

A POSTPARTUM RADIOLOGICAL STUDY OF THE PLACENTAL EFFICIENCY IN PREGNANCY TOXAEMIA

by

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The placenta is an organ performing many functions during pregnancy, amongst which may be mentioned the nutritive, the respiratory, the excretory and endocrine functions as also others. The functional efficiency of such an organ may be diminished in any one or many of its aspects. This fact makes the study of placental function a difficult task.

It is a well established fact that the functional efficiency of the placenta as an organ for respiratory exchange is diminished in toxæmias of pregnancy. This has been substantiated by the clinical observation and demonstration of numerous infarcts in the placentae of toxæmic women and the higher incidence of foetal wastage and foetal distress during labour in toxæmic women. More recently through the employment of radioactive isotope, Moore, Myerscough and Morris have convincingly demonstrated diminished myometrial blood flow in toxæmic women, and Browne and Veall have similarly demonstrated impaired chorio-decidual circulation in toxæmias.

In clinical practice, many foetal deaths occur in toxæmic pregnancies which cannot be wholly correlated

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with the clinical severity of the disease. Examination of placentae in toxæmic women holds no clue to its functional efficiency on gross examination. It was thought that radiological study of a barium injected specimen of placental vasculature in the immediate postpartum period may throw some light on the efficiency of the placenta and possibly enable a correlation of functions with the foetal outcome in labour in toxæmia patients.

Material and Method

The placentae of 25 toxæmic women were studied in the immediate post-partum period. The placental vasculature was studied for abnormalities of filling, extent of filling and vessel defects. Each placental radiograph was traced on to a graph paper and the ratio of area of vascularity to the non-vascular area was calculated. The outcome of labour in each case was known; this was correlated with the radiological findings. The conclusions of study are presented.

Method of Preparation of Injected Placenta

Schematic diagram of the apparatus used for the preparation of Injected placenta is given on the last page.

criminate use is decried in view of the genetic hazards to the mother and foetus and hazards to the blood-forming organs of the foetus.

Acknowledgements

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References

1. Buckingham, J. C., McElin, T. W., Bowers, V. M. and McVay, J.: *Obst. & Gynec.* 15: 652, 1960.
2. Bulfin, M. J., Lawler, F. C. and Lawler, P. E., Jr.: *Am. J. Obst. & Gynec.* 72: 343, 1956.
3. Chawla, S.: *Ind. J. Rad.* 17: 19, 1963.
4. Chawla, S.: *Brit. J. Rad.* 36: 765, 1963.
5. Friedman, R. L.: *Radiology*, 75: 782, 1960.
6. Guttmacher, A. F.: (1944). *Human Multiple Births* (Quoted by Kappelman, 1944).
7. Jenkinson, E. L., Pfisterer, W. H., Latteier, K. K., and Martin, H.: *Am. J. of Roentgenol.* 49: 455, 1943.
8. Kappelman, M. D.: *Am. J. Obst. & Gynec.* 47: 412, 1944.
9. Lewis, T. L. T.: *Brit. M. J.*, 2: 1551, 1960.
10. Maçafee, C. H. G.: *J. Obst. & Gynec. Brit. Emp.* 57: 171, 1950.
11. Mehne, R. G.: *Arch. Pediat.* 78: 67, 1961.
12. Moya, F., Apgar, V., James, L. S. and Berrien, C.: *J.A.M.A.* 173: 1552, 1960.
13. Napolitani, F. D. and Schreiber, I.: *Am. J. Obst. & Gynec.* 80: 582, 1960.
14. Potter, E.: *Pathology of the Foetus and the Newborn.* Chicago, 1961, Year Book Publishers.
15. Rohan Williams, E.: "The Present Position of Radiology in Obstetrics", Chapter XVI in *Modern Trends in Diagnostic Radiology* (Third Series) edited by J. W. McLaren, London, 1960, Butterworth and Co. (Publishers) Ltd.
16. Sarma, V.: *Brit. J. Clin. Practice*, 14: 795, 1960.
17. Stewart, A. M.: *Brit. J. Rad.* 34: 187, 1961.
18. Stewart, A., Webb, J., Giles, D. and Hewitt, D.: *Lancet*, 2: 447, 1956.
19. Strassman, E.: (1931) *Zbl. Gynak.* (quoted by Sarma, 1960).
20. Wells, T. and Steer, C. M.: *Am. J. Obst. & Gynec.* 81: 1059, 1961.

