Assuit Al-Azhar University
Faculty of Medicine
Departement of pediatrics

Updates In The Management Of Small For Gestational Age Neonates

Essay

Submitted for partial fulfillment of
MSc degree in pediatrics

By

Ahmed Mohamed Fahmy Abd – Elrahman
(M.B.B.Ch., Faculty of Medicine, Al-Azhar University

Supervised by

Prof.Dr. Mohammed AbdEl-Monem Matter

Prof. and the head of the Pediatrics Department
Faculty of Medicine, Al-Azhar University, Assiut

Dr.Abd-Elmageed Mohammed Bayoumy

Assistant Prof. Of Pediatrics
Faculty of Medicine, Al-Azhar University, Assiut

Dr.Amira Mohammed Hamed

Lecturer Of Pediatrics
Faculty of Medicine ,Al-Azhar University, Assuit

2013

جامعة الأزهر بأسيوط
كلية الطب
قسم طب الأطفال

الجديد فى علاج الاطفال حديثى الولاده ناقصى الوزن بالنسبه للعمر الرحمى

توطئة للحصول على درجة الماجستير

فى طب الاطفال

مقدمه من

***الطبيب* / احمد محمد فهمى عبد الرحمن**

بكالوريوس الطب والجراحه- جامعة الأزهر

تحت اشراف

ا.د.محمد عبد المنعم مطر

استاذ ورئيس قسم طب الاطفال

كلية الطب – جامعة الازهر – اسيوط

د. عبد المجيد محمد بيومى

استاذ مساعد طب الاطفال

كلية الطب – جامعة الازهر – اسيوط

د. اميره محمد حامد

مدرس طب الاطفال

كلية الطب – جامعة الازهر – اسيوط

2013

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. Mohammed Matter, **Professor and Head of Pediatrics Department, Faculty of Medicine, Al-Azhar University, Assiut** 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.

I would like to express my deepest appreciation to Dr. Abd-Elmageed Bayoumy, **Assistant Professor of Pediatrics, Faculty of Medicine, Al-Azhar University, Assiut** for his kind advice, consult, and supervision.

Also, I would like to thank Dr. Amira Hamed, **Lecturer of Pediatrics, Faculty of Medicine, Al-Azhar University, Assiut** for her encouragement, support and help in this work.

Ahmed Mohamed Fahmy

List of figures

List of tables

Contents

List of abbreviations

A

AC: Abdominal circumference

AGA: Appropriate for Gestational Age

ALS: Acid Labile Subunit

B

BPP: Biophysical Profile

C

CAD: Coronary Artery Disease

CP: Cerebral Palsy

E

EGF: Epidermal Growth Factor

F

F/A ratio: Femur-to-Abdomen ratio

FGR: Fetal Growth Restriction

FHM: Fundal Height Measurement

G

GA: Gestational Age

GH: Growth Hormone

H

HC: Head Circumference

hGH: Human Growth Hormone

HMD: Hyaline Membrane Disease

hPL: Human Placental Lactogen

HT: Height

I

IGF: Insulin like Growth Factor

IGF-1R: Insulin-like Growth Factor 1 Receptor

IGFBP: Insulin like Growth Factor Binding Protein

IUGR: Intrauterine-Growth-Restriction

IVH: Intraventricular Hemorrhage

L

LBW: Low Birth Weight

LCR: Locus Control Region

O

oGH: Ovine Growth Hormone

oPL: Ovine Placental Lactogen

R

RDS: Respiratory Distress Syndrome

S

SD: Standard Deviation

SGA: Small for Gestational Age

SIDS: Sudden Infant Death Syndrome

SLE: Systemic Lupus Erythematosus

U

UP: Uteroplacental

US: Ultrasound

W

WT: Weight

Introduction and aim of the work

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.. 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 and Soothill, 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 vascular disease in later life, **(Barker, 2009)**.

Intrauterine-growth-restriction (IUGR) occurs in 3-10% of all pregnancies **(Haram and Gjelland, 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: determine whether the fetus is reaching its growth potential or is growth-restricted; identify any underlying cause and monitor appropriately; and deliver at the optimum time so as to minimize the damage to the baby both from intra-uterine factors and from prematurity **(Divon and Hsu, 2010)**.

The early and accurate diagnosis that the fetus is small for gestational age is all-important. **(Wagstaff, 2011)**.

