

Concentrations Of Atrial Natriuretic Peptide In The Cord Blood And Plasma of The Newborn

YENİDOĞANDA KORDKANI VE 5-10. GÜNLERDE
ARTERİAL KANDA ATRİAL NA TRİÜRETİK HORMON TA YİNİ

Dr.F.Ayşenur PAÇ, ür.Tuncay KÜÇÜKÖZKAN, Dr.Rahmi ÖRS,
Dr.Ebubekir BAKAN, Dr.Ayhan Gazi KALAYCI

Atatürk Üniversitesi Tıp Fakültesi Araştırma Hastanesi. ERZURUM

SUMMARY

In this study Atrial natriuretic peptide concentrations were determined in cord blood and arterial blood of the newborn on 5 th and 10 th day. ANP concentrations were from cord blood $24, 9 \pm 7,2$, on 5 th day $57,2 \pm 13,5$ and on 10 th day $26,4 \pm 6,8$ (controls $14, 6 \pm 2,8$) pg/ml.

Cord blood and 5 th day arterial blood values statistically significant ($p < 0.001$), 5 th and 10 th day blood ANP values were also significant ($p < 0.001$), but cord blood and 10 th blood ANP results were not significant ($p > 0.05$).

Body weight of newborns were 2918 ± 312 gr. of birth, 2723 ± 146 dn 5 th, and 3012 ± 231 on 10th day.

The importance of ANP levels in detecting newborn abnormalities were discussed.

ÖZET

Bu çalışmamızda Atatürk Üniversitesi Tıp Fakültesi Çocuk Sağlığı ve Hastalıkları ile Kadın Doğum Anabilim dalında izlenen normal, miadında, herhangi bir anomalisi olmayan 17 bebekten doğumdan hemen sonra venöz kord kanından, 5 ve 10. günlerde ise arteriel kandan alınan numunelerde Atrial Natriüretik hormon tayinleri yapılmıştır. Kord kanında ANH $24,9 \pm 7,2,5$. gün kanda $57,2 \pm 13,5$ ve 10. gün kanda $26,4 \pm 6,8$ (kontrol $14, 6 \pm 2,8$) pg/ml bulunmuştur.

Kord kanı ile 5.gün kanı ANH değerleri arasında anlamlı fark ($P < 0.001$), 5. ve 10 günlerde yine anlamlı fark ($P < 0.001$) bulunmuşken, kord kanı ile 10. günler kanı arasında anlamlı fark bulunamamıştır ($P > 0.05$).

Bebeklerin vücut ağırlıkları doğumda 2918 ± 312 gr., 5 günde 2723 ± 146 gr., 10. günde 3013 ± 231 gr. olarak belirlenmiştir.

ANH'nun yeni doğanın anomalilerini belirlemekteki yeri tartışılmıştır.

Key Words: Atrial Natriuretic Peptide, Newborn

Anahtar Kelimeler: Atrial Natriüretik Hormon, Yenidoğan

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Atrial Natriuretic Peptide (ANP) is a polypeptide hormone produced by the atrium of the heart

(1). It compliments the activity of other known regulator of blood pressure and blood volume with its potent diuretic (natriuretic) and vasorelaxant properties as well as its inhibitory effect on renin and aldosterone secretion (2).

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Studies indicate that the stimulus of ANP release consist of atrial distention, causing either

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directly or indirectly by volume loading (3,4), constrictor agents that elevate atrial pressure (5), immersion in water (2), and high-salt diets (6).

Elevated ANP levels have been found in many pathological conditions such as congestive heart failure (8,9), supraventricular tachycardia (10), congenital cardiac deformities (11,12), and physiologically in early neonate period (13,14).

MATERIALS AND METHODS

Seventeen full-term, normal newborn were included in the study. All the infants were born vaginally. Mean birth weight was 2918 ± 312 g ($x \pm \text{SEM}$), mean gestational age $38 \pm 2,1$ weeks, apgar score 1th min 7. Any clinical signs of cardiopulmonary disorders were not seen. Blood samples for hormone analyses were drawn from umbilical artery of newborn immediately after delivery. The other samples were also taken from arteries on the 5 th and 10 th days of life. In ten control infants, 3-6 month ages, arteric blood plasma ANP levels were measured (Figure 1). Plasma concentrations of ANP were measured using a radioimmunoassay kit (Incstar Corpor, Stillwater, Minnesota 550, 82 USA). Data were expressed as mean SEM. Student's t-test was used for statistical analysis.

RESULTS

In umbilical arterial blood, 5 th and 10 th days, plasma ANP concentrations were found $24,9 \pm 7,2$ pg/ml, $57,2 \pm 13,5$ pg/ml, and $26,4 \pm 6,8$ pg/ml, respectively. The mean plasma level of 10 healthy infants for control was $14,6 \pm 2,8$ pg/ml.

On the fifth day of life, significant increase of ANP was seen ($57,2 \pm 13,5$ pg/ml). ($p < 0.001$). But on the tenth day, ANP concentrations decreased to those of first day ($p > 0.05$).

Plasma ANP concentrations were higher in all neonatal periods than in controls ($p < 0.001$). Table 1).

Body weights declined from 2918 ± 312 to 2713 ± 146 g on 5 th day, but increased to 3012 ± 231 g on the 10 th day.

