Calcium Excretion in Pre-eclampsia

PRE-EKLAMPSİDE KALSİYUM ATILIMI

Cüneyt Eftal TANER*, Ali Ceylan ERDEN*, Abdurrahman KAPLAN, Meral ABAN*, Ufuk ÖZELBAYKAL*, Ömer SATICI*****

* Department of Obstetrics and Gynecology,
** Department of Biochemistry,
*** Department of Biostatistics, Dicle University Medical Faculty, Diyarbakır, TURKEY

SUMMARY

Objective: *Investigation and comparison of calcium excretion in normotensive and pre-eclamptic women.*

Institution: *Department of Obstetrics and Gynecology of Medical Faculty of Dicle University, Diyarbakır*

Materials and ***Methods:*** *The study groups included 17 women with preeclampsia. 14 women with eclampsia and 21 normotensive pregnants. Clinical characteristics, calcium, creatinine, calcium and creatinine clearences and fractional excretion of calcium were investigated and compared in serum and in 24 hour urine samples.*

Findings: *Both pre-eclamptic and eclamptic women had significantly higher MAP values than normotensive group (p<0.001). Serum calcium levels were significantly lower in pre-eclamptic groups than normotensives (p<0.01). There was no significant difference in urine protein, calcium, creatinine clearances and fractional excretion of calcium between the three groups.*

Results: *We could not find any significant difference in calcium excretion between pre-eclamptic and normotensive pregnants.*

Key Words: Preeclampsia, Eclampsia, Calcium

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ÖZET

Amaç: Normal ve pre-eklamptik gebelerde kalsiyum atılımını karşılaştırmalı olarak araştırmak.

Çalışmanın Yapıldığı Yer: *Dicle Üniversitesi Tıp Fakültesi Kadın Hastalıkları ve Doğum Anabilim Dalı, Diyarbakır*

Materyal ve Metod: *Çalışmaya 17'si pre-eklamptik, 14'ü eklamptik ve 21'i normotensif olan toplam 52 gebe alındı. Klinik özellikler, serum ve 24 saatlik idrardaki kalsiyum, kreatinin, kalsiyum klirensi, kreatinin klirensi ve fraksiyonel kalsiyum atılımları karşılaştırmalı olarak incelendi.*

Bulgular: *Preeklamptik ve eklamptik kadınlarda noımotensiflere göre daha yüksek MAP değerleri bulundu (p<0.001). Serum kalsiyum seviyeleri pre-eklamptik ve eklamptik hastalarda normotensiflerden anlamlı olarak daha düşük bulundu (p<0.01). İdrar protein, kalsiyum, kreatinin, kalsiyum ve kreatinin klirenslen ve fraksiyonel kalsiyum atılımı açısından gruplar arasında anlamlı bir farklılık bulunmadı.*

Sonuç: *Pre-eklamptik ve normotensif gebelerde kalsiyum atılımı açsından anlamlı bir farklılık bulunmadı.*

Anahtar Kelimeler: Preeklampsi. Eklampsi. Kalsiyum

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Its is a well known fact that renal calcium excretion Increases during normal pregnancy (1,2), and reaches a maximum level during the third trimester (3). There are conflicting data on urinary calcium excretion in women with preeclampsia. Some studies suggested that preeclampsia is associated with significant hypocalciuria (4-8) but some others did not find such correlation (9). And there is no sufficient data for women with eclampsia, in this study we tried to determine whether urinary calcium excretion is changed in patients with preeclampsia and eclampsia.

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Yazışma Adresi: Cüney Eftal TANER
Dicle Üniversitesi Tıp Fakültesi
Kadın Hast. ve Doğum ABD
DİYARBAKIR

MATERIAL AND METHODS

We evaluated 52 pregnant women all having more than 24 weeks of gestation. First group consisted 17 women with preeclampsia. 5 cases had mild preeclampsia and 12 women had severe preeclampsia in this group. Second group consisted 14 women with eclampsia and the third group consisted of 21 normotensive pregnants.

We defined women as preeclamptic if they met the following criteria: blood pressure at least 140/90 mmHg or a rise above baseline values of at least 30 mmHg in systolic pressure or at least 15 mmHg in diastolic pressure. Blood pressures were measured

Table 1, Clinical characteristics of the study group.
Tablo 1, Çalışma grubunun klinik özellikleri.

	Preeclampsia n-17	**eclmapsia** n-14	**normotensive** n-21
Age	28.2i7.7	**23**.8+6.4	**24.9**±5.4
Parity	3.2±3.0	**1.4**+3.1	1.3+1.2
Gravidity	**5.1** ±3,4	**2.7±3.2**	**2.4+1.6**
Gestational age	**30,0±6.9**	**31.5±4.8**	**32.8±6.5**
Max. MAP	**121**.7±32.5	**118**.3±9.2	**86,7+9.0**

Data are **presented as mean** ± SD

twice, 6 hour apart, at bed rest in the hospital. Significant proteinuria (300 mg or more per 24 hours) was the second criteria for diagnosis preeclampsia. Mean arterial pressure (MAP) was calculated as follows: Systolic pressure+2x diastolic pressure divided by 3. Women were excluded from the study if they had a previous diagnosis pre-eclampsia, a history of chronic hypertension or renal disease. Seizures with preeclampsia defined as eclamptic without a history of epilepsia. None of the subjects were receiving diuretics. Magnesium sulfate therapy was started for women with severe preeclampsia and eclampsia. During the study period, normotensive pregnants and 5 women with mild preeclampsia were consuming a normal diet in the hospital while the others were administered 100 ml 5% Dextrose ringer lactate solution in an hour.

