

# ULTRASONIC DIAGNOSIS OF INTRAUTERINE FOETAL GROWTH RETARDATION

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## SUMMARY

The intrauterine growth retardation (IUGR) is a very frequent pathological entity.

After a brief review of the literature on this problem, the AA. expose the ultrasonic techniques that put in evidence the IUGR, and the results obtained.

In relation to this diagnosis, the AA. underline the importance of the abdominal diameter (AD) measurement.

It is also very important to begin this control from the 28<sup>th</sup> week on.

The antenatal diagnosis of intrauterine growth retardation is very important; such a statement is based on the observation that small for gestational age infants present a higher risk of perinatal mortality, of intrapartum asphyxia and of neonatal and long-term consequences in comparison with appropriate for gestational age neonates <sup>(1, 2, 3, 4)</sup>.

Infants who at birth weight less than the 10<sup>th</sup> centile for a given gestational age are small for gestational age.

The incidence of such a pathology can be desumed by the observation that intrauterine growth retardation (IUGR) complicates from 3 to 7% of all pregnancies in U.S.A. and Canada <sup>(13)</sup>.

The clinical examination (fundus height, etc.) provides only presumptive criteria on such a pathologic condition, while using ultrasounds the diagnosis can be more exact and mostly, more precocious (30-35 weeks), which is fundamental for any attempt of therapeutic approach.

Various attempts were made to get to an exact ultrasonic diagnosis, and many researchers have evaluated the most various parameters such as: serial determinations of the biparietal, thoracic and abdominal diameter <sup>(5)</sup>, or determinations of the circumference of these diameters <sup>(6)</sup>; others have investigated the foetal urinary production <sup>(7)</sup> and the total intrauterine volume <sup>(8)</sup>.

Among all these methods we have preferred the serial determination of the biparietal and abdominal diameter; the latter was chosen for it is easier than the other methods (calculation of the circumference or of the abdominal area) and also for the good accuracy that this method presents, if some rules are followed.

The determination of the thoracic diameter has been excluded as it did not provide positive results and therefore it is difficult to obtain it with accuracy.

In fact it is hard to obtain a section of the thorax base, by the heart base, which is perfectly perpendicular to the antero-posterior axis of the spinal column.

#### MATERIAL AND METHODS

The investigation was conducted using an Aloka Real Time Echograph SSD-2020 with manual multicrystal probe of 64 elements. 20

of the foetal biparietal and abdominal diameter.

The diagnosis of IUGR was made according to the scale of the relation weight-gestational age, proposed by Lubchenco *et al.* (9).

The biparietal diameter was calculated by measuring the distance between the two parietals, after the visualization of the brain's median sickle and possibly of the lateral ventricles (fig. 1).

The abdominal diameter was considered exact only if the umbelical vein was visualized in its anterior zone of insertion to the foetal

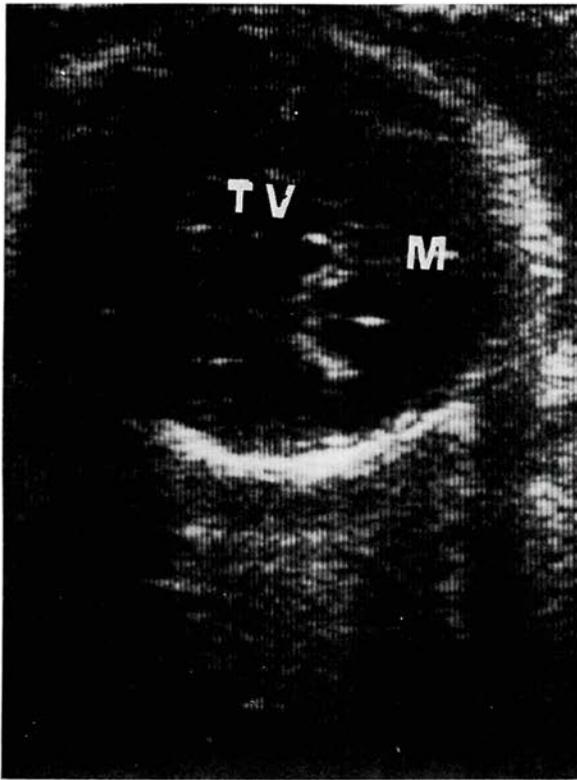


Fig. 1 — Biparietal diameter: transversal scanning; the midline echo (M) corresponding to the brain's sickle and the third ventricle (TV) are evident.

patients with single pregnancy and presenting ultrasonic parameters of suspected foetal growth retardation, were investigated.