DISCUSSION

ANP plays an important role in sodium and body fluid homeostatis. This is also valid for neonatal period. In a study, plasma concentration of ANP had increased significantly on the 3 rd and 5 th day of life while body weight decreased reaching its minimum on the 10 th day whereas body weight increased (14). The increase in ANP concentration may however induce changes in body fluid compartments shortly after birth which would results in physiological weight loss (14).

It to ct all. showed similiar ANP results for newborn, but could not find any significant correlation with urinary excretion of Na, urinary Na/Cl or Na/K ratios (13).

In our study also, plasma concentration of ANP increased significantly on 5 th day ($p < 0.001$) and then returned to cord blood levels on 10 th day. Body weights of newborns decreased on 5 th day

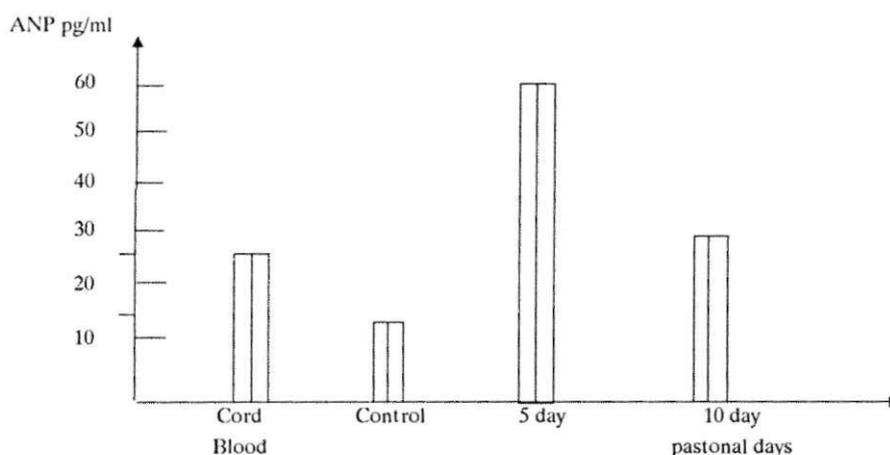


Figure 1. Plasma ANP Concentraions in Postnatal Days.

Table 1. Plasma ANP Concentrations, Statistical Analysis, and Body Weight of the Infants.

Plasma ANP (pg/ml)	First day	5 th day	10 th day
Newborn 17x	24,9	57,2	26,4
SEM	2,8	13,5	6,8
Control 10x	14,6		
SEM	2,8		
BodyWeightx	2918	2723	3012
SEM	312	146	231
Comparison: Student's t-test			
Days	p		
1-5	p< 0.001		
5-10	p< 0.001		
1-10	p<0.05		

•from 2918 ± 312 to 2723 ± 146 g, but reached to 3012 ± 231 on 10th day.

Fetal human heart can respond to acute changes in vascular volume by increasing ANP secretion (15).

It is a well known fact that pulmonary vascular resistance (PVR) decreases dramatically within the first minutes after birth, then a further less rapid reduction in PVR continues over the first 6 to 8 weeks. This hemodynamic changes may be responsible for the elevated ANP levels during this period (13).

ANP may provide a sensitive and important hormonal system for the control of sodium balance, even in premature neonates (16).

ANP concentration have been found to be higher in premature infants with respiratory distress syndrome than in healthy term and premature infants (17). In respiratory distress syndrome (RDS) or meconium aspirasyon syndrome (MAS) hypersecretion of ANP may play an important part in initiating spontaneous diuresis in sick neonates (18).

PDA and distension of the left atrium in premature infants cause an increase of plasma ANP concentration and surgical ligation of PDA was associated with an immediate fall in plasma ANP concentration (12).

In neonates with Transposition of Great Arteries the left atrium appears to be the most important source of ANP and concentration in the left atrium exceeded that of right, ANP concentration in the left atrium decreased after a lowering of the left atrial pressure by atrial septostomy (11). The mode

of delivery did not influence cord venous or arterial blood ANP concentration (19). Yamaji showed that plasma ANP levels were consistently higher in paired umbilical cord arterial than in cord venous samples (20).

In patients with elevated atrial pressures, ANP concentration were increased two fold in peripheral venous, right atrial, pulmonary arterial, and systemic arterial plasma, as compared with the concentration patients with normal atrial pressures. In patients with congestive heart failure, however, the more powerful opposing effect of the reflex activation of the sympathetic and renin-angiotensin system may predominate over those of ANP (9).

Fridrich's study shows that both cardiac and non-cardiac causes may influence ANP concentration. Non-invasive testing of ventricular function usefully supplements the proper interpretation of ANP concentration in apparently healthy individuals or patients (21).

ANP infusion induced changes in aldosterone and pulmonary wedge pressure, cardiac index and systemic vascular resistance. ANP infusion increases hematocrit and serum protein concentration (8).

Plasma concentration of ANP in the pulmonary artery, aorta, and superior vena cava correlated closely with the mean right atrial and pulmonary artery pressure and similar, though weaker, positive relation were seen with the left ventricular end diastolic and pulmonary artery wedge pressures. Concentrations of both ANP and renin showed significant inverse relation with serum concentrations (22).

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