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In Reply.—Our letter in response to Drs. Gandhi and
Burgos was merely an effort to disclose that there was
a simpler technique to solve the problem addressed.
We never claimed to have invented this technique. Like
Dr. Thomas, we simply attempted to popularize this useful
but "lost" technique.

HWA-KOU KING, M.D.
LONG-FONG WANG, M.D.
AHSAKUL K. KHAN, M.D.
Department of Anesthesiology

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ECG Monitoring of Mother and Fetus During Epidural Anesthesia

To the Editor:—When epinephrine is added to the local
anesthetic, careful monitoring of the parturient is needed
to detect inadvertent intravascular injection during epidural
anesthesia.*

Following the maternal heart rate (MHR) by radial artery
palpation1-2 is the easiest, but also the least reliable,
method. The use of a (portable) electrocardioscope3 or a
(cheaper) pulse meter attached on the patient's earlobe4
is also possible, but requires extra equipment.

A fetal monitor, such as a cardiotocograph, is readily
available on an obstetric suite. Recently, Abouleish and
Johnson5 described the use of the Doppler component of
a fetal monitor (model 8040A, Hewlett-Packard, Palo
Alto, CA). Monitoring MHR using the direct ECG mode
of a fetal monitor model 8040A is suggested by Chestnut
and Weiner.6 They place one standard ECG lead at the
upper left sternal border and a second lead just beneath
the left breast in the anterior axillary line. The lead wires
are inserted into the cable block, which is strapped to the

* Van Zundert A, Vaes L, Soetens M, De Vel M, Van Der Aa P,
Van Der Donck A, Meeuwis H, De Wolf A: Every dose given in epidural
analgesia for vaginal delivery can be a test dose. Unpublished data.

Fig. 1. N = normal internal fetal monitoring. A = alternating fetal heart rate (FHR)
and maternal heart rate (MHR) monitoring. B = continuous FHR (external) and MHR
monitoring, and C = continuous FHR (internal) and MHR monitoring.
woman's arm. The monitor electronically calculates each R-R interval and provides a graphic recording of MHR.

However, the latter technique can be simplified. A baby ECG electrode with wire is placed near the cable block, which is strapped to the woman's leg (fig. 1A). Another baby ECG electrode is placed on the lower forearm at the same side. Just before the injection of the epidural test dose containing epinephrine, the fetal wires are disconnected from the cable block and the baby electrode wires are inserted. The monitor electronically now calculates a beat-to-beat MHR and provides a graphic recording of it. The recording of the uterine contractions is uninterrupted. This method can be used with both fetal monitor model 8030A and 8040A.

More recently, Chestnut and Weiner, using the newer fetal monitor model 8040A with dual heart rate monitoring capacity for twins, described a technique allowing continuous recording of MHR and fetal heart rate (FHR) simultaneously (fig. 1B).

However, the direct fetal ECG provides the best trigger for instantaneous (beat-to-beat) measuring and recording. The new fetal monitor model 8040A with dual heart rate monitoring capacity, plus the abdominal ECG option, allows beat-to-beat measuring and recording of both MHR and internal FHR at the same time throughout labor and delivery (fig. 1C). The common spiral electrode is attached to the fetal presenting part (usually the fetal head). The active spiral electrode wire is connected to the cable block of a modified 15240A patient cable, while the reference electrode wire (red) is not used, and the wire of a baby electrode attached to the mother's forearm is connected to the cable block, which is strapped to the leg. The FHR (dark trace) is recorded continuously without interruption, together with the MHR (light trace) and the uterine contractions (fig. 2). As the Hewlett-Packard 15240A patient cable is only suitable for monitoring the direct fetal ECG (or maternal ECG), it should be modified for monitoring both FHR and MHR. The internal resistor, mounted between pins 1 and 6 of the cable connector, should be changed from 4530 Ohm to 7870 Ohm, which is easily done by a technician.

André A. Van Zundert, M.D., Ph.D.
Department of Anesthesiology
Catharina Hospital, Eindhoven, The Netherlands

Leo E. Vaes, M.D.
Department of Anesthesiology
St-Elisabeth Hospital, Turnhout, Belgium

André M. De Wolf, M.D.
Department of Anesthesiology
Catharina Hospital, Eindhoven, The Netherlands

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