All women had regular cycles, they all remembered exactly the date of their last period and did not undergo an oral contraceptive treatment for at least three months before pregnancy.

The patients underwent, during the 2nd trimester of pregnancy, at least one determination

abdomen, with a contemporaneous individuation of the stomach (fig. 2).

The values obtained were reported on pre-constituted growth curves, in order to evaluate the foetal growth.

The presence of IUGR was suspected when the growth of the biparietal diameter was less than 3.1 mm/week between the 19th and 30th week of gestation; less than 2 mm/week bet-

ween the 30th and 36th week of gestation; less than 1.3 mm/week after the 36th week of gestation.

The development of the abdominal diameter must be quite constant during the whole pregnancy (around 5 mm every 2 weeks).

These values were then compared retrospectively with the birth weight of the neonates having a diagnosis of IUGR, according to the criteria proposed by Lubchenco *et al.*

Patterns of biparietal diameter: the most frequent pattern was characterized by a continuous growth of the foetal head, but with a velocity below the 5<sup>th</sup> centile of the normal growth curve.

The second pattern was characterized by a stop and a decrease in growth (less than 1 mm/week) during the last tri-

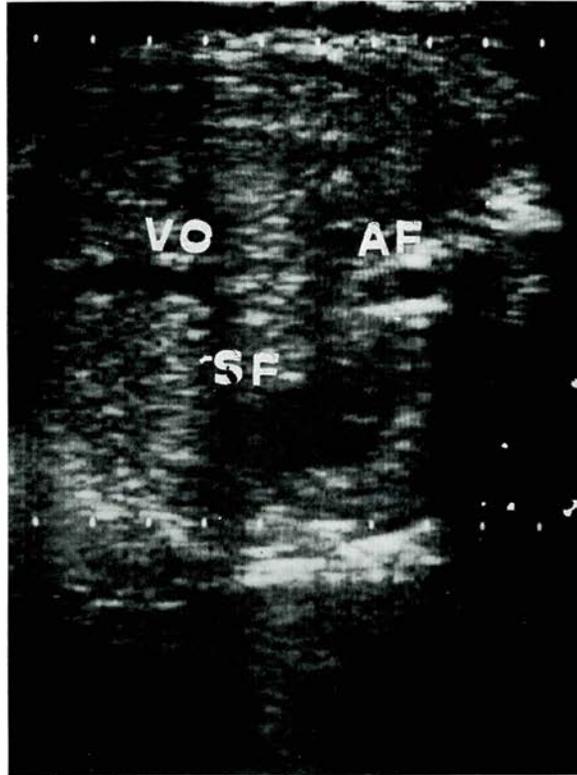


Fig. 2 — Abdominal diameter: transversal scanning; the umbilical vein (VO) in its anterior zone, the foetal aorta (AF) and laterally the foetal stomach (SF) are evident.

## RESULTS

18 out of the 20 patients examined, delivered neonates with birth weight less than the 10<sup>th</sup> centile.

The other two patients delivered two neonates weighting 2700 g and 3150 g respectively (table 1).

mester of pregnancy, as reported by various AA. (<sup>10,11</sup>).

10 out of the 18 infants affected by IUGR, presented these types of anomalous patterns (3 of the 1st and 7 of the 2nd type previously described), while all the others, had ultrasonic growth curves within the normal range.

Patterns of abdominal diameter: as previously reported, the growth curve of the abdominal diameter is characterized by a constant increase.

Concerning our observations, it must be pointed out that, in most of the cases of neonates affected by IUGR (17 out of 18), the growth curves were below the 5<sup>th</sup> centile in comparison with the normal curve.

