (1986)** in 53%.

In the present study eccentric type of cord insertion was observed in 76 specimens (75%). This finding is closely similar to Eastman N.J.& Hellmann L.M. (1966), Monie I.W (1965), J. P.E.Judson (1986). It is less than Chairi et al (1895), Shanklin J.R (1958), Gunapriya R. (2001) and it is higher than the other authors.

5) Insertion of cord in Bilobed Placentae:

Torpin R. & Barfield W.E. (1968) observed that in 1/3rd of the bilobed placenta the cord inserts on the larger lobe and in 2/3 it has velamentous type of insertion.

In the present study of 100 placentae 1 case (1%) of placenta biparita was observed in which cord inserts on the larger lobe, which coincides with Torpin R. and Barfield W.E. (1968).

Nordenvall. M et al. (1988) reported marginal type of cord insertion in extrachorial and bilobed placentae. In the present study 1 specimen of extrachorial placenta and 1 specimen of bilobed placentae was observed of which only the bilobed placentae was associated with marginal (battledore) type of cord insertion and extrachorial had central type of cord insertion.

6) Foetal Blood vessels of the umbilical cord:

Edith.L.Potter (1952) and Keith.L.Moore & T.V.N.Persaud (1973) observed 2 umbilical arteries and 1 umbilical vein.

Stephen A. Heifetz (1996) quoted super numerarary vessels are less common than single umbilical artery. **H. Fox (1997)** stated increased vascular profiles in stillbirth associated with maternal cigarette smoking.

In the present study of 100 placentae in all the specimens (including intrauterine death) 2 umbilical arteries and 1 umbilical vein was observed. No case of single umbilical artery or supernumerary vessels was observed.

V) Length and diameter of the umbilical cord:

1. Length of the umbilical cord:

a) Average of the length of the umbilical cord:
(Chart: 12) (Table: 25 a)

The average length of the umbilical cord quoted by **Fog J. (1930)** is 59.6 cm, **Shordania. J (1929)** is 60 cm, **Mossinger et al (1986)** is 57 Cm, **Williams (1930)** is 55 cm, **Gardiner J.P (1922)** is 55 cm, **Gunapriya. R (2001)** is 53.5 cm, **Henry gray (1858)** is 50 cm, **Edith.L.Potter (1952)** is 50 cm, and **Sarojamma (1986)** is 38.5 cm.

In the present study the average length of the umbilical cord is 47.95 cm in 100 specimens. This finding is closer to Henry Gray (1858), Edith. L. Potter (1952) and higher than Sarojamma (1986). This value is less than the other authors.

Fog. J. (1930) quoted the average length of the cord in term pregnancy is 60.7 cm. The average length of the umbilical Cord in 69 uncomplicated pregnancies is 48.06 cm, which is less than Fog. J (1930). The average length of the cord in 31 complicated pregnancies is 47.71cm, which is less than the uncomplicated pregnancies.

b) Range of the Length of the umbilical cord: (Table: 25 b)

The range of length of the umbilical cord quoted by **Henry gray (1858)** is 20-120 cm; **Sarojamma (1986)** is 25-85 cm, **Gunapriya. R (2001)** is 30-70 cm, **Williams (1930)** is 30-100 cm, **Shordania. J (1929)** is 35-104 cm; **Schmidth-Elmendorf (1952)** is 50-70 cm and **Fox. H (1997)** is 54-61 cm.

In the present study the length of the umbilical cord ranges from 30-60 cm, which coincides with Gunapriya. R (2001) and varies from others. The length of the cord ranges from 30-60 cm in 69 uncomplicated pregnancies and 35-57 cm in 31 complicated pregnancies, which is similar to the normal uncomplicated pregnancies.

c) Short length of the umbilical cord:

Gardiner J.P. (1922) states cord length < 32 cm as absolutely short. In the present study one specimen with cord length < 32 cm was observed which measured 30 cm in length with velamentous type of cord insertion.

W.F. Rayburn et al (1981) quotes that cord length less than 35 cm as short. In the present study 2 cases of short cord with length 30 cm and 32 cm was observed.

Mossinger et al (1986) quoted infants with Down's syndrome have shorter cords (45.1 cm). In the present study no case of Down's syndrome was observed.

d) Length of the cord in Male and Female conceptus: (Table: 25 c)

Gunapriya. R (2001) quoted the average length of the cord in male conceptus is 54.6 cm and in female conceptus is 52.1 cm.

In the present study of 100 placentae the average length of the cord in male conceptus is 46.54 cm and in female is 49.23 cm. The length of the cord in female conceptus is longer than the male conceptus, which differs from Gunapriya. R (2001).

In 31 complicated pregnancies the average length of the cord in male and female conceptus is 46.6 cm and 48.70 cm, which is similar to the normal uncomplicated pregnancies.

e) Length of the cord in preterm conceptus: (Table: 25 d)

Fog. J (1930) stated the length of the cord in preterm conceptus to be 54.8 cm, which is less than the term value, which is 60.7 cm.

In the present study also the average cord length of the preterm conceptus (43.1 cm) is shorter than that of normal term pregnancies 48.06 cm as quoted by Fog. J. (1930).

f) Length of the cord in Breech presentation: (Table: 25 e)

Soernes T. & Bakke T. (1986) quoted the length of the cord in breech presentation in male and female conceptus to be 53.78 cm and 52.51cm.

In the present study 1 placental specimen (female conceptus) was obtained through breech delivery. The cord length was 41 cm, which is less than the value of Soernes. T. & Bakke. T. (1986).

2. Diameter of the umbilical cord: (Table: 26)

Diameter of the umbilical cord stated by **Henry Gray (1858), Shordania. J (1929) and Edith. L. Potter (1952)** each ranges from 1-2 cm (10-20 mm), **schmidt-Elemendorf (1952)** says 15-20mm, **Williams (1930)** stated 0.8-2 cm and **Gunapriya. R (2001)** quoted it as 0.6-1.1 cm.

In the present study the diameter of the placenta in 100 specimens ranges from 0.85 - 1.6cm, which coincides with Williams (1930) and differs from others. The range of the umbilical cord diameter in 31 complicated pregnancies is (0.85-1.5cm) similar to 69 normal uncomplicated pregnancies (0.86-1.6 cm).

