Plasma Concentrations of N-Terminal Pro-B-Type Natriuretic Peptide in Pregnant Women near Labor and during Early Puerperium

To the Editor:

B-Type natriuretic peptide (BNP) is considered an important component of the adaptive mechanism that helps reduce the load on the myocardium through systemic vasodilatation, reduction in venous return, and reduction in vascular volume (1). Plasma concentrations of BNP have been shown to reflect cardiac dysfunction and volume overload in adults and children (2–4). BNP is synthesized in cardiac myocytes as a prohormone, proBNP. The active hormone, BNP, is cleaved and cosecreted from the proBNP. The active hormone, BNP, cardiac myocytes as a prohormone, fluid volume also been suggested that BNP may be involved in various pathologic conditions in pregnancy and the puerperium (5). NT-proBNP concentrations have been shown to provide information similar to BNP, and the validity of the assay as a clinical tool is well documented (3, 6–9).

Pregnancy represents a state of physiologic volume expansion as maternal blood volume increases ~40%–45% above nonpregnancy volumes (10). Despite the growing data on the role of BNP in regulation of volume homeostasis, there are few studies regarding its role in pregnancy (11–14). It has been shown that BNP concentrations are higher in preeclampsia and other hypertensive disorders of pregnancy than in normal pregnancy (11, 12, 14). It has also been suggested that BNP may have a role in regulation of amniotic fluid volume (15).

Because NT-proBNP may be used as a marker for various pathologic conditions in pregnancy and the puerperium, we conducted a study to determine reference values for NT-proBNP in pregnant women near delivery and in the early postpartum period.

The study was approved by the hospital ethics committee. A total of 88 healthy women admitted to the delivery room at Hadassah Mt. Scopus hospital were enrolled in the study. After receipt of informed consent, blood samples were collected (during admission to the labor ward and within 28 h after delivery).

For reference values, all measurements were included. For comparison and correlation between the pre- and postpartum states, only paired sets of measurements were considered. For each patient, demographic details, obstetric history, and current pregnancy details were recorded.

NT-proBNP was measured with an electrochemiluminescence immunoassay for proBNP (Roche) on the Elecsys 1010/2010 system. NT-proBNP results are presented as the mean (SD).

Mean maternal age was 30.5 (range, 18–43) years, and the mean gestational age was 39.5 (35–42) weeks. The mean birth weight was 3237 (2200–4255) g. For 62 women, paired samples were available for analysis, whereas for 26, only one blood sample was available (14 collected before delivery and 12 postpartum). NT-proBNP concentrations in the nonpaired groups were distributed similarly to those in the paired samples and therefore are comparable.

The mean (SD) maternal blood NT-proBNP concentration was 81 (32) ng/L before delivery and 165 (102) ng/L after delivery (n = 62; P < 0.001).

We found no correlation between maternal blood NT-proBNP concentrations before and after delivery to parity, duration of labor, or birth weight of the offspring. There was a weak correlation between maternal blood NT-proBNP concentrations before delivery and gestational week (r = 0.226; P < 0.05; n = 76), but no such correlation was found after delivery.

Women who received analgesia during labor (epidural, pethidine, or inhaled N2O) had significantly higher NT-proBNP concentrations before delivery than did those who did not use analgesia: 92 (48) ng/L (n = 56 of 76) vs 69 (26) ng/L (n = 20 of 76), respectively (P = 0.041). However, we found no postdelivery difference between the 2 groups.

Women who did not undergo induction or augmentation of labor had significantly higher postdelivery concentrations of NT-proBNP than did those who underwent induction: 181 (116) ng/L (n = 50 of 74) vs 116 (70) ng/L (n = 24 of 74), respectively (P = 0.004). However, we found no difference in predelivery concentrations between the 2 groups.

Human pregnancy represents a state of physiologic volume expansion, as maternal blood volume increases markedly. By 1 week after delivery, the blood volume returns nearly to its nonpregnancy value (16), and the mean weight loss of 2–3 kg during this week is attributed to diuresis. The 2-fold increase in NT-proBNP after delivery suggests that BNP may be involved in postpartum diuresis. Recently, it was found that BNP mRNA of the left ventricle was increased in postpartum rats. The authors of that study concluded that natriuretic peptides may be involved in the adaptation to volume alterations associated with pregnancy (17).

In our study cohort, NT-proBNP concentrations before and after delivery were not influenced by parity, gestational age, or duration of delivery. Concentrations after delivery were not influenced by the use of analgesia; although pethidine and nitric oxide depress myocardial contractility, we found no difference in NT-proBNP concentrations after delivery between women who received these medications and those who did not.

Women who subsequently used analgesia during their delivery had significantly higher NT-proBNP concentrations on admission than did those who did not use any form of analgesia during labor. Because analgesia is given to those who demand it, this difference may be a result of variations in pain perception, i.e., women whose threshold is lower feel unbearable pain at earlier stages during delivery and require analgesia. As pain is accompanied by increased sympathetic tone and other mediators, this may lead to higher NT-proBNP concentrations before delivery than in those women whose pain was bearable.

Predelivery NT-proBNP concentrations did not differ between women who were having labor induced and...
women admitted in active labor, but in those women who did not have labor induced, postdelivery NT-proBNP concentrations were higher. We cannot explain these results, as we would expect that women presenting in active labor would have higher NT-proBNP concentrations before labor than those who were admitted for induction of labor because cardiac output increases moderately during the first stage of labor and even more during the second stage (18). Furthermore, we would not expect any difference in NT-proBNP concentrations after delivery because the hemodynamic changes are similar.

Our results may be used as a basis for establishing assay-specific reference values for NT-proBNP in women before and after labor. This may enable physicians to use the concentrations of this hormone as a marker for normal transition and, more importantly, to help identify pathologic conditions such as pulmonary embolism and postpartum cardiomyopathy. To achieve these goals, larger scale studies would be necessary.

References

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