

## OBSERVATIONS

## Effects of Maternal Diabetes on Visual Evoked Potentials and Early Psychomotor Development of the Offspring

Planning and intensive treatment of diabetes in pregnancy has resulted in dramatic improvements in outcomes in terms of congenital malformations or perinatal morbidity (1), but it is still not clear to what extent maternal diabetes affects cognitive development of newborns. In infants of diabetic mothers (IDMs), significant relations have been reported between poor maternal metabolic regulation during pregnancy and poor child intellectual performance, despite an achievement of overall healthy neuropsychological functioning (2,3). Evoked potentials are commonly used in infants to analyze maturational processes and clinical problems (4).

To evaluate the effects of maternal diabetes on brain functions of the offspring, we analyzed psychomotor development (Brunet-Lezine test) and visual evoked potentials (VEPs) in 40 2-month-old IDMs (21 males and 19 females); 24 mothers had type 1 diabetes, 3 had type 2

diabetes, and 13 had gestational diabetes. VEPs were recorded by standard procedure (5) within 2 h of administration of the development test and blinded to the results of the development test. Normative VEP data were obtained from 63 healthy infants matched for age and sex. The most stable component IV was used for statistical analysis. The mean development quotient (DQ) of IDMs was  $94.7 \pm 19.3$ , and the DQ adjusted for gestational age (ADQ) was  $121.2 \pm 66.9$ , with a lower subtest score on speech ( $115.6 \pm 74.0$ ). Six patients (15%) had DQ scores  $<80$ , but only one of them had an abnormal ADQ. VEPs showed a mean latency significantly higher in IDMs than in control subjects on both hemispheres (right:  $200.2 \pm 33.8$  vs.  $155.6 \pm 29.0$  ms,  $P < 0.001$ ; left:  $197.9 \pm 35.5$  vs.  $155.3 \pm 30.3$  ms,  $P < 0.001$ ), with abnormal responses in four cases (10%). No relations were found between VEPs and developmental scores; one infant had both abnormal VEPs and ADQ.

In conclusion, IDMs show delayed VEPs, while their mean developmental quotient is normal, even if abnormal values may occur in some cases. These data suggest that maternal diabetes may have subtle negative effects on brain functions of offspring. VEPs seem to be suitable to analyze subclinical neurophysiologic changes that could represent markers for subsequent developmental risk.

MARIO BRINCIOTTI, MD<sup>1</sup>  
 MARIA MATRICARDI, MD, PHD<sup>1</sup>  
 ANTONIETTA COLATRELLA, MD<sup>2</sup>

FRANCESCO TORCIA, MD<sup>3</sup>  
 FRANCESCO FALLUCCA, MD<sup>2</sup>  
 ANGELA NAPOLI, MD<sup>2</sup>

From the <sup>1</sup>Department of Child Neuropsychiatry and Rehabilitation Sciences, Faculty of Medicine I, "Sapienza" Rome University, Rome, Italy; the <sup>2</sup>Department of Clinical Sciences, Diabetes Unit, Faculty of Medicine II, "Sapienza" Rome University, Rome, Italy; and the <sup>3</sup>Department of Gynecology, Perinatology, and Child Health, Faculty of Medicine II, "Sapienza" Rome University, Rome, Italy.

Address correspondence to Mario Brinciotti, MD, Child Neuropsychiatry and Rehabilitation Sciences, "Sapienza" Rome University, Via dei Sabelli, 108, 00185 Rome, Italy. E-mail: mario.brinciotti@uniroma1.it.

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### References

- Willhoite MB, Bennert HW, Palomaki GE, Zaremba MM, Herman WH, Williams JR, Spear NH: The impact of preconception counseling on pregnancy outcomes: the experience of the Maine Diabetes in Pregnancy Program. *Diabetes Care* 16:450–455, 1993
- Rizzo T, Metzger B, Burns WJ, Burns K: Correlations between antepartum maternal metabolism and intelligence of offspring. *N Engl J Med* 325:911–916, 1991
- Silverman B, Tizzo T, Cho N, Metzger B: Long-term effects of the intrauterine environment. *Diabetes Care* 21 (Suppl. 2): B142–B149, 1998
- Taylor MJ, McCulloch DL: Visual evoked potentials in infants and children. *J Clin Neurophysiol* 9:357–372, 1992
- American Electroencephalographic Society guidelines in electroencephalography, evoked potentials, and polysomnography. *J Clin Neurophysiol* 11:1–147, 1994