

## Arteriovenous Dissociation on the Chorial Surface of the Human Placenta in Abnormal States of Pregnancy and Development

The arteries and veins of the foetal part of the placenta show an intimate association at cotyledonary level. However, regarding their association on the chorial surface, divergent reports ranging from intimate association<sup>1,2</sup> to little<sup>3</sup>, none<sup>4,5</sup> or varying degrees<sup>6</sup> have been made. Arteriovenous dissociation has been recognised as a 'Parameter of stress' of foetal blood vessels of the placenta, which is capable of slowing the circulation<sup>7</sup>. Quantitative assessment of the arteriovenous association or dissociation on the chorial surface in relation to its level of occurrence and degree of severity have been made<sup>8</sup>. It has also been shown that the incidence level of occurrence and degree of severity of arteriovenous dissociation is significantly altered in certain abnormal states of pregnancy and development<sup>9</sup>. Occurrence of this parameter at continuous levels to a marked or severe degree has been regarded as an abnormal quantum of its manifestation. The present communication aims at elaborating the manifestations of this parameter and interpreting their significance in abnormal states of pregnancy and development.

Injection corrosion preparations, using a continuous injection of 10–15% solution of cellulose acetate buterite in acetone, have been made on 509 placentae, of cases with abnormalities of pregnancy or development (prematurity 53, placenta Previa 27, multiple pregnancy 149, hydramnios 116, abnormalities of development 118, coexisting hydramnios and abnormality of development 46). The data regarding the incidence, level of occurrence and degree of severity of arteriovenous dissociation

in each condition was analyzed individually and collectively, in relation to similar observations on 167 placentae belonging to normal cases by means of chi-square test, with Yates's correction when indicated. The respective percentage values in each category were represented in a composite bar diagram and the lines of abnormalcy and severity were plotted in relation to level and degree of the parameter, by joining the upper limits of the normal quantum and intermediate levels of abnormal quantum respectively.

The incidence of arteriovenous dissociation shows a highly significant increase in abnormalities of development, and to a lesser extent in hydramnios (Table I). Collectively, the incidence of the parameter in the abnormal states is highly significant. The level of occurrence of the parameter is significantly accentuated in multiple pregnancy, hydramnios and abnormalities of development, individually, and in the abnormal states as a group (Table II). The degree of severity of arteriovenous dis-

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<sup>9</sup> I. BHARGAVA and P. T. K. RAJA, in press (1969).

Table I. Incidence of arteriovenous dissociation

Entity	Present	Absent	Total	Individual X <sup>2</sup> value	Significance
Normal	111 (66.47)	56 (33.53)	167 (100.00)	—	—
Prematurity	34 (64.15)	19 (34.85)	53 (100.00)	0.02 d.f.1	—
Placenta previa	21 (77.78)	6 (22.22)	27 (100.00)	0.90 d.f.1	—
Twins	110 (73.82)	39 (26.18)	149 (100.00)	1.69 d.f.1	—
Hydramnios	91 (78.45)	25 (21.55)	116 (100.00)	4.24 d.f.1	P < 0.05
Abnormal development	106 (89.83)	12 (10.17)	118 (100.00)	19.55 d.f.1	P < 0.001
Hydramnios and abnormal development	40 (86.96)	6 (13.04)	46 (100.00)	6.65 d.f.1	P < 0.05
Total	513	163	676		

Chi square value 26.85 with d.f.6. P < 0.001.

Table II. Level of arteriovenous dissociation level

Entity	Simple	2 dis-continuous	2 continuous	3 continuous	Total	Individual X <sup>2</sup> value	Significance
Normal	58 (52.25)	1	49 (44.15)	4 (3.60)	111 (100.00)	—	—
Prematurity	20 (58.82)	—	14 (41.18)	—	34 (100.00)	0.61 d.f.1	—
Placenta previa	12 (57.14)	—	8 (38.10)	1 (4.76)	21 (100.00)	0.23 d.f.1	—
Twins	41 (37.27)	—	56 (50.97)	13 (11.82)	110 (100.00)	4.22 d.f.1	P < 0.05
Hydramnios	21 (23.08)	1 (1.10)	58 (63.73)	11 (12.09)	91 (100.00)	17.94 d.f.2	P < 0.001
Abnormal development	27 (25.47)	—	67 (63.21)	12 (11.32)	106 (100.00)	19.22 d.f.3	P < 0.001
Hydramnios and abnormal development	11 (27.50)	—	28 (70.00)	1 (2.50)	40 (100.00)	6.75 d.f.1	P < 0.05
Total	190	1	280	42	513		

Chi square value 45.51 with d.f.12. P < 0.001.