The placenta soon after being expelled in the third stage was washed with normal saline. One of the umbilical arteries was canulated with a polythelene tube for a distance of $2\frac{1}{2}$ —3 inches. The polythelene tube was connected to Wolfe bottle containing standard microbarium suspension. Air was injected into the Wolfe bottle at standard sphygmomanometric pressure, thus the entire vascular tree of the placenta was injected with barium suspension. A radiograph was taken of the placenta at exposure factors. 40 kv 5 mas.

A graphical tracing of the placenta was made, marking out the areas of defective filling and on this data was

Mild: Blood pressure recording between 140/90 to 160/100 mm. of Hg.

Cases could be typed as severe — 5, moderate — 9 and mild — 11.

The clinical severity was compared with the radiological data, the conclusions of the study being presented.

Discussion and Conclusion

Radiological Analysis

On the basis of the radiological graphical tracings, the placentae of the 25 cases studied were grouped as follows: Grade A — 14, Grade B — 8 and Grade C — 3.

The occurrence of foetal distress and perinatal wastage in these cases was as follows:—

TABLE I

Radiological grades	Foetal distress	Still-births	Neonatal death	Remarks
A—14	2	Nil	1	Weight 2 lb. 14 ozs. 2 mid-forceps delivery. Babies alive. 1 patient was chronic nephritis.
B— 8	6	3	—	
C— 3	—	3	—	Patients not responding to drugs.

based the radiological gradings of the placenta as shown under:—

Grade A. More than $\frac{2}{3}$ placenta functioning	14 cases
Grade B. Functioning placenta between $\frac{1}{3}$ to $\frac{2}{3}$	8 cases
Grade C. Functioning placenta less than $\frac{1}{3}$	3 cases

The cases were grouped into clinical types on data based on records of blood pressure as under:—

Severe: Sphygmomanometric reading exceeding 180/120 mm. of Hg.

Moderate: Blood pressure recordings between 160/100 to 180/120 mm. of Hg.

From the above table it is clearly seen that the functional efficiency of the placenta is not undermined when more than $\frac{2}{3}$ of the placenta is functioning, however, when the availability of placental tissue further diminishes, foetal oxygenation suffers and timely interference may save some foetal lives; however, loss can be reduced in this group to some extent by control of toxæmia, but other factors like gestation period and foetal size modify treatment in some cases.

When very large part of the placenta is infarcted, the babies tend to die in utero, the perinatal loss is

extremely high; these are often the worst cases of toxæmia who do not respond favourably to antihypertensive drugs.

evident and midcavity forceps deliveries at birth, both the babies were asphyxiated at birth but could be easily resuscitated.

TABLE II
Clinical Evaluation and Comparison with Radiological Grading

Clinical grading	Total cases	Radiological grading			Perinatal loss	
		A	B	C		
Mild	140-160 90 100	11	9	2	—	
Moderate	160-180 100 120	9	5	4	—	1 premature neonatal death
Severe	180 or higher 120	5	—	2	3	5

The comparison of the clinical severity with the radiological evaluation shows that the extent of placental infarction does not correspond to the severity of manifest toxæmia and hypertension.

In the 11 cases grouped as mild toxæmia, the placental grading radiologically was A in 9 cases and B in two cases, no foetus being lost.

In the 9 cases grouped as moderately severe, 4 cases were grouped as 'B' namely, cases where placental circulation was precariously diminished. One baby was lost in this group; it was a premature baby weighing 2 lbs. 14 ozs. at birth, it died eight hours later of asphyxia. In this group foetal distress in labour was seen in all the 4 cases labelled radiologically as 'B'. All the babies were born alive.

In the 5 cases grouped as severe toxæmias, two cases were radiologically grouped B and 3 cases were grouped C. In the 2 cases grouped 'B' clinically foetal distress was

In the 3 other cases labelled as 'C', the patients were severely toxæmic and not responding to antihypertensive drugs. In all three cases the babies had died in utero, the membranes were ruptured, and labour induced. The babies were born 9 hours and 23 hours after artificial rupture of membranes.

Conclusions

(1) The clinical severity of toxæmia cannot be correlated with the radiological efficiency of the placenta.

(2) Functional efficacy of placenta depends on the vascularity of the organ, diminished vascularity can be partly compensated by the size of the organ.