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 and Soothill; 2009).**

Definition

The use of the term small for gestational age (SGA) and intrauterine growth retardation (IUGR) has been confusing. They are often used interchangeably, although infants born following IUGR may or may not be SGA. **(Johnston and Savage, 2009).**

SGA is a statistically descriptive term that correlates birth length and/or weight with gestational age (G.A.) and is, therefore, a postpartum diagnosis. It does not refer to fetal growth, and is not a synonymous with IUGR although it may be a consequence of diminished fetal growth **(Hokken-Koelega et al., 2007).**

It is important to distinguish between infants who experienced in utero growth restriction from infants with normal in utero growth but constitutionally small (i.e. no loss in percentiles throughout gestation) **(Brodsky and Christou, 2009)**.

In growth clinics in the United Kingdom, SGA is commonly defined as birth weight and/or length two or more SD below the mean for gender and gestation, which is consistant with the definition of childhood short stature (standing height <-2SD) **(Johnston and Savage, 2009).**

Intrauterine growth restriction (IUGR) describes a decrease in fetal growth rate that prevents an infant from obtaining his or her complete growth potential **(Hokken-Koelega et al, 2007)**.

A fetus with IUGR may be born small for gestational age (SGA) or appropriate for gestational age (AGA) according to population reference charts **(Martinez and Simmons, 2010)**.

Additionally, in developing countries, there is a direct correlation between the incidence of low birth weight (<2500 g) and IUGR because in developing countries, the high incidence of low-birth-weight (LBW) infants is almost exclusively due to the incidence of IUGR. Data from developed countries show the opposite, rates of low birth weight being explained almost exclusively by prematurity rates **(Martinez and Simmons, 2010).**

Some women have a tendency to have constitutionally small babies although both parent's gene affect childhood growth and adult find size, maternal genes mainly influence birth weight. Unfortunately, it can be concluded that a fetus is constitutionally small only after a pathological process has been excluded, which requires examination of new born. Therefore, identification of a constitutionally small baby is usually made in retrospect after the infant is born **(Peleg et al., 2008).**

The ponderal index arrived at by the following formula, can be used to identify infants whose soft tissue mass is below normal for the stage of skeletal development.

Ponderal index=(Birth weight(gm)/Crown-heel length(cm)^3)×100.

Thus a ponderal index below the 10th percentile may be used to identify IUGR infants, thus all IUGR may not be SGA, and all SGA infants may not be small as a result of growth restricted process **(Desai and Rao, 2009).**

The two components that are necessary to define a SGA fetus are:

a) Birth weight < 10th percentile.

b) Absence of pathogenic process.

(Lin et al., 2007)

To document adequately impaired fetal growth and diminished growth velocity in utero, at least 2 intrauterine size assessments must be performed **(Hokken-Koelega et al., 2007)** Thus, IUGR should be considered a prenatal diagnosis, based primarily on serial measurements of fetal ultrasound parameters including estimates of fetal weight, head circumference, abdominal circumference and femur length **(Thomas et al., 2010)**.

Intrauterine growth curves:

It is to be noted that the postnatal Egyptian curves were published in 2002 and are now being used as standards all over the country but Unfortunately there are no available Egyptian intrauterine growth curves to date.