VI) Spiral Twist(Turns) of the umbilical cord:

a) Sinistral twist (Left) : (Chart-13) (Table: 27 a)

The percentage of sinistral twist quoted by **Ronald. V. Lacro (1987)** is 83, **Henry. W. Edmonds (1954)** is 82, **Read. W (1860)** is 77 and **Neugebauer L.A (1858)** is 71.

In the present study of 100 placentae (99+1(didi) with 101cords) sinistral twist was observed in 96 specimens (95%), which is higher than the value of the above authors.

b) Dextral twist (Right) : (Table: 27 b)

The percentage of dextral (right) twist reported by various authors like **Neugebauer. L.A (1858) is** 24, **Read. W (1860)** 14, **Henry W.Edmonds (1954)** 12 and **Ronald. V. Lacro (1987)** 12.

In the present study dextral (right) twist was observed in 3 specimens (2%), which is much less compared to the above authors.

c) Compound twist (Right and Left) : (Table: 27 c)

Read. W (1860) stated 1.85% incidence of compound twist.

In the present study 2 specimens of compound twist (1.9%) was observed which coincides with Read. W (1860).

d) Nil Twist: (Table: 27 d)

The percentage of nil twist (absent twist) observed by various authors like **Henry. W.Edmonds (1954) is** 8, **Ronald. V.Lacro (1987)** 5, **Thomas et al (1993)** 4.3, **Neugebauer. L.A (1858) 4.3** and **Read.W (1860)** 1.8.

In the present study 1 specimen (0.9%) had no twist and it was shorter in length with velamentous cord insertion. This value is much less when compared to the above authors.

e) Umbilical coiling index : (Table: 27 e)

Rana et al (1995) reported the average umbilical coiling index in their study of 635 placentae was 0.19 coils/cm

In this study of 100 placentae the average umbilical coiling index is 0.134 coils /cm. This value is less similar to Rana et al (1995).

DISCUSSION (Animal Placenta)

Domestic cattle - cow : (Table: 28 a)

Wild (1964):

Stated the cotyledons in cow placenta ranges from 80-120.

In the present study the cow placenta contained 80 cotyledons, which is similar to Wild (1964).

KurtBenirschke (2007):

Quoted cow placenta weigh 4 - 5 kg with 4 blood vessels and no spiral twist in the umbilical cord.

In the present study the cow placenta weighed 4 kg and the cord contained 4 blood vessels with absent spiral twist, which concurs with findings of KurtBenischke (2007).

Domestic Pig: (Table: 28 b)

Stephens J. Roberts (1971):

Says the pig placenta is diffuse in type.

In the present study 1 fused pig placenta with no discrete cotyledon was observed which corresponds with findings of Stephen. J. Roberts.

KurtBenirschke (2007):

Quotes that the pig placenta contains 3 blood vessels with a patent allantoic duct.

In the present study the umbilical cord of the pig placenta measured around 40 cm, with 3 blood vessels and an allantoic duct, which matches with the findings of KurtBenirschke (2007).

Sheep Placenta: (Table: 28 c &d)

Kleeman et al (2001):

Reported the weight of the sheep placenta to be around 600 gms.

In the present study the weight of the sheep placenta is 800 gms, which is greater than Kleeman et al (2001).

KurtBenirschke (2007):

Stated the polycotyledonary sheep placenta contained around 60-100 cotyledons. Umbilical cord measured 27 cm in length with 4 blood vessels and an allantoic duct.

In the present study the sheep placenta is polycotyledonary in shape with 60 cotyledons. The length of the cord is 20 cm with 4 blood vessels and an allantoic duct, which is similar to KurtBenischke (2007).

Reynolds S.R.M. (1952):

Quoted umbilical cord of the sheep had no spirals.

In the present study also spirals were absent in the umbilical cord.

Goat placenta: (Table: 28 e)

KurtBenirschke (2007):

States that goat placenta weigh around 200 gms. The umbilical cord measured 10 cm in length, 1 cm in diameter with 4 blood vessels and an allantoic duct with absent spirals of the umbilical cord.

In the present study the goat placenta weighed around 400 gms and the length of the umbilical cord measured 17cm, which differs from Kurt Benirschke (2007). The umbilical cord without spirals measures 0.95cm in diameter with 4 blood vessels and an allantoic duct, which is similar to Kurt Benirschke (2007).

Domestic Rabbit: (Table: 28 f)

Martensson.L (1984):

Stated the average placental weight of the rabbit to be 4 g.

In the present study the rabbit placenta weighed 5 gms, which is similar to Martensson.L (1984).

KurtBenirschke (2007):

Stated that rabbit umbilical cord measured 2 cm in length, with absent spirals and contained within it 2 umbilical arteries and 1 umbilical vein.

In the present study the umbilical cord measured 2 cm in length with 2 umbilical arteries, 1 vein, and with absent spirals. This finding agrees with Kurt Benirschke (2007).

CONCLUSION

- In 100 placentae the circular shape was the common form (55%) and oval shape was the next common (30%). Triangular shape (8%), succensuriata (2%), circumvallata (1%), bilobedplacenta (1%), kidney shape (1%), heart shape (1%) and fused placenta (1%) were also observed in this study.

- The mean diameter of the placenta in 100 specimens is 17.73 cm. The mean diameter of the placenta in complicated pregnancies (17.20 cm) is similar to the uncomplicated pregnancies (17.97 cm). The mean placental diameter is increased in diabetes mellitus and decreased in anaemia and hypertension.

- The average thickness of the placenta in the present study in 1.9 cm. The thickness of the placenta in complicated pregnancies (1.89 cm) is slightly less than the uncomplicated pregnancies (1.9cm). The thickness of the diabetes mellitus placenta (2.6cm) is greater than the uncomplicated pregnancies and the thickness in hypertension and anaemia is less than the uncomplicated pregnancies (1.5cm).

- The average cotyledon number in the present study is 18, in normal uncomplicated pregnancies it is 19 and in complicated pregnancies it is 17. The cotyledon number is increased in diabetes mellitus (19) and reduced in hypertension (14). In anaemia ill-defined cotyledons were observed.

- The average weight of the placenta in 100 cases is 472.49 gms, in complicated pregnancies it is 432.74 gms and in uncomplicated pregnancies it is 490.58 gms. In diabetes mellitus (587.5 gms), weight of the placenta is greater than the uncomplicated pregnancies (490.58 gms).

The weight of the placenta in hypertension (388.66 gms) and anaemia (387.5 gms) is less than the uncomplicated pregnancies (490.58 gms).

