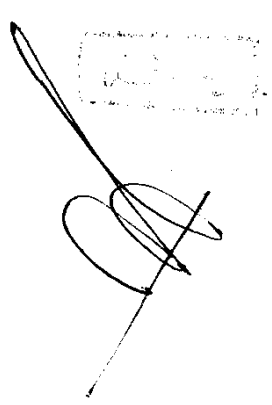


فيلم / ١٠ / ١٩
١٩٨٤ / ١٠ / ١٩

١١٤٨ / ١٢

١٩٨٤ / ١١ / ١٤

٦١٨.٣٢
M.O



biometric
and dynamic
ultrasonic
assessment
of fetal growth
retardation

A THESIS SUBMITTED FOR
PARTIAL FULFILLMENT OF
THE MD DEGREE OF
OBSTETRICS & GYNAECOLOGY

AIN SHAMS UNIVERSITY - CAIRO
BY Abdel Razik Ahmed
MAHER OMRAN

20855

Supervisors:

Prof. dr MAHER MAHRAN
Prof. dr HAMDY EL KABARITY
AND
Prof. dr ASIM KURJAK
Chief of Ultrasonic Institute
for post graduate studies Zagreb University

1984

*Every man is some months elder
than he bethinks him: for we live,
move, have a being and are
subject to the actions of elements
and the malice of diseases, in that
other World, the truest Microcosm;
the Womb of our Mother*

Sir Thomas Brown

1642



ACKNOWLEDGEMENT

For this work to be accomplished, I have received assistance from numerous sources and I wish to record my deepest gratitude to all who have helped. I would specially like to indicate my indebtedness to my supervisors who have honoured me by allowing this work to be supervised by them, To ; Professor **Maher Mahran**; F.R.C.S., F.R.G.O.G., Ph.D., my teacher and chief who have first drew my attention to this interesting field of work and furtherly guided me by his valuable and unfailing advice throughout the work. Also to Professor **Hamdy Elkabarity**; M.D. for his everlasting precious advice even long before the start of this work.

I have to declare that I have been extremely lucky by getting the chance of work with professor **Asim Kurjak**; to him I offer my cordial appreciation for his direct and most valuable assistance with the preparation of thiw work, his real and kind friendly attitude towards me, his personal care to me and my affairs during my stay in Zagreb which continued to the last moment, and also his family and friends' hospitality.

It has been a great pleasure of me to receive cooperation in this work from my colleagues working in professor Kurjak team; Dr. **Rayhva**jn, Dr. **Miljan**, Dr. **Klubecer**, Dr. **Yacobicic**, Dr. **Zoran** and my Polish freind Dr. **Kaplanski**; to them I am grateful for their help, understanding and forebearance.

I would like also to offer my best thanks to the cheif and members of Gynaecology and Obstetrics Department, the staff working in the liberary, the department of medical statistics, the secretary and nursing staff of the ultrasonic institute, **Josiph Kayfes** Hospital-Zagreb.

Special praise and thanks must be given to Mr. **Danjal** who has constructed the graphs, slides and the cover of this book, and last but certainly not least I would express my gratitude and gratefullness to the family Saciragic; Mr. **Ibraheem** and his wife Mrs **Fadila**; for the nice atmosphere they have offered me that has made me feeling at home during my stay in Zagreb.

*TAKER ZORAN.
MAY, 1984*

C O N T E N T S

Page

1

review of literature

120

purpose of the study

121

patients, apparatuses and methods

143

results

169

discussion

199

conclusions

1-4

Arabic

summary

204

literature

INTRODUCTION

Recent reemphasis of gestational maturity as a criterion to be used with birth weight in the categorization of the neonates, has distinguished a new group of newly born infants in which birth weight is less than expected for gestational maturity. The pioneer work of Lubchenko et al (1963) has stimulated a great deal of work over the last two decades, regarding this group of undergrown newborn infants, variously termed "Small for dates", "Small for gestational age", "Dysmatures" or "Intrauterine growth retarded."

It has come to the realization of the contemporary obstetricians and the neonatologists as well, that this group of newly born infants constitutes a particularly vulnerable group in which quantitative and qualitative differences in mortality and morbidity are apparent when they are compared either to their gestational or weight peers, furthermore, the influence of this condition has been also observed in later childhood.

It has become evident that the prognosis of this group depends upon the severity and the duration

of fetal growth retardation, hence the paramount importance of early antenatal diagnosis of such fetuses and subsequent management of their pregnancies and deliveries. Today we are faced with an extensive amount of literature that have accumulated over the last twenty years dealing with this end. Many measurements have been developed varying from simple clinical methods to the highly sophisticated laboratory technologies.

In this context, we have carried out this work aiming to highlight the role that the diagnostic ultrasound can play in the evaluation of fetal growth retardation through the media of biometric measurements and dynamic assessments.

This work has been carried out in the ultrasonic institute, department of ultrasonic post graduate studies, Dr. Josiph Kayfes Hospital - University of Zagreb - Zagreb - Yougoslavia, during the year 1983, where the candidate received his first experience in diagnostic obstetric ultrasound in 1977; through the medium of cooperation between Ain Shams University and Zagreb University founded by our Chief Professor Dr. Maher Mahran from our side, and Prof. Dr. Asim Kurjak from theirs.

review of literature

FETAL GROWTH

General Aspects of Fetal Growth:

Several comprehensive surveys of the growth in fetal weight and the different dimensions as pregnancy advances have been made on series of induced abortions, late abortions, premature deliveries and normal deliveries (Streeter 1920, Scammon and Calkins 1924, Gruenwald and Minh 1961, Hendriks 1964, Hendriks 1967, Rantakallio 1969, Usher and Mclean 1969, Sterky 1970, Brenner et al. 1976). Although findings, in the second trimester in particular, have largely been made in pathologic pregnancies, the consistent results obtained in these large series have been taken to represent fetal growth in normal pregnancies too (Campbell 1974b, Brenner et al. 1976). Fetal weight, length and head circumference follow a sigmoidal curve and fetal growth has therefore been divided into four phases (Suzuki 1977):

- 1) a phase of slow growth up to the 15th-16th week.
- 2) a phase of accelerating growth from the 16th-27th week.
- 3) a phase of maximal growth from the 28th-38th week.
- 4) a phase of deceleration after the 38th week.

