

Effect of Acute Maternal Hydration and Bed Rest in Third-Trimester Oligohydramnios

AKUT MATERNAL HİDRASYON VE YATAK İSTİRAHATININ ÜÇÜNCÜ TRİMESTER OLİGOHİDRAMNİOSUNA ETKİSİ

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Summary

Objective: The aim of this study was to investigate the effect of acute maternal hydration and bed rest in amniotic fluid index (AFI) and the correlation between changes in maternal plasma osmolality and AFI in third-trimester patients with oligohydramnios.

Institution: Cumhuriyet University School of Medicine, Department of Obstetrics and Gynecology, SIVAS.

Materials and Methods: Thirteen women with third-trimester oligohydramnios (AFI<5cm) and 11 patients with normal AFI (range 6 to 18 cm) were prospectively recruited for this study. Maternal plasma osmolality (mosmol/L), AFI (cm), and urine specific gravity were determined before and after acute oral hydration by having the pregnant woman drink 2 L of water with bed rest over 2 hours.

Findings: After acute maternal hydration, there was a significant decrease in maternal plasma osmolality and urine specific gravity and a significant increase in AFI in the study group ($p<0.05$). The changes of plasma osmolality, AFI, and urine specific gravity were significantly different in the study group than the controls. As to the difference of changes of maternal plasma osmolality and AFI, there was no significant correlation between the study and control groups ($p>0.05$).

Conclusions: Acute maternal hydration provides a significant increase in amniotic fluid index in patients with third-trimester oligohydramnios. Acute maternal hydration may prevent potential complications of oligohydramnios in patients undergoing labor induction and be used as an alternative to amniocentesis.

Key Words: Oligohydramnios, Oral Hydration, Amniotic Fluid Index

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Özet

Amaç: Bu çalışma, üçüncü trimester oligohidramniosu olan gebelerde, akut maternal hidrasyon ve yatak istirahatinin amniotik sıvı indeksine etkisini ve maternal plazma ve amniotik sıvı indeksinde oluşan değişikliklerin korelasyonunu araştırmak amacıyla yapıldı.

Çalışmanın Yapıldığı Yer: Cumhuriyet Üniversitesi Tıp Fakültesi Kadın Hastalıkları ve Doğum Anabilim Dalı, SIVAS.

Materyal ve Metod: Üçüncü trimesterde oligohidramniosu (amniotik sıvı indeksi<5) olan 13 ve amniotik sıvı hacmi normal olan (amniotik sıvı indeksi 6-18 cm) 11 gebe kadın prospektif olarak incelendi. İki saat içinde 2 litre su içirilen ve yatak istirahati yaptırılan gebe kadınlarda bu akut hidrasyon tedavisinden önce ve sonra plazma osmolalitesi (mosmol/L), amniotik sıvı indeksi (cm) ve idrar dansitesi ölçüldü.

Bulgular: Akut maternal hidrasyondan sonra, çalışma grubunda maternal plazma osmolalitesi ve idrar dansitesinde anlamlı azalma ve amniotik sıvı indeksinde anlamlı artış saptandı ($p<0.05$). Çalışma grubunda plazma osmolalitesi, amniotik sıvı indeksi ve idrar dansitesinde oluşan değişiklikler kontrol grubuna göre anlamlı olarak farklı bulundu ($p<0.05$). Çalışma ve kontrol grubunda maternal plazma osmolalitesi ve amniotik sıvı indeksinde oluşan değişiklikler arasında korelasyon bulunmadı ($p>0.05$).

Tartışma: Üçüncü trimesterde oligohidramniosu olan gebelerde, akut maternal hidrasyon amniotik sıvı indeksinde belirgin artışa neden olmaktadır. Doğum induksiyonu uygulanan oligohidramnioslu gebelerde, akut maternal hidrasyon oligohidramniosun olası komplikasyonlarını önleyebilir ve amniyoinfüzyona bir alternatif olarak kullanılabilir.

Anahtar Kelimeler: Oligohydramnios, Oral Hidrasyon, Amniotik Sıvı İndeksi

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Oligohydramnios, occurring in 0.5% to 5% of pregnancies at term, is associated with increased perinatal mortality and morbidity rates (1). Such pregnancies have increased the rate of meconium

aspiration, fetal distress, and operative delivery (2). Oligohydramnios can be associated with congenital anomalies such as urinary obstruction, intrauterine growth retardation, postterm pregnancy and placental problems related to maternal-fetal interaction. Amniotic fluid volume is an important predictor of fetal well-being in a gestation allowed to continue beyond 40th gestational weeks since it decreased gradually after 37 weeks of gestation. The amount of fluid can also predict how the fetus will tolerate labor.

The amniotic fluid index (AFI) is a semiquantitative technique to assess the amniotic fluid volume (3). An AFI of less than 5.1 cm are consistent with oligohydramnios. According to Rutherford et al., the inter- and intra-observer variation was 10 to 15 percent in patients with a normal amniotic fluid volume. They found that the lower the amniotic fluid volume, the less the margin of observer error (4).