- The mean feto-placenta ratio in this study is 6.6 (Complicated pregnancies – 6.5 and uncomplicated pregnancies – 6.7). The feto placental ratio is not much altered in anaemia (6.3), hypertension (6.4) and diabetes mellitus (6.7) when compared to uncomplicated pregnancies.

- The placental coefficient in this study is 0.15 (complicated-0.16 and uncomplicated is 0.14). The placental coefficient is increased in factors complicating pregnancy such as hypertension (0.15), anaemia (0.15) and not altered in diabetes mellitus (0.14) when compared to normal pregnancies.

- The average weight of the conceptus in the present study is 3.16 kg (complicated – 2.6 kg and uncomplicated – 3.28 kg). The average weight of the conceptus is reduced in factors complicating pregnancy like intrauterine death, anaemia, and hypertension and increased in diabetes mellitus.

- In the present study the vascular pattern of the placenta observed were disperse type 40%, magistral 14% and mixed type 44%.

- In the present study the type of cord insertion observed was central 9%, battledore (marginal) 12%, velamentous type 1.9% and eccentric type 75%, which is the most common in the present study.

- In all the 100 specimens 2 umbilical arteries and 1 umbilical vein was present.

- The average length of the umbilical cord is 47.95 cm. The length of the cord in complicated pregnancies is 47.71 cm, which is shorter compared to the normal pregnancies 48.06 cm.

- The average diameter of the umbilical cord in the present study is 1.132 cm (complicated pregnancies- 1.112 cm, uncomplicated pregnancies- 1.138 cm).

- In the present study dextral twist was observed to be (right) 2%, compound twist 1.9%, nil twist 0.9%, and sinistral twist (Left) was 95% which was most commonly observed.

- In the present study 15 % of false knots were observed.

- Histological study –In hypertensive placenta histology showed numerous syncytial knots, hypermature villi with medial hypertrophy of the blood vessel. Diabetic placenta showed hypovascular large villi with fibrin deposits. Placenta in anaemia showed small villi with narrow intervillous spaces.

- Silicone gel cast technique revealed 3 disperse type and 2 magistral type of vascular pattern.

- Contrast study of placental vasculature by angiogram method revealed 3 disperse type and 2 magistral type of vascular pattern.

- Sheep, goat and cow placentae have cotyledonary type of placenta where as pig has diffuse type of placenta. Only rabbit has discoidal placenta similar to the humans. Weight of the cow placenta is heavier than the human placenta.

- Morphology and morphometric study of the placenta and umbilical cord with vascular pattern will be definitely useful to the vascular surgeons operating intrauterinely to correct the congenital defects, and the variations observed will be useful to the respective clinicians and anatomist, who are doing further research in this field. Comparative anatomy done in this study will help the Veterinary doctors in their research.

STAINING PROCEDURE FOR FORMALIN FIXED SPECIMENS

Dehydration with graded alcohol

↓

Cleaning with xylol

↓

Impregnation with wax

↓

Embedding

↓

Sectioning

↓

Mounting of Sections

↓

Staining

Staining

↓

Deparaffinization

↓

Hydration with graded alcohol

↓

Haematoxylin and Eosin Staining

↓

Dehydration

↓

Cleaning

↓

Mounting the slide with DPX

(Cytoplasm – Pink)
(Nucleus – Purple)

Tables – 1

STUDY	No. of male conceptus placenta	No. of female conceptus placenta	Total
69 uncomplicated pregnancies	33	36	69
31 complicated pregnancies	14	17	31
Total100 specimens	47	53	100

Tables – 2

Factors complicating pregnancy	No. of male conceptus placenta	No. of female conceptus placenta	Total
Pregnancy induced hypertension:			
Mild	3	2	5
Moderate	1	2	3
Severe	2	1	3
Diabetes mellitus	-	2	2
Anaemia	2	-	2
Rh-isoimmunisation	-	1	1
Abruptio placentae	2	-	2
Pre maturity	2	4	6
Post maturity	1	2	3
Twin pregnancy	1	-	1
Abnormal pregnancy	-	2	2
Placenta praevia	-	1	1
Total	**14**	**17**	**31**

Tables – 3
SHAPE OF THE PLACENTA

Shape of the placenta	Uncomplicated Pregnancies			Complicated Pregnancies			Total number of placental Specimens
	M	F	T	M	F	T	
Circular	16	26	42	4	9	13	55
Oval	11	11	22	4	4	8	30
Triangular	4	-	4	2	2	4	8
Succensuriata	-	-	-	2	-	2	2
Circumvallate	-	-	-	1	-	1	1
Fused	-	-	-	1	-	1	1
Kidney	-	-	-	0	1	1	1
Heart	-	1	1	-	-	-	1
Bilobed	-	-	-	-	1	1	1
Total	31	38	69	14	17	31	100

Tables – 4

DIAMETER OF THE PLACENTA

Study	Diameter in cm Average			Diameter in cm Range		
	Total	Male	Female	Total	Male	Female
100 specimens	17.73	17.72	17.74	11-28	11-28	12-26
69 uncomplicated pregnancies	17.97	18.13	17.81	14-22	14-22	14-22
31 complicated pregnancies	17.16	16.75	17.58	11-28	11-28	12-26

Tables – 5

THICKNESS OF THE PLACENTA

Study	Thickness in cm Average			Thickness in cm Range		
	Total	**Male**	**Female**	**Total**	**Male**	**Female**
100 specimens	1.9	1.9	1.9	1-3.1	1-3	1-3.1
69 uncomplicated pregnancies	1.93	1.96	1.9	1-3.1	1-3	1.2-3.1
31 complicated pregnancies	1.8	1.7	1.9	1-2.8	1-2.5	1-2.8

Tables – 6

MATERNAL SURFACE -COTYLEDON

Study	Cotyledon number Average			Cotyledon number Range		
	Total	**Male**	**Female**	**Total**	**Male**	**Female**
100 specimens	18	18	18	8-30	8-30	9-28
69 uncomplicated normal pregnancies	19	19	19	12-26	13-25	14-26
31 complicated pregnancies	17	17	17	8-30	8-30	9-28

Tables – 7

WEIGHT OF THE PLACENTA

Study	Placental weight in (gms) Average			Placental weight in (gms) Range		
	Total	**Male**	**Female**	**Total**	**Male**	**Female**
100 specimens	472.49	468.29	476.69	150-850	150-850	275-675
69 uncomplicated normal pregnancies	490.58	487.42	493.75	375-625	400-625	375-575
31 complicated pregnancies	432.74	423.21	440.5	150-850	150-850	275-675