Just after admission, 24 hour urine samples were collected and evaluated for volume, creatinine content, total protein and total calcium. The same day venous blood samples were evaluated for calcium, creatinine and uric acid. Total urine calcium and serum calcium, creatinine and uric acid were determined with a color/metric autoanalyser (Beckman Syncron CX-3), fractional excretion of calcium was calculated by calcium clearance divided by creatinin clearance and multiplied by 0.60 (4).

For statistical analysis student"! t test was used.

RESULTS

Table 1 presents clinical characteristics of the 52 pregnants. The study group consisted of 17 women with preeclampsia, 14 with eclampsia and 21 women with normal blood pressure.

Preeclamptic women had significantly higher parity and gravidity than normotensive group (P<0,05, P<0.01) respectively. There was no significant difference between age, parity, gravidity, and gestational age of the patients with eclampsia and in normotensive group. Both preeclamptic and eclamptic women had significantly higher MAP values than normotensive group (P<0.001). There was no significant difference in MAP values between preeclamptic and eclamptic women.

Table 2 lists the laboratory findings of the three groups.

Patients with preeclampsia and eclampsia had significantly lower serum calcium levels than the normotensive pregnants (P<0.01). There was no other significant difference in serum parameters of the three group. Urine: protein, calcium, creatinin, calcium clearance and creatinine clearances were higher in women with preeclampsia and eclampsia than the normotensives. This differences, however were not statistically-significant. There was no significant difference in daily total calcium excretion and fractional excretion of calcium between the three groups.

DISCUSSION

Calcium metaboiism during pregnancy is characterized by minor changes in serum levels of total and ionized calcium; however urinary calcium excretion increases markedly during normal pregnancy (2).

Table 2. Laboratory findings of the study group.
Tablo 2. Çalışma grubunun laboratuar bulguları.

		Preeclampsia n=I7	eclampsia n-14	**normotensive** **n**-21
2	**Calcium** (mg/dl)	8.37*1.13	8.63±0.87	9.50+0.91
3	**Creatinin (mg/dl)**	0.92+0.31	**0.94±0.48**	0.79+0.27
I	Uric **acid (mg/dl)**	**5.21** ±1.24	5.90±1.74	5.3H1.18
	Prolein (g/24h)	0.62r.0.69	0.46+0.47	**0.27±0.23**
	Calcium (mg/dl)	15.15*18.97	11.79+13.87	8.33-2.62
m	Calcium (mg/24h)	110.15+47.13	150.76+77.81	135.46±35.97
z	**Creatinin (mg/dl)**	**108.01 ±56.23**	82.23+42.94	79.76±29.97
IX	**Calcium clearance (ml/min)**	**1**.28+1**.49**	**1**.85+2.44	1.00±0.32
3	**Creatinin clearance (ml/min)**	**1S9.60+.12S.47**	**140.74+107.09**	112.29+58.95
	fractional excretion of calcium	0.01 **+0.02**	**0.01 ±0**,01	0.01+0.01

Data are presented as mean ± SD

In our study, preeclamptic and eclamptic women had significantly lower serum calcium levels than the normotensive pregnants. Decline in serum calcium levels is parallel to serum albumin (10,11). Hipoproteinemia might be suggested as a cause of low serum levels. Other explanations for lower serum calcium levels are reduced dietary calcium intake and maternal magnesium therapy in severe preeclamptic and eclamptic women. They received 4 gr IV and 10 gr IM loading dose followed by 5 gr IM in every 4 hours. Monif (12) described maternal hypocalcemia following therapy with magnesium sulfate. Hypermagnesemia depresses serum calcium levels and it is suggested that this is due to interference with synthesis or release of parathyroid hormone (13). Some authors reported that they did not find out any significantly different serum calcium levels in preeclamptics and normotensives (2,3,8,14).

It has been suggested that the hypercalciuria characteristic of normal pregnancy is largely a consequence of the increased glomerular filtration rate (2). A highly significant correlation between calcium excretion and creatinine clearance has been shown (1). Furthermore metabolic studies have found a high urinary calcium output even though the positive calcium balance necessary to provide fetal calcium requirements was not achieved. The diurnal variation of calcium and creatinine excretion with a peak at or before mid day makes 24 hour values preferable (15). In our study we preferred 24 hour urine samples. However, there are some reports suggesting that 24 hour urinary calcium excretion can be estimated from a single voided urine sample (6).

There are conflicting data on urinary excretion of calcium in preeclampsia. Taufield (4) reported that women with preeclampsia had reduced urinary excretion of calcium as compared with normal pregnant women and women with more benign forms of gestational hypertension. They suggested increased distal tubular reabsorption of calcium as a possible mechanism for hypocalciuria. Pedersen (3) reported that the fractional excretion of calcium was reduced in the third trimester in preeclamptics as composed with normotensives. Ramos et al (5) also reported that the patients with preeclampsia had significantly less excretion of total calcium than normotensives or those with gestational hypertension. They suggested that reduced excretion of urinary calcium may result from dietary variation. Some other reports also supported reduced urinary calcium excretion in women with preeclampsia (4-6,8,16). In addition some authors reported that restriction of dietary calcium leads to a reduction in urinary calcium and setting of mild renal insufficiency may result with hypocalciuria (4,17).

On the other hand Roelofsen (9) and et al reported that they failed to find a decrease in the excretion of urinary calcium in preeclamptic women. Their subjects did not have singificant proteinuria 300 mg or more per 24 hours. We had no patient with renal insufficiency. When we compared preeclamtic and eclamptic women with normotensive pregnants, we failed to find any significant difference in urinary calcium excretion between these three groups.

Further prospective studies are needed to determine whether a change in urinary calcium exists in pre-eclampsia and whether it plays a role in its pathophysiology.

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