(3) Foetal distress is often clinically seen in cases where placental efficiency is precarious.

(4) In severe toxæmic patients with intrauterine death of the foetus, the placental vascularity was always markedly reduced.

The placenta soon after being expelled in the third stage was washed with normal saline. One of the umbilical arteries was canulated with a polythelene tube for a distance of 2½—3 inches. The polythelene tube was connected to Wolfe bottle containing standard microbarium suspension. Air was injected into the Wolfe bottle at standard sphygmomanometric pressure, thus the entire vascular tree of the placenta was injected with barium suspension. A radiograph was taken of the placenta at exposure factors. 40 kv 5 mas.

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Fig. 1
1/3 placenta vascular.

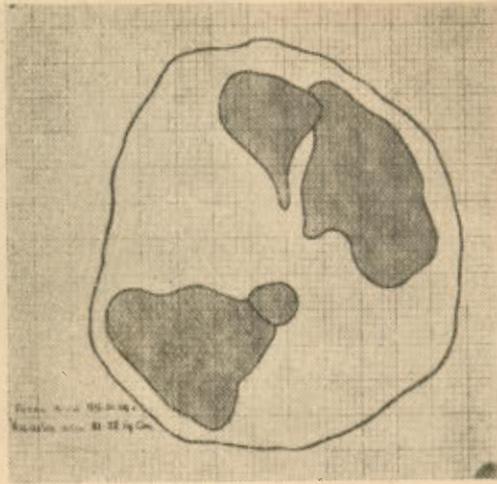


Fig. 1a
Graphical tracing of Fig. 1.

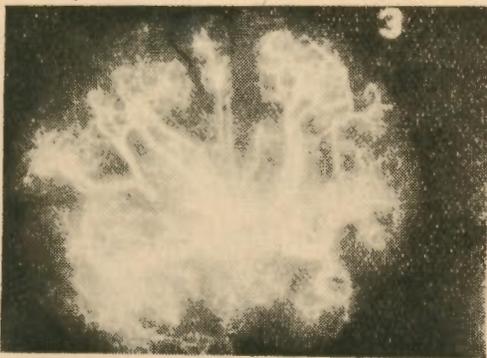


Fig. 2
2/3 placenta vascular.

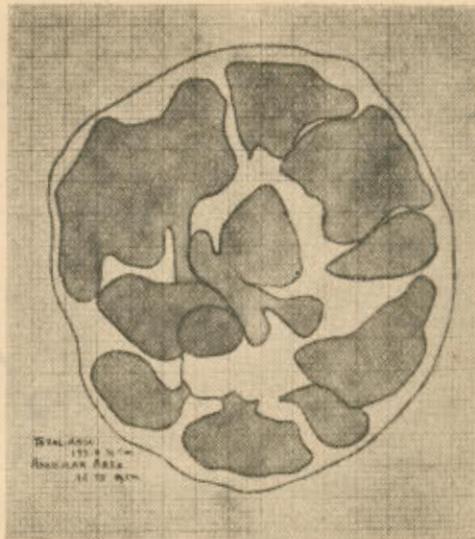


Fig. 2a
Graphical tracing of Fig. 2.

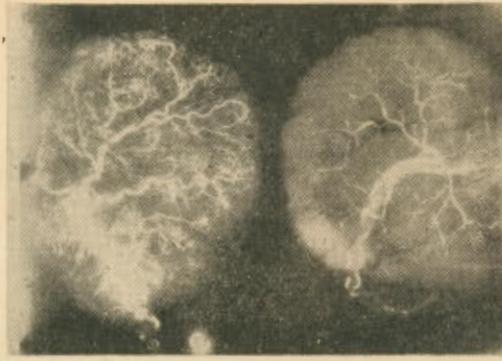


Fig. 3
Vascular and avascular placenta.

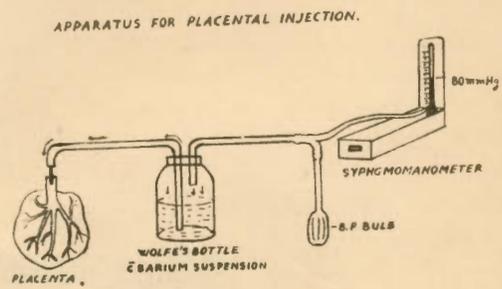


Fig. 4
Apparatus for injection.