Tables – 8 a

WEIGHT OF THE CONCEPTUS

Study	Weight of the conceptus in (Kg) Average			Weight of the conceptus in (Kg) Range		
	Total	**Male**	**Female**	**Total**	**Male**	**Female**
100 specimens	3.16	3.005	3.247	.475-4	0.475-3.9	2.1-4
69 uncomplicated normal pregnancies	3.28	3.13	3.4	2.2-3.8	2.2-3.75	2.4-3.8
31 complicated pregnancies	2.6	2.71	2.85	0.475-4	0.475-3.9	2-4

Table: 8 b

WEIGHT OF THE PLACENTA IN RELATION TO THE WEIGHT OF THE CONCEPTUS

Sex of the conceptus	No of conceptus	Weight of the Conceptus kg		Weight of the Placenta gms	
		Average	Range	Average	Range
Male	47	3.005	.475-3.9	468.29	150-850
Female	53	3.247	2.1-4	476.69	275-675

Tables –8c

FETO PLACENTAL RATIO

Study	Feto placental ratio in (FW/PW) (FP) Average		
	Total	Male	Female
100 specimens	6.6	6.6	6.7
69 uncomplicated pregnancies	6.7	6.6	6.7
31 complicated pregnancies	6.5	6.6	6.5

Tables – 8 d

PLACENTAL COEFFICIENT

Study	Placental co-efficient (PW/FW) Average		
	Total	Male	Female
100 specimens	0.15	0.14	0.15
69 uncomplicated pregnancies	0.14	0.14	0.14
31 complicated pregnancies	0.16	0.19	0.14

Tables – 9

VASCULAR PATTERN OF THE PLACENTA

S.No.	Type of pattern	Number of vascular pattern	%
1	Disperse	41	40
2	Magistral	15	14
3	Mixed	45	44

Tables – 10
INSERTION OF THE UMBILICAL CORD

S.No.	Type of Insertion	Number of specimens	%
1.	Central	10	9
2.	Battle dore (Marginal)	11	10
3.	Velamentous	2	1.9
4.	Eccentric	78	77

Tables – 11

UMBILICAL CORD LENGTH

Study	Umbilical cord length in (Cm) Average			Umbilical cord length in (Cm) Range		
	Total	Male	Female	Total	Male	Female
100 specimens	47.95	46.54	49.23	30-60	32-55	30-60
69 uncomplicated pregnancies	48.06	46.54	49.48	30-60	32-55	30-60
31complicated pregnancies	47.68	46.46	48.76	35-57	35-55	38-57

Tables – 12
DIAMETER OF THE UMBILICAL CORD

Study	Umbilical cord diameter in (Cm) Average			Umbilical cord diameter in (Cm) Range		
	Total	Male	Female	Total	Male	Female
100 specimens	1.132	1.128	1.136	0.85-1.6	0.85-1.5	0.85-1.6
69 uncomplicated pregnancies	1.138	1.120	1.156	0.86-1.6	0.86-1.5	0.87-1.6
31 complicated pregnancies	1.112	1.146	1.094	0.85-1.5	0.85-1.5	0.85-1.4

Tables –13 a
SPIRAL TWIST OF THE UMBILICAL CORD

S.No.	Type of Spiral Twist	Number of Spiral Twist	%
1.	Sinistral	96	95
2.	Dextral	3	2
3.	Compound	2	1.9
4.	Nil	1	0.9

Tables – 13 b
UMBILICAL COILING INDEX

S.No.	Study	Average umbilical coiling index per cm
1.	100 specimens	0.134
2.	69 uncomplicated pregnancies	0.131
3.	31 complicated pregnancies	0.139

Tables – 13 c
KNOTS

S.No.	Type of Knot	Number of Knots
1.	False knots	15
2.	True knots	Absent

Table 14 c

MORPHOMETRIC VALUES OF THE FACTORS COMPLICATING PREGNANCY

Factors complicating pregnancy	Average diameter of umbilical cord Cm	Range of umbilical cord diameter Cm	Umbilical coiling index per cm
Pregnancy induced hypertension			
i) Mild	1.2	1-1.5	.14
ii) Moderate	1.01	.89-1.2	.17
iii) Severe	1.26	1.1-1.4	.133
Diabetes mellitus	1.2	1.1-1.3	.085
Anaemia	1.15	1.1-1.2	.0925
Rhiso immunisation	1.1	-	.07
Prematurity	1.25	.85-1.4	.13
Post maturity	.91	.85-1	.10
Abruptio placentae	1.05	1-1.1	.097
Twin pregnancy	1.2	1.1-1.3	.13
Abnormal presentation	1.15	1.1-1.2	.15
Placenta praevia	1.1	-	.18

Table: 15
VASCULAR PATTERN OF THE PLACENTA
BY SILICONE GEL CAST METHOD

Specimen	Type of vascular pattern
1	Disperse
2	Magistral
3	Disperse
4	Magistral
5	Disperse

Table: 16

VASCULAR PATTERN OF THE PLACENTA
BY ANGIO GRAM METHOD

Specimen	Type of vascular pattern
1	Disperse
2	Magistral
3	Disperse
4	Magistral
5	Disperse

Table – 17

MORPHOMETRIC VALUES OF THE ANIMAL PLACENTA

Parameters	Cow	Pig	Sheep	Goat	Rabbit
1. Shape of the placenta	Poly cotyledonary	Diffuse	Poly cotyledonary	Poly cotyledonary	Discoidal
2. Length of the placenta	40 cm	35 cm	35 cm	30cm	-
3.Breadth, Diameter of the placenta	13 cm	15 cm	10 cm	13 cm	5.5cm
4. Thickness of the placenta	0.9 cm	1.2 cm	0.8 cm	0.75 cm	1.2 cm
5. Weight of the placenta	4 kg	1.6kg	800gms	400gms	5gms
6. Cotyledon number	80 concave shaped	Absent	60 convex shaped	70 Convex shaped	4
7. Length of the umbilical cord	35 cm	30 cm	20 cm	17 cm	2 cm
8. Diameter of the umbilical cord	1cm	.95 cm	1 cm	1 cm	0.75 cm
9. Umbilical blood vessels	2 arteries, 2 veins	2 arteries 1 vein	2 arteries 2 vein	2 arteries 2 vein	2 arteries 1 vein
10. Allantoic duct	Present	Present	Present	Present	Absent
11. Spiral Twist of the umbilical cord	Absent	Absent	Absent	Absent	Absent

