The role of the three dimensional ultrasonography in the diagnosis of placental abnormalities in pregnant women

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The placenta commonly called the afterbirth; is an organ that develops inthe uterus during pregnancy. It is a unique characteristic of the highermammals. The placenta draws nourishment and oxygen, which it suppliesto the fetus, from the maternal circulation. In turn, the placenta receivesthe wastes of fetal metabolism and discharges them into the maternalcirculation for disposal. It also acts as an endocrine gland, producingestrogen, progesterone and gonadotrophin. Shortly after delivery of thefetus the placenta is forced out by contractions of the uterus.There are many placental abnormalities such as: abnormalities of location,implantation, thickness as well as anomalous shape, abnormal placentalcalcifications, placental tumors and placenta in multiple gestations.The placenta can be effectively studied by antenatal ultrasound. Valuableinformation regarding placental configuration, location, maturity,pathology and maturation irregularities can be assessed. It is recognizedthat the anatomic component of the placenta are discernible from as earlyas the seventh to eighth weeks of gestation. By the 12th week ofpregnancy, sonography can determine the position of the placenta andidentify specific component of the placenta. The placental location,appearance and relationship to the internal cervical os should be recorded.The umbilical cord should be imaged, and the number of vessels in thecord should be evaluated when possible.As for the assessment of the placental vascularization , the 3D powerDoppler allows the evaluation of the placental vascular tree architecture,and of it’s vascular indices the method apparently can show the villousvessels of the first , second and third order , with higher percentage ofvascularization than two-dimensional Doppler.The last two decades have witnessed unprecedented developments of newimaging systems making use of 3D visualization; these new technologieshave revolutionized diagnostic radiology, as they provide the clinicianwith information about the interior -of the human body never beforeavailable ultrasound imaging is an important cost effective technique usedroutinely in the management of a number of diseases. However, 2Dviewing of 3D anatomy, using conventional ultrasound, limits our abilityto quantify and visualize the anatomy and guide therapy, because multiple20 images must be integrated mentally. This practice is inefficient, and164leads to variability and incorrect diagnoses. Also, since the 2D ultrasoundimage represents a thin plane at an arbitrary angle in the bodyreproduction of this plane at a later time is difficult. Over the past 2decades, investigators have addressed these limitations

by developing 3Dultrasound techniques. The 2D images are digitized and thenreconstructed in real-time into a 3D image, which can be viewed andmanipulated interactively.Regarding placental evaluation, the 3-D display enables visualization ofplacental changes including calcifications, placental ”lakes” indentationsof the chorionic plate, and changes in gray-scale echogenicity. The 3 Ddisplay also helps to identify abnormal position abruption, hematoma, andaccreta. This capability is especially helpful in evaluating membranes andother anatomical relationships in twin gestations.Some diagnostic procedures as well as therapy and surgery planningrequire accurate volume measurements in which 3D ultrasound plays animportant role. The use of 2D ultrasound for measurement of organ orlesion volume is variable and at times inaccurate. But using 3Dultrasonography enables us for accurate estimation of the volumes.Power amplitude ultrasonic angiography (3D power Doppler) has alsobeen used to better delineate the abnormal placental vasculature in casesof placenta accrete. Unlike conventional color Doppler imaging, thistechnique is less dependent on the orientation of the blood vessels. Thismay result in faster, easier, and more confident acquisition of goodDoppler signals.3D ultrasound may play a crucial role in mapping out the relationship ofthe placenta, vessels and internal cervical os, to obtain the best possibleoutcome at the time of Cesarean delivery.The angioarchitecture revealed by 3D power Doppler enabled us toconfirm that the vascular channels in the tumor were continuous with thefetal circulation. Therefore, the diagnosis of chorioangioma was morestraightforward.The added value of 3DPD modality lies in its potential to improve 3aspects of sonography: understanding of anomalies structure, precision ofdiagnosis, and vascular volume of lesions.