



Original Research Article

Study of the Vascular Organization of the Placenta

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ABSTRACT

Background: The human placenta is highly vascular and the study of its mode of distribution is the mirror image of its morphology. Study of branching pattern of the chorionic vessels helps to know the type of cord insertion. Hyrtl anastomosis plays a role in regulation and distribution of fetal blood flow.

Methodology: The methods employed for the study of vascular pattern of placenta were Dissection method and radiographic method. The specimens were duly numbered, photographed and results were drawn.

Results: Disperse pattern was noticed in 25 (62.5%) specimens, the specimens of magistral pattern in 13 (7.5%) and mixed in 12 (30%) of the specimens. On studying the types of Hyrtl's anastomosis, transverse communicating branch between two umbilical arteries in 33 specimens and 7 specimens showed fusion of two umbilical arteries.

Conclusion: Study of placental vasculature pattern of distribution blood vessels helps to know the pathophysiology of Twin to twin toxic syndrome (TTTS) and developmental anomalies. Hyrtl's anastomosis establishes equal distribution of blood and regulating the pressure.

Key words: placental vasculature, Dissection and Radiographic method, Hyrtl's anastomosis,

INTRODUCTION

The human placenta as an organ has attracted attention of many investigators. Study about the and pattern of its vasculature is of due importance as normal fetal development is dependent on adequate placental blood perfusion. The human placenta is highly vascular and the study of its mode of distribution is the mirror image of its morphology.^[1] The branching pattern of the chorionic vessels was defined as disperse for a branching network that courses from a cord insertion, in which the

vessel gives 2-5 branches immediately after the insertion. Magistral^[2] for the vessel that has along mother limb from the site of insertion till the circumference which gives remaining branches and mixed (having both types).

The Hyrtl anastomosis is a common connection between the umbilical arteries in most human placentas. Ullberg and Standstet by angiographic method, demonstrated variable anatomy of Hyrtl anastomosis.^[3] The anatomic structure of this anastomosis is of a large variability, but

it was always found in the vicinity of the cord insertion [4,5] Hyrtl's anastomosis plays an active role in the regulation and distribution of fetal blood flow to the placenta. [6]

The study was aimed at defining the percentage of types of distribution of chorionic vessels and detailed study of sites of insertion of umbilical cord and types of Hyrtl's anastomoses between the two umbilical arteries.

MATERIALS AND METHODS

The study conducted in JJM Medical College, Davangere. Forty (40) full-term human placentas were procured from department of OBG. The methods employed for the study of vascular pattern of placenta were Dissection method and radiographic method.

Dissection method (30 specimens): Fresh placentas obtained were washed under running tap water. They were hardened by keeping them in 40% formaldehyde solution. Careful dissection on fetal and maternal surface was carried out by taking care not to injure vessels. The specimens were duly numbered, photographed and preserved in 5% formaldehyde solution.

Radiographic method: After obtaining placenta washed. Normal saline was injected into fetal vessel. Then normal saline was drained out slowly. Then 30ml of 60% of Urografin dye was injected into umbilical arteries. Radiographs were taken by adjusting x-ray tube 55kv and 12MAS. Distance between x-ray tube and specimen was 32 inches and exposure time 1/20th of a second. Positive photographic prints of the radiographs were prepared and results were drawn.

RESULT

We have studied vascular pattern of 40 placentas with dissection method and radiographic method. The dissection method allows direct 3 dimensional visualization of fetal blood vessels which enables the study of ramifications, distribution of blood vessels and about cotyledons. Whereas the radiographic method allowed clear picture of types of distribution of vessels (magistral disperse and mixed), the counting of arteries of 1st and 2nd order were easily done but the 3rd order were perfused less and deeper branches cannot be seen and this method enabled us only two dimensional study.

The following results were observed. In Table-1 and Figure-1 Disperse pattern was noticed in 25 (62.5%) specimens, the specimens of magistral pattern in 13 (7.5%) and mixed in 12 (30%) of the specimens. The cotyledons were larger and heavier incase of magistral pattern than those of disperse pattern. It is observed that magistral pattern of average had higher number of arteries of I order than in disperse or mixed type. The average number of these arteries in magistral pattern was 9, in disperses type 5, and in mixed, 6. It is also noticed that among three types, most of the specimens with central attachment of the cord are of disperse type.

On studying the types of Hyrtl's anastomosis, in Table-1 and Figure-2 we have observed 33 (82.5%) cases show transverse anastomosis. Fusion of arteries before reaching the chorionic plate was seen in 4 (10%) cases. No anastomosis was seen 1 case. (2.5%) A transverse communicating branch between two umbilical arteries in 33 specimens and the remaining 7 specimens showed fusion of two umbilical arteries at the entrance of the placenta. The communication establishes an equal distribution of blood and regulating the pressure acting as a buffer system.