Table-14 a

MORPHOMETRIC VALUES OF THE FACTORS COMPLICATING PREGNANCY

Factors complicating pregnancy	Average diameter cm	Range of diameter cm	Average thickness cm	Range of thickness cm	Average cotyledon No.	Range of cotyledon No.	Average length of umbilical cord cm	Range of the umbilical cord length (cm)
Pregnancy induced hypertension								
i) Mild	17.2	16-20	2.2	1.6-2.8	17	16-22	48.2	42-51
ii) Moderate	18.3	17-19	1.36	1-1.7	14	14-15	49	45-57
iii) Severe	14	11-18	1.26	1-1.8	11	8-14	45	43-49
Diabetes mellitus	23.5	21-26	2.6	2.4-2.8	19	18-20	55	54-56
Anaemia	13	12-14	1.5	1-2	14	12-16	46.5	45-48
Rh-iso immunization	16	-	1.8	-	18	-	57	-
Prematurity	13.25	11.5-17	1.34	1-2	12	9-20	43.1	35-50
Post maturity	19.3	18-20	2.45	2-2.8	22	18-22	51	47-51
Abruptio placentae	18	17.5-18.5	1.9	1.8-2	17	16-18	43	41-45
Twin pregnancy	28	-	2.5	-	30	-	52.5	50-55
Abnormal presentation	19	18-20	1.9	1.8-2	17	16-22	51.5	48-55
Placenta praevia	14	-	2	-	13	-	55	-

Table-14 b

MORPHOMETRIC VALUES OF THE FACTORS COMPLICATING PREGNANCY

Factors complicating pregnancy	Average placental weight gms	Range of placental weight gms	Average weight the of conceptus Kg	Range of weight of the conceptus Kg	Feto placental ratio	Placental coefficient
Pregnancy induced hypertension						
i) Mild	475	425-525	3.322	3-3.8	6.4	.14
ii) Moderate	375	1350-400	2.266	2-2.7	6	.16
iii) Severe	316.66	2275-350	2.025	1.4-2.4	6.98	.15
Diabetes mellitus	587.5	-575-600	3.95	3.9-4	6.7	.14
Anaemia	387.5	375-400	2.45	2.2-2.7	6.3	.15
Rh- iso immunisation	400	-	2.9	-	7.2	.13
Prematurity	306.6	150-390	1.945	.475-2.7	6.34	.15
Post maturity	585	500-575	3.73	3.5-3.7	6.3	.15
Abruptio placentae	425	350-475	2.7	2.2-3.2	6.5	.15
Twin pregnancy	425	-	2.45	-	5.76	.17
Abnormal presentation	437.5	425-450	3	3-3.2	6.8	.14
Placenta praevia	475	-	3.3	-	6.9	.14

Table: 18 a

COMPARISON OF INCIDENCE OF CIRCULAR SHAPE OF THE PLACENTA

AUTHORS	%
SAROJAMMA (1986)	57
GUNAPRIYA.R (2001)	93
PRESENT STUDY	55

Table: 18 b

COMPARISON OF INCIDENCE OF OVAL SHAPE OF THE PLACENTA

AUTHORS	%
SAROJAMMA (1986)	36
GUNAPRIYA.R (2001)	7
PRESENT STUDY	30

Table: 18 c

COMPARISON OF INCIDENCE OF TRIANGULAR SHAPE OF THE PLACENTA

AUTHORS	%
SAROJAMMA (1986)	7
PRESENT STUDY	8

Table: 18 d

COMPARISON OF INCIDENCE OF SUCCENSURIATA PLACENTA

AUTHORS	%
GUNAPRIYA.R (2001)	3
PRESENT STUDY	2

Table: 18 e

COMPARISON OF INCIDENCE OF CIRCUMVALLATA PLACENTA

AUTHORS	%
SCOTT.J.S (1960)	18.3
WENTHWORTH.P (1968)	6.5
J.BAZSO (1966)	5.8
FOX.H AND SEN.D.K (1972)	2.4
WILSON.D AND PAALMAN.R.J (1967)	1
ZIEL.H.A (1963)	0.62
PRESENT STUDY	1

Table: 18 f

COMPARISON OF INCIDENCE OF PLACENTA BIPARITA

AUTHORS	%
AUGERO.O (1957)	3.26
H.FOX (1978)	0.2
PRESENT STUDY	1

Table: 19a

COMPARISON OF AVERAGE DIAMETER OF THE PLACENTA

AUTHORS	DIAMETER IN CM
HENRY GRAY (1858)	18.5
J.DBOYD AND W.J HAMILTON (1970)	18.5
LESLIE.B.AREY (1924)	17.5
GUNAPRIYA.R (2001)	17.4
J.P.E.JUDSON (1986)	16.9
RICHARD.S. SNELL (1973)	20
PRESENT STUDY	17.73

Table: 19 b

COMPARISON OF RANGE OF PLACENTAL DIAMETER

AUTHORS	DIAMETER IN CM
HENRY GRAY (1858)	10-40
T.W.SADLER (1963)	15-25
KEITHL.L.MOORE & T.V.N PERSAUD (1973)	15-20
GUNAPRIYA.R (2001)	12-22.5
PRESENT STUDY	11-28

Table: 20 a

COMPARISON OF AVERAGE THICKNESS OF THE PLACENTA

AUTHORS	THICKNESS IN CM
T.W.SADLER (1963)	3
LESLIE .B. AREY (1924)	2.5
RICHARD.S.SNELL (1973)	2.5
HENRY GRAY (1858)	2.3
J.DBOYD AND W.J HAMILTON (1970)	2.1
GUNAPRIYA.R (2001)	12-22.5
PRESENT STUDY	1.9

Table: 20 b

COMPARISON OF RANGE OF PLACENTAL THICKNESS

AUTHORS	THICKNESS IN CM
HENRY GRAY (1858)	10-40
T.W.SADLER (1963)	15-25
KEITHL.L.MOORE & T.V.N PERSAUD (1973)	2-3
GUNAPRIYA.R (2001)	1.5-2.7
CYNTHIA..G.KAPALAN (1996)	2-2.5
SAROJAMMA (1986)	1.5-2
PRESENT STUDY	1-3.1

