
Editorial

Special Issue: New Devices In Fetal Surveillance

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Unique devices are necessary to assess and monitor the health of the fetus, which is somewhat invisible and untouchable within the uterus and abdominal wall, and floating in the amniotic fluid during pregnancy. Human fetal function is therefore surveyed mainly based on its central/peripheral circulatory, nervous, and motor systems, with the goal of confirming fetal wellbeing and detecting any abnormality. Fetal cardiac function can be assessed using fetal electrocardiography (fECG) applied to the maternal abdominal surface, which sends out a mixture of fetal and maternal signals. Recent advances in fECG have made it possible to reject maternal signals, as reported by Kimura and his colleagues in this issue. Fetal magnetocardiography (fMCG) is the detection of magnetic field variation from the maternal abdomen. Fetal arrhythmia and autonomic nervous function were also studied with fMCG by A. Fukushima and colleagues in this special issue. Fetal magnetoencephalography (fMEG) is also a promising technique for assessing fetal brain functions such as response to fetal sound and light stimulation [1]. Tissue oxygenation can be monitored based on the hemoglobin and oxy-hemoglobin contents measured by near-infrared spectroscopy. In this issue, N. Kanayama and colleague presented such a study of placental oxygenation, which is an important indication of fetal oxygen intake during pregnancy. Individual fetal heart rate (FHR) monitoring with cardiotocogram (CTG) is a common ante- and intra-partum fetal surveillance technique

by which fetal status is assessed and the outcomes improved. K. Maeda and colleagues presented central-computerized fetal monitoring of simultaneous multiple deliveries using a rapid and direct alarm system, and reported its clinical effect in improving outcome in this issue. Fetal ultrasonic Doppler actocardiogram, invented by K. Maeda, enables the simultaneous tracing of FHR and fetal movement signals, which is useful for fetal behavioral studies, differentiation of false-positive FHR, assessing outcome in fetal central nervous system lesions and other fetal disorders, and common fetal monitoring as a CTG.

A human embryo shows extreme morphological changes in the central nervous and other systems in the first trimester, which are visualized using three- and four-dimensional ultrasound images and discussed by RK Pooh in this issue for the diagnosis of congenital malformation.

Twin-twin transfusion syndrome (TTTS) is an ominous disease in monochorionic twins that results from fetal vessel anastomosis in the placenta. Visual detection by fetoscope and laser photocoagulation could provide a cure for fetuses affected by TTTS, as reported in this issue by T. Murakoshi.

Further studies of the new techniques in fetal surveillance will progress advances in fetal investigation and ultimately improve the outcomes in perinatal practice.

REFERENCE

- [1] Kiefer I, Siegel E, Preissel H, *et al.* Delayed maturation of auditory-evoked responses in growth-restricted fetuses revealed by magnetoencephalographic recordings. *Am J Obstet Gynecol* 2008; 199: 503. e1-7.

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