Table-1 showing anatomy of vasculature of the human placenta studied in 40 specimens by dissection method and radiographic method

Types of placenta	No of specimens by dissections method	No of specimens by radiographic method	Total no of specimens	Percentage(%)
1. According to the pattern of the distribution of the vesels				
a. Disperse	19	6	25	62.5
b. Magistral	2	1	3	7.5
c. Mixed	9	3	12	30.0
2. Different types of Hyrtl's anastomosis				
a. Transverse communicating branch	25	8	33	82.5
b. Fusion of the arteries	4	-	4	10
c. No of anastomosis	-	1	1	2.5
d. Single umbilical artery	1	1	2	5.0

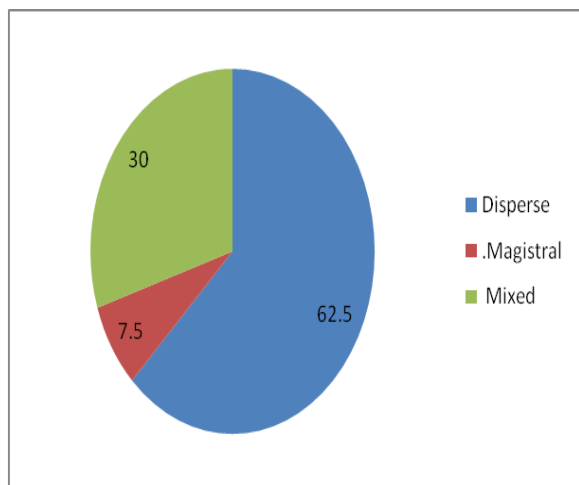


Figure-1 Type of placenta according to the pattern of distribution of vessels

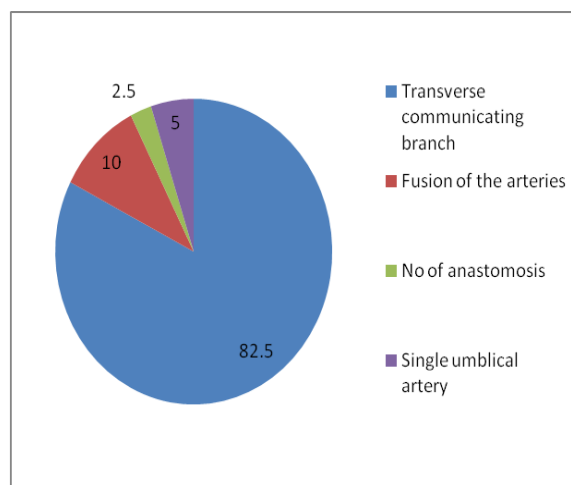


Figure-2 Different types of Hyrtl's anastomosis

DISCUSSION

Study of vascular pattern of placenta gives pattern of distribution blood vessels, types of Hyrtle's anastomosis and site of insertion of the umbilical cord

Similar to our study, Bhargava and Raja [7] in their study noticed 52% of disperse pattern and 54% of Magistral pattern and observed significant association of absence of one umlical artery with magisterial pattern this may lead to developmental defects. De Paepe [8] suggests that the magistral/mixed vascular distribution pattern may represent an important placental architectural feature contributing to the complex pathophysiology of Twin to twin transfusion syndrome (TTTS).

We have observed a Tranverse communicating branch between two umbilical arteries and this communication establishes an equal distribution of blood and regulating the pressure acting as a buffer system. Baesich and Smout [9] observed that the transverse communicating branch establishes the equal distribution of blood and regulates the pressure in the placenta, as a buffer system. Luigi and Fabio [10] in their evaluation of two cases by Doppler observed the regulation of blood pressure because of anastomosis. This helps to know fetal status in case abnormal umbilical artery resistance to blood flow.

Result which was similar to our study was observed by Ullberg and Standstet [3] who studied variation in Hyrtl's

anastomosis. They studied the arterial system of 67 placentas from pregnancies with normal umbilical flow velocity wave and resulting in full term AGA infant. They found, in 60 cases there was one anastomosis between the umbilical arteries, and calculation of relative placental area supplied by each umbilical arteries.

CONCLUSION

To conclude study of placental vasculature pattern of distribution blood vessels which will helps us to know the pathophysiology of Twin to twin toxic syndrome (TTTS) and developmental anomalies. Hyrtl's anastomosis establishes equal distribution of blood and regulating the pressure which results in normal full term AGA infant,

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