Table: 21 a

COMPARISON OF AVERAGE COTYLEDON NUMBER

AUTHORS	COTYLEDON NO:
ALLAN.C.BARNES (1968)	30
MAJUMDAR ET AL (2005)	19
SAROJAMMA (1986)	18
GUNAPRIYA.R (2001)	18
PRESENT STUDY	18

Table: 21 b

COMPARISON OF RANGE OF COTYLEDON NUMBER

AUTHORS	COTYLEDON NO:
K.BENIRSCHKE ET AL (1967)	10-40
J.DBOYD AND W.J HAMILTON (1970)	10-38
HENRY GRAY (1858)	15-30
T.W.SADLER (1963)	15-20
SAROJAMMA (1986)	3-24
GUNAPRIYA.R (2001)	12-24
PRESENT STUDY	8-30

Table: 21 c

COMPARISON OF AVERAGE COTYLEDON NUMBER IN HYPERTENSION

AUTHORS	COTYLEDON NO:
MAJUMDAR ET AL (2005)	18
IN HYPERTENSION GROUP (PRESENT STUDY-11 SPECIMENS)	14

Table: 22 a

COMPARISON OF AVERAGE WEIGHT OF THE PLACENTA

AUTHORS	WEIGHT IN GMS
LURIE. S.ET AL (1999)	613
KUCUZ.M.DOYMAZ.F (2008)	610
SWANSON .L.D, BEWTRAC.C (2008)	537
SAIGAL.S & SRIVASTAV.J.R (1970)	531.5
MAJUMDAR ET AL (2005)	485.85
SHAMEER SINGH ET AL (1979)	475
HENRY GRAY (1858)	470
WONG.T.C & J. A .P. LARTOUR (1966)	463
FUJIKURA ET AL (1970)	448
RATH .G ET AL (2000)	382.148
PRESENT STUDY	472.49

Table: 22 b

COMPARISON OF RANGE OF PLACENTAL WEIGHT OF THE PLACENTA

AUTHORS	WEIGHT IN GMS
HENRY GRAY (1858)	200-800
WIGGLES WORTH (1962)	360-570
HOSEMAN.H (1949)	400-1000
PRESENT STUDY (IN 100 SPECIMENS)	150-850

Table: 22 c

COMPARISON OF PLACENTAL WEIGHT IN MALE AND FEMALE CONCEPTUS

Authors	Weight in Male conceptus Gms	Weight in female conceptus Gms
GOSH.L.V&CHANDRASEKAR.C (1948)	486.3	479
S.P.GUPTA ET AL (1972)	521.9	510.4
PRESENT STUDY	468.29	476.69

Table: 22 d

COMPARISON OF FETO-PLACENTAL WEIGHT RATIO IN NORMAL CASES

Authors	Average feto-placental weight	Average feto-placental weight in males	Average feto-placental weight in females
KUCUZ. M.DOYMAZ.F (2008)	5.6	5.7	5.6
PRESENT STUDY	6.6	6.6	6.7

Table: 22 e

COMPARISON OF FETO-PLACENTAL WEIGHT RATIO IN HYPERTENSION PREGNANCIES

Authors	Average feto-placental weight in normal pregnancies	Average feto-placental weight in hypertensive pregnancies
MAJUMDAR ET AL (2005)	5.89	6.23
PRESENT STUDY	6.6	6.47

Table: 22 f

COMPARISON OF PLACENTAL COEFFICIENT IN NORMAL PREGNANCIES AND DIABETES MELLITUS

Authors	Placental coefficient in normal pregnancies	Placental coefficient in diabetic pregnancies
KUCUZ. M.DOYMAZ.F (2008)	0.18	0.21
PRESENT STUDY	0.15	0.14

Table: 22 g

COMPARISON OF PLACENTAL WEIGHT IN HYPERTENSION

Authors	Weight in mild hypertension Gms	Weight in moderate hypertension Gms	Weight in severe hypertension Gms
RATH.G ET AL (2000)	351.308	338.308	332.410
PRESENT STUDY	475	375	316

Table: 22 h

COMPARISON OF PLACENTAL WEIGHT IN DIABETES MELLITUS

Authors	Weight in gms
N.A BEISCHER ET AL (1968)	900
KUCUZ. M.DOYMAZ.F (2008)	694.8
PRESENT STUDY	587.5

Table: 22 i

COMPARISON OF PLACENTAL WEIGHT IN ANAEMIA

AUTHORS	WEIGHT IN GMS
DOCKERY.J.L (1960)	1,984
N.A BEISCHER ET AL (1968)	900
PRESENT STUDY	387.5

Table: 22 j

COMPARISON OF PLACENTAL WEIGHT IN RH-ISOIMMUNISATION

AUTHORS	WEIGHT IN GMS
N.A BEISCHER ET AL (1968)	900
PRESENT STUDY	400

Table: 22 k

COMPARISON OF PLACENTAL WEIGHT IN PREMATURE MALE AND FEMALE CONCEPTUS

Authors	Weight in Male conceptus gms	Weight in Female conceptus gms
GOSH.L.V & CHANDRASEKAR.C (1948)	391.1	379.1
S.P.GUPTA ET AL (1972)	449.9	405.3
PRESENT STUDY	237.5	341.5

Table: 22 l

COMPARISON OF PLACENTAL WEIGHT IN POST-MATURE CONCEPTUS

AUTHORS	WEIGHT IN GMS
SAIGAL.S & J.R SRIVASTAVA (1970)	475.9
PRESENT STUDY	585

Table: 22 m

COMPARISON OF WEIGHT OF PLACENTA BIPARITA

AUTHORS	WEIGHT IN GMS
FUJIKURA ET AL (1970)	473
PRESENT STUDY	475

Table: 23 a

COMPARISON OF INCIDENCE OF DISPERSE TYPE OF VASCULAR PATTERN

AUTHORS	%
KISHORE .N & SARKAR.S.C (1967)	61.8
PRESENT STUDY	40

Table: 23 b
COMPARISON OF INCIDENCE OF FOETAL VEINS CROSSING FOETAL ARTERIES

AUTHORS	%
PAUL WENTHWORTH (1965)	3
PRESENT STUDY	1

Table: 24 a

COMPARISON OF INCIDENCE OF CENTRAL TYPE OF CORD INSERTION

AUTHORS	%
SAROJAMMA (1986)	40
EARN.A.A (1951)	28
KRONE.H.A. (1961)	25
J.P.E JUDSON (1986)	20
EASTMAN .N.J & HELLMANN.L.M (1966)	18
HYRTL. J (1870)	16
SHANKLIN.D.R (1958)	11
GUNAPRIYA.R (2001)	5
CHIARI ET AL (1895)	3.3
PRESENT STUDY	9

