ABSTRACT:
The umbilical cord is the lifeline between the foetus and placenta. It is formed by the fifth week of development and it functions throughout pregnancy to protect the vessels that travel between the foetus and the placenta. In the present study, 60 term placenta were studied. Out of these 28 were of female and 33 of male babies from healthy looking mothers aged between 25 - 35 years and the parity from one to five. All cords obtained were of normal vaginal deliveries and aborted foetuses. For light microscopy, two cm. of tissue was taken from each cord and fixed in 10% formalin for one week. Grossly the attachments of umbilical cord to the placenta were observed which showed that the eccentric site of insertion was 64.99%, the central insertion 28.33% and the marginal insertion 6.66% from the total observed placenta. The tunica intima consists of a single continuous wavy layer of small oval or rounded shaped, which bulges into the lumen of arteries. A thick tunica media which contains two areas of smooth muscle fibres arrange into an inner longitudinal and an outer circular fibres, both being equal in thickness. Between the longitudinal smooth muscles, there are uniformly distributed collagen fibres. In addition there are two to eight folds called Hoboken Folds which cause irregular narrowing of the lumen; some of these folds show bifurcation. Such features of tunica media was observed at nine months umbilical cord section. The Hoboken folds not found at the sections of three and five months of umbilical cord sections. It is concluded that the measurement of thickness of muscular layer (tunica media) increased from 0.6 μm at the third month of gestation to 9.2 μm at ninth month (at delivery) which may be lead to increase the strength and elasticity of the cord against torsion and compression as the foetus became near the delivery time.

INTRODUCTION:
The umbilical cord is the lifeline between the foetus and placenta. It is formed by the fifth week of development and it functions throughout pregnancy to protect the vessels that travel between the foetus and the placenta. It attains more growth until 28 weeks of pregnancy reaching an average length of 55-65 cm. It is composed of three blood vessels of different structure and function, one vein, which transports oxygenated and nutrition-rich blood from placenta to foetus, and two arteries, which transport deoxygenated blood and metabolic waste products from foetus to placenta. All these vessels are surrounded by Wharton’s jelly (Kliman, 1998; Cruikshank, 2003), which constitutes the major part of human umbilical cord and provides a thick protective mantle around vessels. Wharton’s jelly plays also an important role as storage for some compounds, such as growth factors (Sobolewski et al., 2005). The extracellular matrix (ECM) in the vascular wall contains many macromolecules (collagen, elastin, proteoglycans, and glycoproteins) necessary for the structural and functional properties of vessel wall. The epithelial covering of the umbilical cord is derived from the amniotic epithelium which covers the cord during the early development of the embryo (Lukashev and Werb, 1998). When umbilical cord reaches the foetal surface of the placenta, the blood vessels divided into many branches which enter the chorionic villi. The oxygenated blood returns to the foetus via the venules and veins in the chronic villi. These join to form the umbilical vein in the umbilical cord (Wigginsworth and Singer, 1998).

Variations in the site of the insertion of umbilical cord are thought to result from the process known trophotrophism (Robinson et al., 1983) in which the chorionic frondosum or the early placenta "migrates" with advancing gestation to ensure a better blood supply from a more vascularised area (Monie,1965). The insertion of the umbilical cord to the placenta was central insertion into placenta at midgestation; insertion may become more eccentric as gestation proceeds (Morgan and Ross, 2006).
Microscopically the umbilical arteries composed of double layered muscular wall, no internal elastic lamina. The umbilical vein is large in diameter with thin wall. It consists of a single layer of disorganized circular smooth muscle and an internal elastic lamina. A number of abnormalities can affect the umbilical cord. The cord may be too long or too short. It may connect improperly to placenta or become knotted or compressed (Al-Okail and Al-Attas, 1994; Benirschke and Kaufmann, 1995). Cord abnormalities can lead to problems during prolapsed or labor and delivery like single umbilical artery, umbilical cord prolapsed vasaprevia, punchal cord umbilical cord knots, and umbilical cyst (Rana et al., 1995).

The aim of the present work was to recognize the site of umbilical cord insertion and to study the histological appearance of the cord at different gestational periods to develop a better understanding of the causes of birth defects.

**MATERIAL AND METHODS:**

In this prospective study, 60 term placenta with a mean weight of 359.32 - 485.12 gm of babies were studied. Out of these 28(46.6%) were of female and 33(55.0%) of male babies. The random samples were collected from unit of obstetrics and gynecology in Al-Hilla Teaching Hospital. All subjects included in this study were healthy looking mothers aged between 25 - 35 years and the parity from one to five. All cords obtained were of normal vaginal deliveries and aborted foetuses. Gross observation of cords was noted these features include shape, length and site of attachment of umbilical cord included in this study. For light microscopy, two cm. of tissue was taken from each cord and fixed in 10% formalin for one week. The tissue sections were dehydrated and followed by embedding in paraffin and serial sections were generated with the help of rotatory microtome. The tissue sections were stained with haematoxylin and eosin. Histological appearance of cords was assessed. The results of gross observation of the insertion sites were expressed as percentage.