Randomized clinical trials have shown that correction of oligohydramnios by amnioinfusion or maternal hydration reduces the incidence of delivery complications (5,6). Although amnioinfusion has increasingly been incorporated into the management of pregnancies with oligohydramnios, it is an invasive technique. To increase amniotic fluid volume, maternal hydration is an effective and non-invasive option. In two recent studies, Kilpatrick et al. (7) and Kilpatrick and Safford (8) reported that maternal intake of 2 L of water in a 2 hour period increased the AFI in pregnancies with decreased or normal amniotic fluid volume.

The aim of this study was to examine the effect of acute maternal hydration and bed rest on left lateral position on AFI and the correlation of the differences in maternal plasma osmolality and AFI in third-trimester patients with oligohydramnios.

Materials and Methods

In the period between November 1996 and May 1997, this nonrandomized interventional study was performed at the obstetrics service of Cumhuriyet University Hospital, Sivas. A written, informed consent was obtained from each patient on admission. The study group consisted of 13 women with third-trimester oligohydramnios, defined as an AFI <5 cm (3). Eleven third-trimester pregnant women with normal amniotic fluid vol-

ume, defined as an AFI between 8.0 and 24.0 cm (9), were enrolled as controls. The oligohydramnios and control groups were asked to participate in a prospective study to examine the effect of acute maternal hydration and bed rest on left lateral position on AFI and the correlation between changes in maternal plasma osmolality and AFI. At recruitment, median gestational age was 34 weeks (range 29 to 38 weeks) in the study group and 35 weeks (range 28 to 40 weeks) in the control group, and median maternal age was 25 years (range 19 to 35 years) in the study group and 26 years (range 22 to 29 years) in the control group. The groups consisted of 53% and 54% of primigravidas, respectively.

Exclusion criteria for both groups were as follows: (1) women at risk of fluid overload such as those with cardiac disease, renal impairment, moderate or severe preeclampsia or hypertension and diabetes; (2) those receiving prostaglandin synthetase inhibitors; (3) fetal renal abnormalities; (4) multiple pregnancy; (5) rupture of membranes; (6) postterm pregnancy; (7) absent end-diastolic flow in the umbilical artery (8) clinically suspected chorioamnionitis, (9) those receiving tocolytic treatment, (10) significant hemorrhage, (11) a fetal heart rate pattern necessitating imminent delivery, (12) acute febrile illness.

Gestational age was assigned on the basis of a reliable last menstrual period, a first-trimester pelvic examination, and/or an ultrasonographic examination before 21 weeks' gestation. Ultrasonography was performed on admission to rule out anomalies, confirm dates, and obtain an estimated fetal weight. Patients were given similar instructions at entry and advised to continue with strict bed rest. Women who completed a full course of maternal hydration were considered compliant with the treatment.

After basal measurements were taken, women who fulfilled the inclusion criteria were instructed to drink 250 ml of water every 15 minutes for a total of 2 L in two hours. Baseline maternal plasma osmolality (mosmol/L) and urine specific gravity were measured. At the end of 2-hour drinking period, the measurements repeated. AFI measurements were performed as described in the report of Flack et al (6). AFI was measured before and after oral hydration therapy. Obstetric ultrasonographic scans

Table 1. Comparison of pre- and post- treatment clinical findings of the study group

	Pre-treatment	Post-treatment	Significance
AFI (cm)	3.5±0.9	5.2±0.7	<0.05
Plasma osmolality (mosmol/L)	287±2.1	283±2.3	<0.05
Urine specific gravity	1019±2.9	1014±3.72	<0.05

were performed with a convex probe (3.5- and 5.0-MHz, Combison 410, Kretz Technik, Zipf, Austria).

Data are presented as mean±SD, median (range), as proportion when appropriate. Data with skewed distribution were analyzed by Mann-Whitney U test. We compared pre- and post-treatment mean AFI (cm), plasma osmolality (mosmol/L), and urine specific gravity in both groups. Delta AFI (post-treatment AFI minus pre-treatment AFI), delta plasma osmolality (pretreatment plasma osmolality minus post-treatment plasma osmolality), and delta urine specific gravity (pre-treatment urine specific gravity minus post-treatment urine specific gravity) were analyzed between the study groups. We examined the correlation between delta plasma osmolality and delta AFI by Spearman correlation test. Differences were

considered statistically significant if p is less than 0.05.

Results

All women completed the maternal hydration protocol and no maternal complication were seen. There was no significant difference in baseline plasma osmolality and urine specific gravity between the two groups (Table 1 and 2) ($p>0.05$). There was a significant reduction in maternal plasma and urine specific gravity after oral hydration in the study group ($p<0.05$) but a significant difference only in the urine specific gravity in the control group (Table 1 and 2). The delta AFI, delta plasma osmolality and delta urine specific gravity is significantly higher in the oligohydramnios group than the control group (Figure 1) ($p<0.05$). There was no significant correlation between the delta plasma osmolality and delta AFI in the two groups ($p>0.05$).