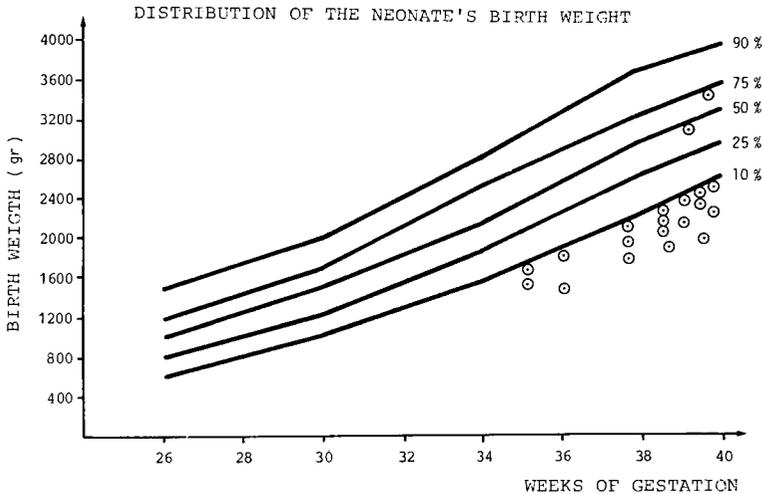
This ultimate observation agrees with the opinion of other researchers (10, 11, 12)

ciency of the determination of the only biparietal diameter for the evaluation of the foetal birth weight, while the determination of the abdominal diameter seems to be more significant.

This is easily understandable if one thinks of the fact that the foetal fat tissue and liver are the first to be damaged by undernutrition.

In fact, it is well known that the foetus in a chronic hypoxic situation, favours the essential districts (heart, brain)

TAB. 1



according to whom the patterns of disarmonic growth, characterized by a disproportion between normal growth of the head, and decreased one of the abdomen and trunk, are the ones in which you can find more easily an infant affected by IUGR.

Even in our series in all cases presenting this of growth retardation, the infant was small for gestational age (table 2, 3).

DISCUSSION

As results from the data presented, once more it is emphasized the insuffi-

to the detriment of the peripheral ones (in particular the splanchnic), according to the well known phenomenon of the «centralization» of the blood flow.

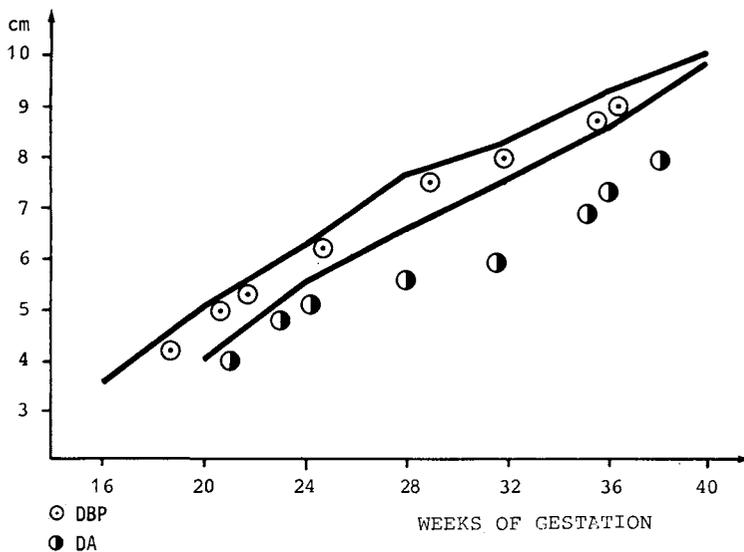
This points out that the first sign of foetal undernutrition will be a decreased growth of such structures, while the reduced growth of the head will be later.

Many researchers on this matter believe that improving the technical methods at our disposition, it will be possible to measure exactly the hepatic area, with the possibility of an exact diagnosis in almost all the cases.

Our investigation points out two other interesting points, which are confirmed

TAB. 2

ARMONIC I.U.G.R.



TAB. 3

DISARMONIC I.U.G.R.

