Updates in The Investigations And Management Of The Small For Gestational Age Fetus

Essay
Submitted in fulfillment of the Master degree (M.Sc.)
in obstetrics and gynecology

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2007

Acknowledgment

First and foremost thanks to ***God,*** to whom I relate any success in my life.

I would like to express my extreme appreciation to ***Prof Dr. Fadel Shaltout*** for his fatherly and kind supervision, kind advice, consult, and encouragement through the whole work which couldn't be a fact without his kind help.

And express my deepest appreciation to ***Dr. Dalia Abd-Allah*** for her kind advice, consult, and supervision.

Also, I would like to thank ***my family, my husband and my colleagues*** for their encouragement, support and help in this work.

Table of contents

List of figures

List of Tables

List of abbreviations

Abbreviation	Full title
AC	abdominal circumference
AFI	Amniotic fluid index
AFP	alpha fetoprotein
AEDF	absent end diastolic flow
AGA	appropriate-for-gestational-age
BMI	Basal metabolic index
BPD	Biparital diameter
BPP	Biophysical profile
CI	confidence interval
CPR	Cerebral placental ratio
CRL	crown-rump length
CST	Contraction stress test
CTG	Cardiotocogram
C/U ratio	cerebro-umbilical ratio
CW	Continuous wave
DDLN	diffuse decidual leukocytoclastic necrosis
DIs	Doppler indices
DV	Ductus venosus
E3	oestriol
EDF	End diastolic flow
FHM	Fundal height measurement

FAS	Fetal alcohol syndrome
FBP	Fetal Biophysical profile
FGR	Fetal growth retardation
FHR	Fetal heart rate
FL	Femur length
FVW	Flow velocimetry waveforms
GRIT	Growth Restriction Intervention Trial
HC	head circumference
HC/AC	head-to-abdomen circumference ratio
hCG	human chorionic gonadotrophines
HPL	human placental lactogen
HR	Heart rate
IGF	insulin growth factor
IUGR	Intrauterine growth restriction
IVC	Inferior vena cava
LGA	large-for-gestational-age
MCA	Middle cerebral artery
MLS	Maternal life styles study
MSAFP	maternal serum alpha fetoprotein
MVP	Maximum vertical pocket
NI	Notch index
NST	Non-stress test
OFD	Occipito-frontal diameter
PW	Pulsed wave
PI	Pulsatility index
PIH	Pregnancy induced hypertension
RDS	Respiratory distress syndrome

REDF	Reversed end diastolic flow
RI	Resistance index
Rc	Ratio of cerebral index
Rp	Ratio of placental index
S/D ratio	Systolic/Diastolic ratio
SGA	Small-for-gestational-age
SIDS	sudden infant death syndrome
UA	Umbilical artery
UADWs	umbilical artery Doppler waveforms
UP	Uteroplacental
US	Ultrasound

Abstract

This study is concerned about the recent advances in the investigation and management of small for gestational age fetuses which affects approximately 3-10% of all deliveries. FGR is associated not only with a marked increase risk in perinatal mortality and morbidity but also with long-term outcome risks. Combination of fetal biometry, amniotic fluid volume, heart rate patterns, arterial and venous Doppler, and biophysical variables allow a comprehensive evaluation of FGR. The aim of the obstetricians is to identify fetuses with early FGR so delivery can be planned according to gestational age and severity of the condition.

Key Words

Intrauterine growth retardation- Intrauterine growth restriction- Fetal growth restriction- Low birthweight- Placental insufficiency- Small for gestational age.

Chapter (1)

Introduction

Fetal growth restriction (FGR) is challenging because of the difficulties in reaching a definitive diagnosis of the cause and planning management. FGR is associated not only with a marked increased risk in perinatal mortality and morbidity but also with long-term outcome risks. Combination of fetal biometry, amniotic fluid volume, heart rate patterns, arterial and venous Doppler, and biophysical variables allow a comprehensive fetal evaluation of FGR. However, no evidence supports that the use of cardiotocography or the biophysical profile improves perinatal outcome. Therefore, obstetricians aim to identify fetuses with early FGR so delivery can be planned according to gestational age and severity of the condition. The balance of risks and the need for the availability of services mean that the involvement of neonatologists in FGR management is vital **(Alberry M & Soothill P, 2007).**

As many as 40 % of so-called unexplained still-births are small-for-gestational-age (SGA), leading to the suggestion that early detection and timely delivery may well prevent many fetal deaths. Some 30 % of sudden infant death syndrome (SIDS) cases were SGA at birth, and the overall infant mortality of infants suffering from fetal growth restriction (FGR) is as much as eight-fold greater than that for appropriately grown infants. These infants are also at high risk of perinatal hypoxia and acidaemia, operative delivery and neonatal encephalopathy. Other neonatal problems include hypoglycemia, hypothermia, hypocalcaemia and polycythemia. Paradoxically, these infants have a slightly reduced incidence of respiratory distress syndrome (RDS), presumably because of the intrauterine stress resulting in increased surfactant production.