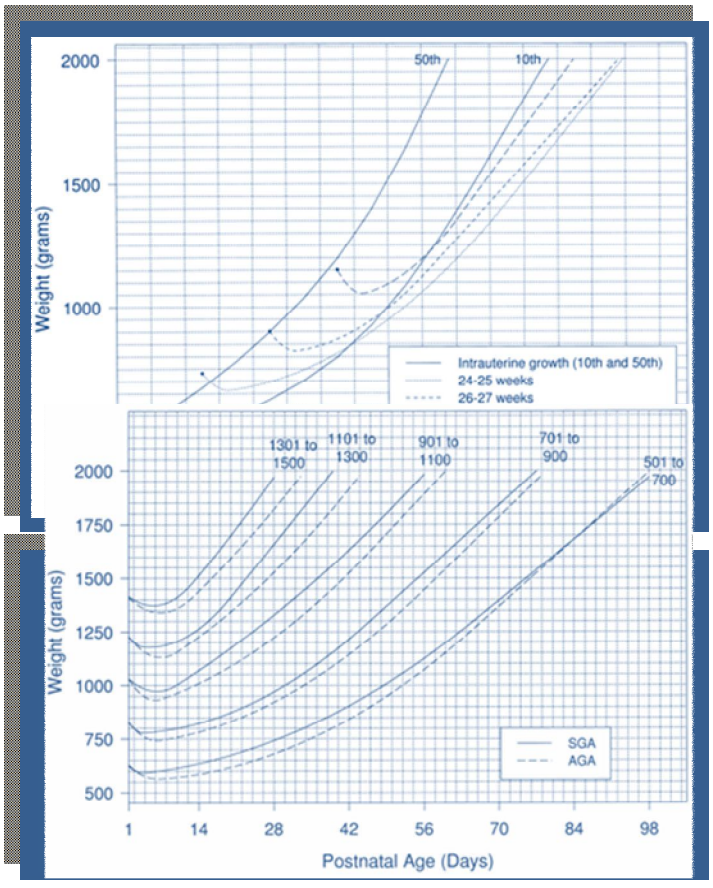

Figure (1): Fetal growth charts

a) Average body weight versus postmenstrual age in weeks for all study infants with gestational ages 24 to 25 weeks (dotted line), 26 to 27 weeks (short dashes), and 28 to 29 weeks (long dashes). The reference intrauterine growth curves were plotted using the smoothed 10th and 50th percentile birth weight.

b) Growth curves of small-for-gestational age infants (solid line) and of appropriate-for-gestational age infants (dashed line) plotted by postnatal age in days. The infants are stratified by 200-g birth weight intervals **(Alexander et al., 2007).**

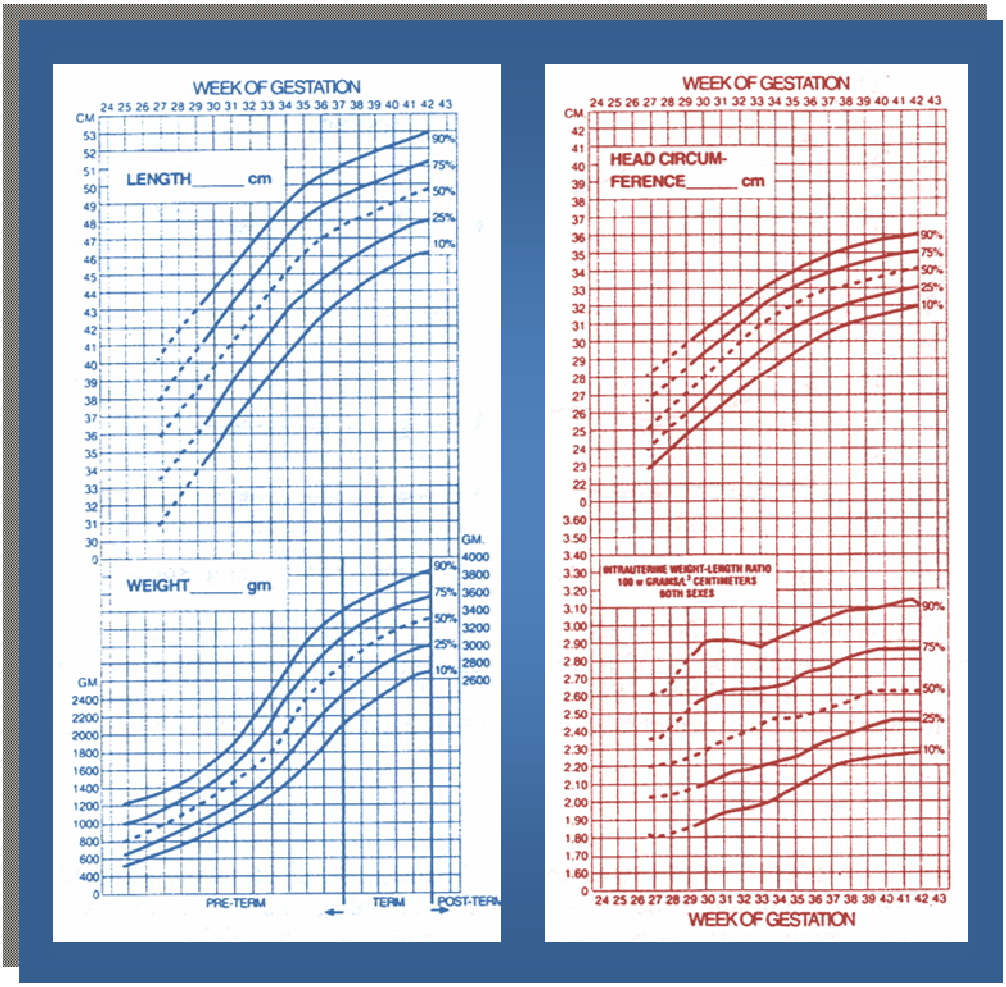

Figure (2): Sample of a form used to classify newborns based on maturity and intrauterine growth **(Lee and Kimbery, 2008)**