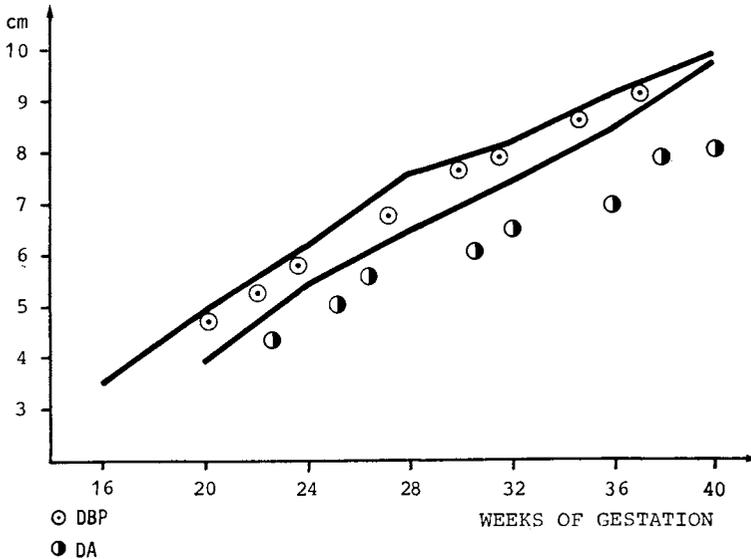


Table 4. — Correlation between presence of high risk maternal factors and neonate's birth weight.

Risk factors	I.U.G.R.	No I.U.G.R.	Total
None	1	2	3
Bad obstetric anamnesis	2	0	2
Chronic hypertension	8	0	8
renal diseases	1	0	1
Placenta previa	2	0	2
Diabetes			

by the opinion of various researchers (9, 10, 11): the first is the importance of the gestational age of the first determination; it must be as precocious as possible.

In fact, in our series the two cases who underwent the first determination later than the others (after the 35<sup>th</sup> week of gestation) did not present an IUGR at birth.

The second point concerns the presence of maternal factors complicating the gestation among which, the most frequent are represented by the chronic hypertension and the cardiopathies.

According to data obtained by our investigation and supported by the opinion of many other researchers (7, 10, 12) we can conclude that a foetus presenting at a first ecographic examination before the 35<sup>th</sup> week of gestation, a « disarmonic » growth parameter in presence of maternal risk factors, will be a small for gestational age infant.

On the contrary, a foetus presenting an « armonic » growth retardation, in absence of maternal risk factors, develops with more difficulty an IUGR, and will have less problems during the neonatal period.

Obviously all the patients presenting a « disarmonic » growth should undergo a monitoring of the foetal heart rate, in order to detect the first possible altera-

tions indicating a foetal distress, by a weekly oxitocin test.

The determination of the total blood estriol, seems to be less important in these cases, for it does not provide good informations on the foetal well-being (10).

In our Institute, these types of patients usually undergo a cesarean section in case of positive O.C.T. or of severe alterations of the basal tracing, because of the frequent foetal acidosis during labour.

Concluding, it can be asserted that the ultrasonic diagnosis of IUGR contributes significantly in reducing the incidence of perinatal mortality and of long-term consequences.

#### BIBLIOGRAPHY

- 1) Arias F.: *Obst. Gyn.*, 49, 293, 1977.
- 2) Campbell S.: *Lancet*, 2, 1002, 1971.
- 3) Campbell S., Wladimiroff J. W., Dewhurst C. J.: *J. Obst. Gyn. Brit. Cwlth.*, 80, 680, 1973.
- 4) De Ieew R. in: *Poor intrauterine foetal growth*. Salvadori B., Bacchi Modena A. Ed., Parma 1977.
- 5) Fois A. in: *Poor intrauterine foetal growth*. Salvadori B., Bacchi Modena A. E., Parma 1977.
- 6) Gohari P., Berkowitz R. L., Hobbins C. J.: *Am. J. Obst. Gyn.*, 127, 255, 1977.
- 7) Hobbins C. J., Winsberg F.: *Ultrasonography in obstetrics and gynecology*. The Williams and Wilkins Company Ed., Baltimore 1978.
- 8) Levi S. in: *Poor intrauterine foetal growth*. Salvadori B., Bacchi Modena A. Ed., Parma 1977.
- 9) Lubchenco L. O., Hausmen C.: *Pediatrics*, 32, 793, 1973.
- 10) Macler J. in: *Poor intrauterine foetal growth*. Salvadori B., Bacchi Modena A. Ed., Parma 1977.
- 11) Scarpa P., Guerrini P. in: *Poor intrauterine foetal growth*. Salvadori B., Bacchi Modena A. Ed., Parma 1977.
- 12) Warsof Steven L., Gohari P., Berkowitz R. L., Hobbin J. C.: *Am. J. Obst. Gyn.*, 128, 881, 1977.
- 13) Wellis S. in: *Poor intrauterine foetal growth*. Salvadori B., Bacchi Modena A. Ed., Parma 1977.