Table: 24 b

COMPARISON OF INCIDENCE OF BATTLE DORE (MARGINAL) TYPE OF CORD INSERTION

AUTHORS	%
HYRTL. J (1870)	19
EARN.A.A (1951)	15
MONIE.I.W (1965)	14.7
KRONE.H.A. (1961)	10
J.P.E JUDSON (1986)	10
GUNAPRIYA.R (2001)	9
EASTMAN .N.J & HELLMANN.L.M (1966)	7
S.BRODY & D.A.FRENKEL (1953)	6.2
UYANWAH ET AL (1977)	5.6
CHIARI ET AL (1895)	5
THOMAS.J (1963)	5.2
SCOTT.J.S (1960)	2
SAROJAMMA (1986)	2
SHANKLIN.D.R (1958)	1.9
ROBINSON ET AL (1983)	1.5
PRESENT STUDY	12

Table: 24 c

COMPARISON OF INCIDENCE OF VELAMENTOUS TYPE OF CORD INSERTION

AUTHORS	%
MONIE.I.W (1965)	15.3
SAROJAMMA (1986)	4
UYANWAH ET AL (1977)	1.6
ROBINSON ET AL (1983)	1.5
SCOTT.J.S (1960)	1.5
THOMAS.J (1963)	1.3
EASTMAN .N.J & HELLMANN.L.M (1966)	1.25
NOLDEKE.H (1934)	1
EARN.A.A (1951)	1
DITERLIZZI.G & ROSSI.G.F (1955)	1
KRONE.H.A. (1961)	1
LEFEVRE.G (1896)	.84
SHANKLIN.D.R (1958)	.78
GRIECO.A (1936)	.4
SCHEFEL.T & LANGANKE.D (1970)	.22
CORKILL.T.F (1961)	.024
PRESENT STUDY	1.9

Table: 24 d

COMPARISON OF INCIDENCE OF ECCENTRIC TYPE OF CORD INSERTION

AUTHORS	%
CHIARI ET AL (1895)	91.2
SHANKLIN.D.R (1958)	89
GUNAPRIYA.R (2001)	86
EASTMAN .N.J & HELLMANN.L.M (1966)	73
MONIE.I.W (1965)	70
J.P.E JUDSON (1986)	70
KRONE.H.A. (1961)	64
EARN.A.A (1951)	56
HYRTL. J (1870)	54
SAROJAMMA (1986)	53
PRESENT STUDY	75

Table: 25 a

COMPARISON OF AVERAGE LENGTH OF THE UMBILICAL CORD

AUTHORS	LENGTH IN CM
FOG.J (1930)	59.6
SHORDANIA .J (1929)	60
MOSSINGER ET AL (1986)	57
WILLIAMS (1930)	55
GARDINER .J.P (1922)	55
GUNPRIYA.R (2001)	53.5
HENRY GRAY (1858)	50
EDITH.L.POTTER (1952)	50
SAROJAMMA (1986)	38.5
PRESENT STUDY	47.95

Table: 25 b

COMPARISON OF RANGE OF LENGTH OF THE UMBILICAL CORD

AUTHORS	LENGTH IN CM
HENRY GRAY (1858)	20-120
SAROJAMMA (1986)	25-85
GUNAPRIYA.R (1986)	30-70
WILLIAMS (1930)	30-100
SHORDANIA.J (1929)	35-104
SCHMIDTH-ELMENDORF (1952)	50-70
FOX.H (1997)	54-61
PRESENT STUDY	30-60

Table: 25 c

COMPARISON OF LENGTH OF THE UMBILICAL CORD IN MALE AND FEMALE CONCEPTUS

Authors	Average length of the cord cm	Average length of the cord in males cm	Average length of the cord in females cm
GUNAPRIYA.R (2001)	53.5	54.6	52.1
PRESENT STUDY	47.95	46.54	49.23

Table: 25 d
COMPARISON OF LENGTH OF THE UMBILICAL CORD LENGTH IN PRETERM CONCEPTUS

Authors	Average length of the cord in term conceptus Cm	Average length of the cord in preterm conceptus Cm
FOG. J (1930)	60.7	54.8
PRESENT STUDY	47.95	43.1

Table: 25 e

COMPARISON OF LENGTH OF THE UMBILICAL CORD IN BREECH PRESENTATION

Authors	Average length of the cord in male Conceptus Cm	Average length of the cord in female conceptus Cm
SOERNES.T & BAKKE.T (1986)	53.78	52.51
PRESENT STUDY	-	41

Table: 26

COMPARISON OF RANGE OF THE UMBILICAL CORD DIAMETER

AUTHORS	DIAMETER IN CM
HENRY GRAY (1858)	1-2
SHORDANIA .J (1929)	1-2
EDITH.L.POTTER (1952)	1-2
SCHMIDTH-ELMENDORF (1952)	1.5-2
WILLIAMS (1930)	0.8-2
GUNPRIYA.R (2001)	0.6-1.1
PRESENT STUDY	0.85-1.6

Table: 27 a

COMPARISON OF INCIDENCE OF SINISTRAL (LEFT) TYPE OF UMBILICAL CORD TWIST

AUTHORS	%
RONALD.V.LACRO (1987)	83
HENRY.W.EDMONDS (1954)	82
READ.W (1860)	77
NEUGEBAUER .L.A (1858)	71
PRESENT STUDY	95

Table: 27 b

COMPARISON OF INCIDENCE OF DEXTRAL (RIGHT) TYPE OF UMBILICAL CORD TWIST

AUTHORS	%
NEUGEBAUER .L.A (1858)	24
READ.W (1860)	14
HENRY.W.EDMONDS (1954)	12
RONALD.V.LACRO (1987)	12
PRESENT STUDY	2

Table 27 c

COMPARISON OF INCIDENCE OF COMPOUND (BOTH) TYPE OF UMBILICAL CORD TWIST

AUTHORS	%
READ.W (1860)	1.85
PRESENT STUDY	1.9

Table 27 d

COMPARISON OF INCIDENCE OF NIL (ABSENT) TYPE OF UMBILICAL CORD TWIST

AUTHORS	%
HENRY.W.EDMONDS (1954)	8
RONALD.V.LACRO (1987)	5
THOMAS ET AL (1993)	4.3
NEUGEBAUER.L.A (1858)	4.3
READ.W (1860)	1.8
PRESENT STUDY	0.9

