Role of Updated Ultrasound in The Assessment of Fetopathy of Diabetic Patients

Thesis

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قُلْ إِنَّ صَلَاتِي
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List of Abbreviations

MHG ..... Maternal high glucose
FHI ..... fetal hyperinsulinaemia .
HbA1c..... Glycosted hemoglobin
DM ..... Diabetes Mellitus
ADA ..... American Diabetes Association
SGA ..... Small for gestational age
LGA ..... large for gestational age
IUGR ..... Intrauterine growth restriction
IDMs ..... Infants of diabetic mothers
NTD ..... Neural Tube Defect
BPD ..... Biparietal diameter
HC ..... Head circumference.
AC ..... Abdominal circumference
FL ..... Femur length
UB ..... Urinary bladder
IVS ..... Interventricular septum
RMWT..... Right myocardial wall thickness
LMWT..... Left myocardial wall thickness
UA ..... Umbilical artery
MCA ..... Middle cerebral artery
GDM ..... Gestational diabetes mellitus
ASTT ..... Abdominal subcutaneous tissue thickness
SSTT ..... Subscapular subcutaneous tissue thickness.
CHD ..... Congenital heart disease
HCM ..... Hypertrophic cardiomyopathy
IVST ..... Interventricular septal thickness
HLHS ..... Hypoplastic left heart syndrome

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Introduction

The number of pregnant women with pre-existing diabetes is increasing, mainly from an increase in type 2 diabetes, but also an increase in type 1 diabetes which may be related to harmful environmental conditions .

Approximately 87.5% of pregnancies complicated by diabetes are estimated to be due to gestational diabetes (which may or may not resolve after pregnancy), with 7.5% being due to type 1diabetes and the remaining5% being due to type 2 diabetes. Thus, the knowledge and management of this condition in pregnancy has become important

(Dabelea ,2009) .

The pathogenesis of fetal malformations associated with pre-existing diabetes is poorly understood but may be multifactorial and related to nutrient deficiencies or toxic metabolites. Hyperglycemia, hypoxia, ketone and amino acid abnormalities, and glycosylation of proteins have been reported as potential teratogens that may alter molecular signalling pathways and adversely affect embryogenesis Hyperglycemia, beta-hydroxybutyrate (the major ketoneproduced in ketoacidosis) and somatomedin inhibitors have been associated with neural tube defects ***(Gabby and Baschat, 2015)***

Ultrasonography is a non invasive, readily available method to assess and monitor the fetus .Ultrasound surveillance can be a useful tool to supplement clinical evaluation of fetuses in pregnancies complicated by diabetes is also a helpful guide for instituting early therapeutic management for pregnancies complicated by diabetes ***(PO-Fan, et.al.,2015)***

Prenatal ultrasound of diabetic patients can detect CNS structural defects as anencephaly,Holoprosencephaly,and spina bifida. Again sonographic imaging remains the standard method to diagnose fetal cardiac abnormalities in diabetic patients where measurements of the thickness of the ventricular walls can reveal myocardial hypoplasia ***(Zhiyong and Albert ,2013).***

With the aid of prenatal sonography, selection of medical therapy in diabetic mothers can be judged by detecting the risk of fetal macrosomia which may guide the start of insulin therapy.

On color Doppler studies, The uterine artery reflects the utero-placental circulation while the umbilical artery reflects the feto-placental circulation In long standing diabetes , perfusion is decreased on placental size and the umbilical artery shows increased impedance to blood flow

which can be assessed with Doppler Ultrasound.***(Bano etal.,2010).***

The Utility of three-dimensional ultrasound in diabetic pregnant patients is still being established. Fetal bone anomalies are better detected on 3D ultrasound and hence skeletal dysplasia can be detected more accurately on 3D ultrasound ***(Shahina et al.,2016).***

Aim of the Study

To evaluate the role of ultrasound in the assessment of pre-existing and gestational diabetes related fetal complications and its impact on obstetric management.

Normal Ultrasound Appearance Of The Fetus

Detection of fetal anomalies requires thorough familiarity with normal fetal anatomy and sonographic landmarks. The 2nd and 3rd trimesters of pregnancy are a progressive period when the organs and organ systems formed during the 1st trimester become fully developed ***(Bano et al;2016)***.

Fetal organ systems:

Head &Brain:

Ultrasonographic examination of the head and brain are among the most important images that can be obtained for exclusion of a wide variety of anomalies .Examination of the fetal brain can essentially be carried out by 2 transverse planes: the transventricular and transcerebellar planes. The transventricular view can readily identify the calvaria from late first trimester until term which provides an easily means for estimation of gestational age through measurement of biparietal diameter ,(Fig 1) head circumference ,or both .This view also allows examination of the lateral ventricles which appear as complex anatomic structures that contain anechoic cerebrospinal fluid and lie deep within the cerebral

ventricles .Within the ventricular system lie the echogenic choroid plexus (Fig.2). On the other hand, the transcerebellar view(Fig .3) allows examination of the posterior fossa structures with measurement of transverse cerebellar diameter and cisterna magna ***(Kalish et al ;2004)***.

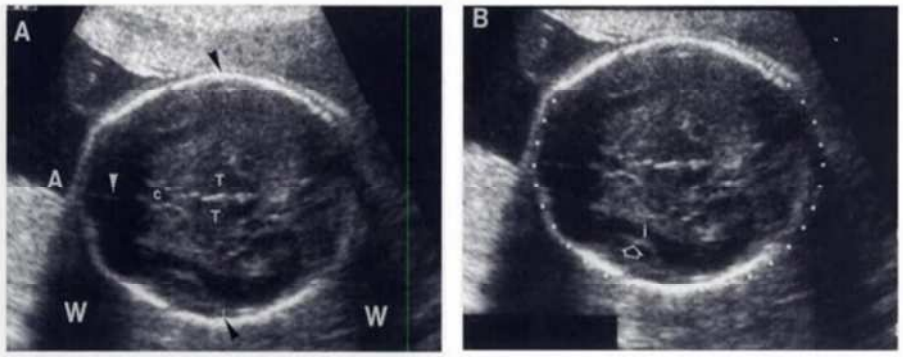

Fig (1): Biparietal diameter and head circumference A :Axial image showing the thalami(T) and cavum septum pellucidum (c)B: Head circumference measurement.(**Quoted from Kalish et al ;2004)**

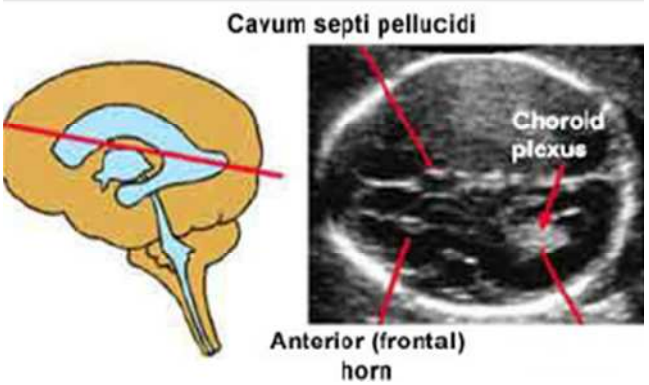

Fig (2): Transventricular view of the fetal brain

(Quoted from Kalish et al ;2004)