**RESULTS AND DISCUSSION:**

Grossly the attachments of umbilical cord to the placenta were observed which showed that (Table 1 & Fig.1) the eccentric site of insertion was 64.99%, the central insertion 28.33% and the marginal insertion 6.66% from the total observed placenta.

Table 1. Gross observation of umbilical cord

<table>
<thead>
<tr>
<th>Site of umbilical cord insertion</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eccentric</td>
<td>39</td>
<td>64.99</td>
</tr>
<tr>
<td>Central</td>
<td>17</td>
<td>28.33</td>
</tr>
<tr>
<td>Marginal insertion</td>
<td>4</td>
<td>6.66</td>
</tr>
</tbody>
</table>

The low and high field light microscopic findings (at 4 X and 40 X magnifications) of the umbilical artery at different gestational stages are summarized in figure 2. Tunica intimae consist of a single continuous wavy layer of small oval or rounded shaped darkly stained, which bulges into the lumen of arteries. There is no evidence of internal elastic lamina in the artery. The thickness of this layer was (0.1, 0.2, and 0.6 \( \mu \)m) at three, five and seven month, respectively. A thick tunica medium which contains two areas of smooth muscle fibres arranged into an inner longitudinal and an outer circular fibres, both being equal in thickness. Between the longitudinal smooth muscles, there are uniformly distributed collagen fibres. In addition there are two to eight folds called Hoboken Folds which represent muscular projections that have been herniated from the inner muscular layer toward the lumen. These folds cause irregular narrowing of the lumen; some of these folds show bifurcation. Such features of tunica media was observed at nine months umbilical cord section. The Hoboken folds not found at the sections of three and five months of umbilical cord sections. The measurements of this layer were (0.6, 1.4, and 3.6 \( \mu \)m) at three, five, and seven months.
of gestation, respectively. The umbilical arteries were observed to be completely devoid of tunica adventitia. Figure 3 shows the histological appearance of umbilical artery at delivery (9 months). The measurements of thickness of umbilical artery layers were (9.2 \mu m).

However, in approximately 7% of single births the insertion point occurs at the very edge of the placenta and in about 1% of cases. When the umbilical cord inserts into chorionic plate of the placenta the foetal vessels are stabilized, thus protected from torsion and shear forces (Strong et al., 1993).

The histological appearance of the cord in this study shows in figures 2 & 3 the umbilical cord normally contains two arteries and one umbilical vein. At early gestational periods three and five month the microscopic field at 4X magnification all umbilical vessels (two artery and one vein) can be seen under the field, but these vessels not appeared together at 4X magnification in the late gestational stages seven and nine month (at delivery). The umbilical vessels are embedded within a loose proteoglycan rich matrix known as Wharton’s jelly this jelly has physical properties as resistance to twisting and compression (Benirschke and Kaufmann, 1995; Yang, 2003). Due to abnormal umbilical cord development 1% of cords contain one artery. Although many infants born with a single umbilical artery have no obvious anomalies in 15-20% of such cases these anomalies could be the results of genetic factors alone or environmental factors (Gossett, 2002).

Other studies suggest that babies with single umbilical artery have an increase risk for birth defects, including heart, central nervous system and urinary-tract defects and chromosomal abnormalities (Das et al., 1996; Amato et al., 2007). From the low and high power light microscopic study, it is concluded that the measurement of thickness of muscular layer (tunica media) increased from 0.6 \mu m at the third month of gestation to 9.2 \mu m at ninth month (at delivery) which may be lead to increase the strength and elasticity of the cord against torsion and compression as the foetus became near the delivery time.

The umbilical cord is the lifeline between the foetus and placenta. It is formed by the fifth week of development and it functions throughout pregnancy to protect the vessels that travel between the foetus and the placenta. Compromise of the foetal blood flow through the umbilical cord vessels can have serious deleterious effects on the health of the foetus and newborn (Naeye, 1983).

The attachment of umbilical cord in the present study (Table 1 & Fig 1) was eccentric and rarely marginal. The abnormal attachment of umbilical cord has been reported by previous workers. Murthy et al. (1976) revealed that the umbilical cord normally inserted near the centre of placenta.

REFERENCES:


Drasa Tissijahy lil jhill seryi fi mrhalal jhill al mahitkomah

Rafa Haiy Liyf

Qam al wulum eihy, jahimu laulum ililul ilanat, lil iraq

kma afohrat al draasah al anadan al meryki li jhill seryi kan

nisb 64.99% ilanadam al alamikri 28.33% al ilanadam und

al haqik 6.66%.

Al mahkom:

aad: Hasyin alaraq arsam

fism al wulum ilanat, ilulul ilanat

aad: Fawad ufrify Abu Rid

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