Ultrasonic Control of Umbilical Blood Flow in Small for Date Fetuses

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Although during the last two decades there has been an explosive outflow of information from many areas of perinatal medicine - information on fetal blood flow has been based on direct deductions rather than blood measurements. Actually we know less about the regulation of the fetal placental blood flows than we do about the regulation of the blood flow to any other organ. There are several reasons for this. One is the complexity of the arterial supply to the uterus. Another problem is the difficulty of measuring blood flow because of the inaccessibility of the fetus and its sensitivity to infection. Furthermore the placenta is an organ which does not have just one blood flow but two, each of which comes from a separate organism. For these reasons there is little classical literature on this important system. It seems that recent ultrasound Doppler techniques will help in better understanding of the physiology and pathophysiology of fetal placental blood flow.

In 1979 Kossoff and Gill from the Sydney group introduced direct measurements of umblical blood flow using Doppler ultrasound in combination with the real-time technique. These new techniques opened up quite new possibilities of directly studying human fetal circulatory changes and is now being carefully investigated in several centres all over the world. In Zagreb we have over a year's experience using the Aloka Doppler Echograph machine.

This technique was first applied to 200 normal pregnancies from 30 to 41 weeks of gestation. (Table 1).

Table 1. Umbilical Blood Flow in Normal Pregnancies

Weeks	Mean (mil/min/kig)	2SD	No.
30	118	24	10
31	127	26	12
32	121	14	
33	117	36	12
34	127	38	14
35	124	36	14
36	105	16	16
37	108	34	18
38	110	35	20
39	97	40	20
40	98	32	24
41	83	40	16
42	70	36	10
Average 106		Total no. of patients - 200	

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Table 1 schows the mean values and 2 standard deviations of umbilical blood flow in normal pregnacies. Absolute values of flow increase steadily with increasing fetal size reaching a maximum at about 38 weeks gestation after which there is a definite decrease in flow over the last two weeks of pregnancy. The fall-off near term is also seen in serial studies of individual patients demonstrating that it is a real phenomenon not a statistical artefact. However, if we express blood flow per unit of fetal weight the graph will show an almost constant flow per kilogram of fetal weight with a gradual decrease in the 40th and 41st weeks of pregnancy.

In the second part of our studies 93 complicated pregnancies were investigated. 13 of them delivered small-for-date babies, with the birth weight below the 5th percentile.

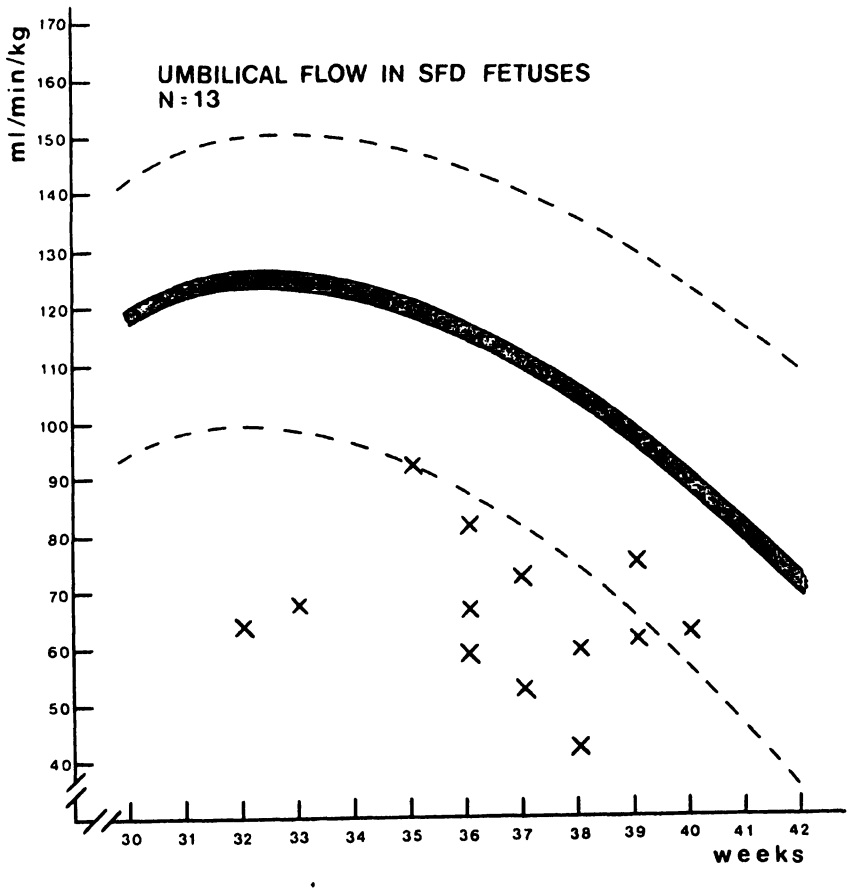

Fig.1. The umbilical blood flow in 13 small-for-dates fetuses may be seen. It should be stressed that these values were obtained at the time of diagnosis, before any treatment was administered.

Investigations in the group of growth retarded babies are still in the preliminary stages and the number of small-for-dates is not large enough to allow for any serious statistical analyses. Even with this reserve, however, it seems that there is a difference as compared with babies of normal weight.
There is no doubt that this new ultrasonic technique is promising and has already thrown new lights on fetal placental circulation, However, as with any other new technique, there are still technical and methodological problems which should be solved in the near future. In the meantime the technique of direct measurement of fetal blood flow should be neither over- nor under-estimated.

References:

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