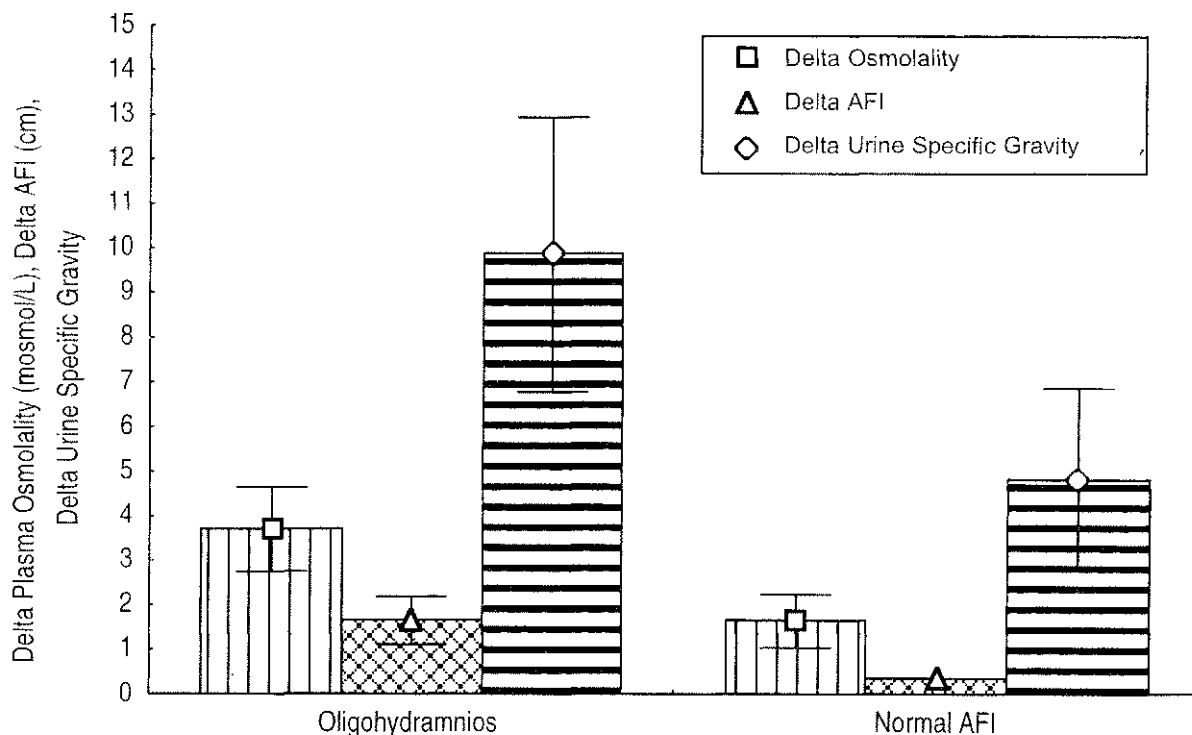


Figure 1. Changes in maternal plasma osmolality, amniotic fluid index, and urine specific gravity in the study and control groups

Table 2. Comparison of pre- and post- treatment clinical findings of the control group

	Pre-treatment	Post-treatment	Significance
AFI(cm)	11.1±2.5	11.4±2.6	NS
Plasma osmolality (mosmol/L)	285.8±1.78	284±1.9	NS
Urine specific gravity	1019±1.6	1010±2.33	<0.05

Discussion

Although adequate amniotic fluid volume is considered an important aspect of fetal well-being, the etiology of decreased amniotic fluid volume is not well understood. Decrease in maternal plasma volume and uteroplacental perfusion have been implicated in oligohydramnios. The mechanism for oligohydramnios is known to involve reduced fetal urine output and renal perfusion. Amniotic fluid volume is shown to correlate with the state of maternal hydration (10,11). Animal studies support the mechanism of fluid shift into the fetal compartment in response to acute osmolality changes (12).

Our study presents that maternal oral hydration increases amniotic fluid volume in third-trimester oligohydramnios but not in normal pregnancies. These results confirm a previous clinical trial in patients with oligohydramnios (6). We were unable to confirm the increase in AFI with hydration in normal pregnancies. The reason for this discrepancy is unclear, but the following may explain it. The degree of amniotic fluid increase may be too small to be determined by AFI changes, even if there had been the same increase in absolute volume terms, as occurred in the oligohydramniotic patients.

There is more significant decrease in the difference of plasma osmolality in patients with oligohydramnios than control group. This situation suggests that women in control group may have cleared the load of excess water through urination more quickly than did in the patients with oligohydramnios. We found that the changes in maternal urine specific gravity are significantly lower in the control group than the oligohydramnios group. No correlation between differences in AFI and maternal plasma osmolality was also found in the study.

Two conclusions can be drawn from this study: First, acute maternal hydration causes a significant increase in AFI in oligohydramniotic patients, as well as a significant decrease in maternal plasma osmolality and maternal urine specific gravity.

Second, acute oral maternal hydration can be used to decrease fetal complications in the management of oligohydramniotic patients as a noninvasive alternative to amnioinfusion to increase amniotic fluid volume.

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