Table 27 e

COMPARISON OF UMBILICAL COILING INDEX

AUTHORS	AVERAGE UMBILICAL COILING INDEX
RANA ET AL (1995)	0.19 COILS PER CM
PRESENT STUDY	0.134 COILS PER CM

ANIMAL PLACENTA

Table 28 a

COW PLACENTA- COMPARISON OF COTYLEDON NUMBER, UMBILICAL BLOOD VESSELS AND LENGTH OF THE UMBILICAL CORD

Authors	Shape of the placenta	Weight of the placenta kg	Cotyledon Number	Umbilical Blood Vessels	Length of the umbilical cord cm
WILD.A (1964)	-	-	80 - 120	-	-
KURT BENIRSCHKE (2007)	Poly cotyledonary	4 – 5	-	4, (2 Arteries 2 Veins)	-
PRESENT STUDY	Poly Cotyledonary	4	60	4, (2 Arteries 2 Veins)	20

Table: 28 b

PIG PLACENTA- COMPARISON OF COTYLEDON NUMBER, UMBILICAL BLOOD VESSELS AND LENGTH OF THE UMBILICAL CORD

Authors	Shape of the placenta	Weight of the placenta Kg	Cotyledon Number	Umbilical blood vessels	Length of the umbilical cord cm
STEEPHEN.J. ROBERTS (1971)	Diffuse	-	No discrete cotyledons	-	-
KURT BENIRSCHKE (2007)	-	-	-	3, (2 Arteries 1 Vein)	-
PRESENT STUDY	Diffuse	1.6	No cotyledons	3, (2 Arteries, 1 Vein)	30

Table: 28 c

SHEEP PLACENTA- COMPARISON OF WEIGHT OF THE PLACENTA

Authors	Weight of placenta in gms
KLEEMAN ET AL (2001)	600
PRESENT STUDY	800

Table: 28 d

SHEEP PLACENTA- COMPARISON OF COTYLEDON NUMBER, UMBILICAL BLOOD VESSELS AND LENGTH OF THE UMBILICAL CORD

Authors	Cotyledon Number	Umbilical blood vessels	Length of the umbilical cord cm
KURT BENIRSCHKE (2007)	60-100	4, (2 Arteries 2 Veins)	27
PRESENT STUDY	60	4 (2 Arteries 2 Veins)	20

Table: 28 e

GOAT PLACENTA- COMPARISON OF COTYLEDON NUMBER, UMBILICAL BLOOD VESSELS AND LENGTH OF THE UMBILICAL CORD

Authors	Weight of the placenta gms	Umbilical blood vessels	Length of the umbilical cord cm
KURT BENIRSCHKE (2007)	200	4, (2 Arteries 2 Veins) with allantoic duct	10, spirals absent
PRESENT STUDY	400	4 (2 Arteries 2 Veins) allantoic duct	20, spirals absent

Table: 28 f

RABBIT PLACENTA- COMPARISON OF COTYLEDON NUMBER, UMBILICAL BLOOD VESSELS AND LENGTH OF THE UMBILICAL CORD

Authors	Weight of the placenta gms	Cotyledon Number	Umbilical blood vessels	Length of the umbilical cord cm
MARTENSSON.L (1984)	4	-	-	-
KURT BENIRSCHKE(2007)	-	-	3, (2 Arteries 2 Veins)	2, Absent Spirals
PRESENT STUDY	5	4	3, (2 Arteries 2 Veins)	2, Absent Spirals

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LEGEND

AC-**AC**CESSORY LOBE

AE-**A**MNIOTIC **E**PITHELIUM

AL-**AL**LANTOIC DUCT

AM-**A**MNIOTIC **M**EMBRANE

AV-**A**NCHORING **V**ILLI

B-**B**ATTLEDORE (MARGINAL) INSERTION

BC-**B**LOOD **C**LOT

BI-**BI**LOBED SHAPE

BV-**B**LOOD **V**ESSEL

C-**C**OTYLEDON

CC-**C**ONVEX SHAPED **C**OTYLEDON

CI-**C**ENTRAL **I**NSERTION

COC-**CO**NCAVE SHAPED **C**OTYLEDON

CR-**CI****R**CULAR SHAPE

CT-**C**OMPOUND **T**WIST

CV-**C**HORIONIC **V**ILLI

CVV-**C**IRCUM**V**ALLATE SHAPE

CY-**CY**TOTROPHOBLAST

D-**D**ISPERSE (DICHOTOMOUS)

DAC-**D**OUBLE FOLD OF **A**MNION AND **C**HORION

E-**E**CCENTRIC INSERTION

F-**F**EMALE

FA- **F**ETAL **A**RTERY

FO-**F**OLD

FD-**F**IBRIN **D**EPOSIT

F: P- **F**W/BW-FETO**P**LACENTAL RATIO

FN-**F**ALSE K**N**OT

FS -**F**ETAL **S**URFACE

FU-**FU**SED SHAPE

FV-**F**ETAL **V**EIN

G-GROOVE

HCUC-HIGHLY **C**OILED **U**MBILICAL **C**ORD

H-HAEMORRAGE

HE-HEART SHAPE

HO-HORN

IC-ILLDEFINED **C**OTYLEDON

IVS-INTER**V**ILLOUS **S**PACE

K-KIDNEY SHAPE

KN-KNOT

L-LUMEN

LT-LEFT **T**WIST

M-MALE

ME-MEMBRANE

MA-MAGISTRAL (MONOPODIAL)

MI-MIXED PATTERN

MS-MATERNAL **S**URFACE

O-OVAL SHAPE

PM- PERIPHERAL **M**ARGIN

PW/BW-PLACENTAL **W**EIGHT/**B**ABY **W**EIGHT-PLACENTAL COEFFICIENT

RT-RIGHT **T**WIST

SKN-SYNCITIAL **KN**OTS

ST-SPIRAL **T**WIST

SU-SUCCENTURIATE SHAPE

SY-SYNCYTOTROPHOBLAST

T-TRIANGULAR SHAPE

TA-TUNICA **A**DVENTITIA

TI-TUNICA **I**NTIMA

TM-TUNICA **M**EDIA

UC-UMBILICAL **C**ORD

V-VELAMENTOUS INSERTION