It is possible that babies who suffer with FGR are at increased risk of early cognitive and neurological impairment and cerebral palsy. Long-term data from the 1970 British Birth Cohort indicate that adults who were born SGA had significant difference in academic achievement and professional attainment compared with adults who were of normal birth weight. It would also appear that the uterine

environment to which the fetus is exposed can lead to "programming", resulting in consequences in adulthood-the so-called Barker hypothesis.SGA is associated with an increased risk of hypertension, glucose intolerance and atheromatous vascular disease in later life, **(Barker DJ; 1997)**.

Intrauterine-growth-restriction (IUGR) occurs in 3-10% of all pregnancies **(Haram K, Gjelland K, 2007).**

Identification of IUGR is crucial because proper evaluation and management can result in a favorable outcome.

The small baby is vulnerable, not only to death or damage that may be inflicted by inadequate intra-uterine nutrition, but also to the complications of prematurity which may occur iatrogenically. At present, little can be done to treat fetal growth restriction (FGR) and so, in most cases, the only intervention open to the obstetrician is to deliver the baby prematurely. A number of investigations of fetal behavior and placental function are used to guide timing of delivery, but a great degree of uncertainty exists, both between clinicians in a similar situation and in an individual clinician facing different clinical situations.

Having identified that a fetus is small for gestational age, the challenge to the clinician is to: (1) determine whether the fetus is reaching its growth potential or is growth-restricted; (2) identify any underlying cause and monitor appropriately; and (3) deliver at the optimum time so as to minimize the damage to the baby both from intra-uterine factors and from prematurity.

Despite the extensive research in the field of IUGR and significant improvement in the understanding of pathophysiology, diagnosis and treatment of aberrant growth, still it is somewhat of an enigma making a major concern for the obstetrician **(Divon, 1992)**.

The early and accurate diagnosis of this condition is all-important, but it's missed in 50-75% of cases. The reason is probably the necessity, first, to recognize clinically that the problem may exist **(Wagstaff, 1991)**.

It is self-evident that not all infants suffering from FGR will be SGA and that not all infants who are SGA will suffer from FGR. Indeed, as few as 15 percent of SGA fetuses may be small as a result of FGR. Some 70 % of fetuses suffering from reduced growth velocity will have a birth weight considered appropriate for gestational age - it does not seem to affect neonatal outcomes unless the fetus is also small, with an abdominal circumference under the fifth centile. It is therefore logical to concentrate on the SGA fetus that is suffering from FGR **(Bobrow CS& Soothill PW; 1999).**

Chapter (2)

Definitions

In 1935, The American Academy of Pediatrics defined prematurity as a live-born infant weighing 2500g or less **(Cone, 1985).** These criteria were used widely until it became apparent that there were discrepancies between gestational age and birthweight because of restricted fetal growth. The World Health Organization in 1961 added gestational age as a criterion for premature infants, defined as those born at 37 weeks or less. A distinction was made between low birthweight (2500g or less) and prematurity (37weeks or less). Moreover, low birthweight, defined as less than 2500g, has been modified now to describe very low birthweight, infants weighing 1500g or less; and extremely-low birthweight, those who weigh 1000g or less.

With respect to gestational age, a fetus or infant may be preterm, term, or post-term. With respect to size, the fetus or infant may be normally grown or appropriate-for-gestational-age (AGA), small in size or small-for-gestational-age (SGA), or overgrown and consequently large-for-gestational-age (LGA). In recent years, the term small-for-gestational-age has been widely used to categorize an infant whose birthweight is usually below the 10^{th} percentile for its gestational age. Other often-used terms have included fetal growth retardation (FGR) or intrauterine growth retardation (IUGR). Within the past 5years the term restriction has largely replaced retardation, because the latter may erroneously convey mental delay rather than only the intended suboptimal fetal growth. The infant whose birthweight is above the 90^{th} percentile has been categorized as large for gestational age, and the infant whose weight is between the 10^{th} and 90^{th} percentiles is designated appropriate for gestational age. Thus an infant born before term can be small or large for gestational age and still be preterm according to chronological gestational age. Moreover, some preterm infants have also suffered growth restriction in-utero. It is important to recognize that preterm birth also frequently includes infants who have suffered subnormal in-utero growth.

A fetus is said to be small for gestational age if it falls below