Factors Influencing Normal Fetal Growth:

Genetic and Environmental Factors:

A multitude of genetic factors as well as environmental ones significantly influence the growth of organisms as a whole, the cells and organs and the biochemical balance during the ante-natal period (Thomson et al. 1968, Brenner et al. 1976). The racial heritage of the mother is one of the most important genetic factors.

Merideth (1970) comparing the birth weights in several geographically and ethnically different populations, found the largest children in the American Indian Cheyenne tribe. In this tribe the average weight at birth was 3800 g. At the same time the average birth weight in the Luni tribe of New Guinea was found to be 2400 g.

Among environmental factors it is worth emphasising life at high altitudes above sea level where there is a low partial oxygen pressure. This is well illustrated by data from Peru. In the mountainous regions of the Andes, the average weight at birth is 2950 g, while in the Lima coastal area the average birth weight is a whole 1000 g higher (Kruger and Arias-Stella 1970).

Ounsted (1970) wrote about the genetic influence of the Y-chromosome. He determined that the male fetus grows more rapidly than the female fetus in mixed multiple

pregnancies and that the presence of the male embryo accelerates the growth of the female twin. The same author maintains that intra-uterine growth is controlled by the maternal system which acts through two variables. The first is the hypothetical maternal regulation which slows down fetal growth and the other affects the antigen reaction between the fetus and the mother (Ounsted 1971).

In experiments with mice, Billington (1964) found that the intensity of the penetration of trophoplasts in the decidual tissues is determined by the size of the placenta and that this penetration is greater when the trophoblastic antigen is different from the decidual antigen.

James (1964) explained these phenomena being the maternal immunological response to the paternal antigens which then influences the size of the placenta. Thus, the more rapid intra-uterine growth of the male fetus could be explained by this mechanism: the Y-chromosome produces stronger antigens than the X-chromosome and thus gives the male fetus a greater antigenic difference from that of the mother which is not the case with the female embryo (Ounsted and Ounsted, 1973). Nevertheless, the problem of biological differences among different populations and the influence of genetic factors such as the Y-chromosome still remain important biological questions. The question of the mechanisms whereby the cited factors act is still unresolved. Do they exert their influence

indirectly on fetal growth by increasing the utero-placental transport of nutritional substances or do they exert their influence by increasing the secretion of insulin?

Hormones:

The role of hormones in the regulation of fetal growth is also not entirely clear although the majority of published works have not confirmed a significant influence. Jost (1962) and Remion et al. (1968) found in experiments on rabbits that hypophysectomy of the mother and decapitation of the fetus does not significantly influence the birth weight. In human embryos without pituitary glands, the birth weights and lengths were within normal limits (Ried 1960). Studies of the endocrine glands of anencephalic children, have provided us with valuable knowledges. In these children the hypothalamus is missing as a rule and as a result there is a disturbance in the hypothalamic-hypophyseal integrity. The birth weights of such children are mostly below the 50th percentile (Honnebier and Swabb 1973) but it is still insufficiently clear whether this should simply be attributed to the absence of the brain mass and cranial wall or whether it is the influence of the hypothalamic-hypophyseal axis on the intra-uterine growth of an anencephalic

fetus. The actual existence of this influence has been confirmed by the works of Hennebier and Swabb (1973). The linear regression of the birth weights of 122 anencephalic fetuses showed a growth rate of 97g weekly in comparison with 143g weekly in the control group of healthy fetuses. In further experimental work the same authors found significant growth retardation in rabbit fetuses 21 days after the removal of the brain, performed between the 18th and 19th day of pregnancy. Kurjak et al. (1976b) in a retrospective work reviewed 143,175 case histories of which 88 were found to be anencephalic fetuses. By statistical analysis they found that the weekly growth of the anencephalics was 105g while in the control group it was 147g. These works show that the data available on the influence of the embryo's own hormonal development has on fetal growth is quite inadequate and markedly contradictory. Additionally, there are still no data on the level of hormonal development in anencephalic newborns.

* Human Placental Lactogen (HPL):

The amount of HPL found in the body fluids of the embryo is especially small and it is therefore unlikely that this placental hormone directly affects fetal growth. However, it can indirectly affect fetal growth by accelerating maternal lipolysis (Grumbach et al. 1968).

Because of the resulting increase in the amount of free fatty acids, less glucose will be used by the maternal organism leaving more for the utero-placental transport. In contrast to the high level of HPL in the maternal blood, Kaplan and Grumbach (1965) found an almost insignificant amount of this hormone in the blood of the embryo. The very low values of HPL in the blood of pregnant women carrying children with renal agenesis should not be erroneously interpreted because these values approach normal ones following correction in relation to the weight of the placenta (Josimowich 1971). It would seem necessary to obtain more reliable data regarding the levels of these peptides in the fetal fluids as well as data on a larger number of newborns from all gestational groups.

* Insulin:

In the discussion of hormonal influences on fetal growth a special place is occupied by insulin. It is common knowledge that a large baby is sometimes born even in a well-controlled insulin dependent pregnancy.

Although there is still no direct evidence that this is the cause of accelerated fetal growth, it is justifiable to believe that this fact has a particular significance.

It appears that this effect is strictly connected with