Table III. Degree of arteriovenous dissociation

Entity	Mild	Moderate	Marked	Severe	Total	Individual X <sup>2</sup> value	Significance
Normal	20 (18.02)	60 (54.05)	25 (22.52)	6 (5.41)	111 (100.00)	--	-
Prematurity	2 (5.89)	21 (61.76)	7 (20.59)	6 (11.76)	34 (100.00)	2.72 d.f.2	-
Placenta previa	-	9 (42.86)	9 (42.86)	3 (14.28)	21 (100.00)	6.37 d.f.1	P < 0.05
Twins	9 (8.18)	42 (38.18)	40 (36.36)	19 (17.27)	110 (100.00)	15.56 d.f.3	P < 0.01
Hydramnios	4 (4.39)	28 (30.77)	38 (41.76)	21 (23.08)	91 (100.00)	33.39 d.f.3	P < 0.001
Abnormal development	4 (3.77)	34 (32.08)	42 (39.62)	26 (24.53)	106 (100.00)	33.14 d.f.3	P < 0.001
Hydramnios and abnormal development	1 (2.50)	13 (32.50)	18 (45.00)	8 (20.00)	40 (100.00)	18.12 d.f.2	P < 0.001
Total	40	207	179	87	513		

Chi square value 77.73 d.f.18. P < 0.001.

sociation shows a significant increase in placenta previa, multiple pregnancies, hydramnios and abnormalities of development individually as well as in the abnormal states as a whole (Table III).

The lines of abnormalcy and severity in relation to degree of the parameter parameter show a significant gradient, similar pattern and different magnitudes in the abnormal states with prematurity at the lowest level and abnormalities of development and hydramnios at the highest (Figure). The line of abnormalcy in relation

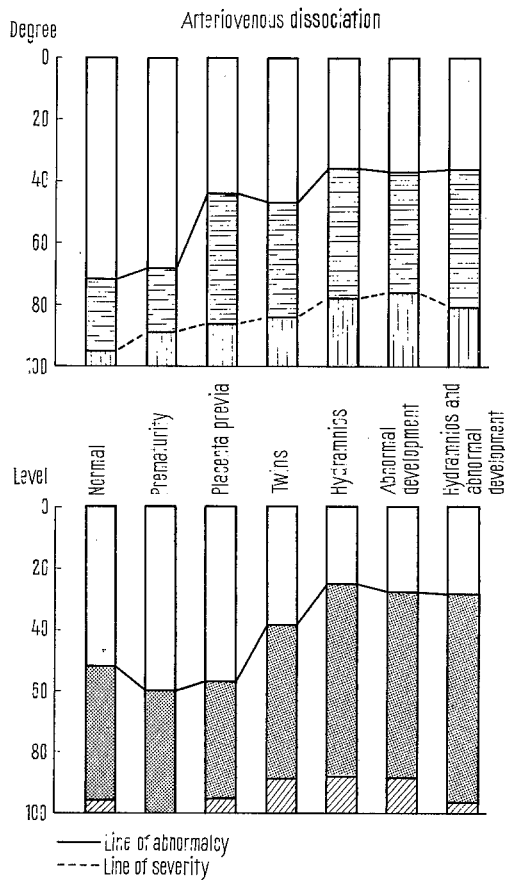
to level of the parameter show a similar gradient, in the abnormal states (Figure).

The manifestations of the parameter, in relation to its level and degree are maximal in abnormalities of development and hydramnios, possibly being a sequelae of selective tortuosities of arteries and veins in these conditions. Arteriovenous dissociation has been regarded as a manifestation of a common factor or combination of factors, affecting foetal blood vessels of the placenta in these clinical entities<sup>9</sup>. Presence of a positive gradient of the manifestations of the parameter lends further support to this surmise. Differential accentuation of the level of occurrence and degree of severity of the parameter in individual clinical states suggest a complex interaction between the two components of the parameter. These facts and a significant association of the incidence of the parameter in abnormalities of development and hydramnios indicate that arteriovenous dissociation is present at discontinuous levels to a mild or moderate degree in normal cases. In some abnormal states, the pre-existing dissociation is extended to continuous levels, and in the others - abnormalities of development and hydramnios, it also appears at new sites, thereby making it a manifestation of marked or severe degree. It is suggested that with arteriovenous dissociation utilization of the arterial pulse in propelling blood in venous channels, is reduced, with a consequent slowing of the circulation, the final hemodynamic equilibrium being achieved in conjunction with other parameters<sup>10</sup>.

*Zusammenfassung.* Auf der Membrana chorii treten manchmal Venen und Arterien getrennt voneinander in die Zottenstämme ein. Hier wird erstmals ein grösseres Material auf dieses Faktum hin untersucht und gleichzeitig gezeigt, dass bei Fehlbildungen und Hydramnion sowie bei Zwillingsgeburten diese Abweichungen signifikant gehäuft auftreten.

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Composite bar diagram showing percentage values of the manifestations of the level and degree of the arteriovenous dissociation and corresponding lines of abnormalcy and severity.

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