

Plasma Cholinesterase Levels In Non-Pregnant, Normal Pregnant And Preeclamptic Patients

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ÖZET

Amaç: Gebe olmayanlarda, normal gebelerde ve preeklampitik hastalarda plazma kolinesteraz düzeyleri değişikliklerinin belirlenmesi.

Gereç-yöntem: 32 preeklampitik, 44 sağlıklı, üçüncü trimester gebe ve reproduktif dönemdeki gebe olmayan 30 kadında plazma kolinesteraz düzeyleri ölçüldü. Sonuçlar Kruskal-Wallis, Mann-Whitney U ve Student's *t* testleri ile analiz edildi.

Bulgular: Gebe olmayan kadınlarla karşılaştırıldığında, preeklampitik ve normal gebelerde plazma kolinesteraz düzeyleri belirgin olarak düşük bulundu. Normal gebe kadınlar ve preeklampitikler arasında belirgin fark yoktu.

Yorum: Gebelikte plazma kolinesteraz düzeylerinin azaldığını doğruladık ancak preeklampside bu düşüşün daha da fazla olmadığını bulduk.

Anahtar kelimeler: Plazma kolinesteraz, gebelik, preeklampsi, anestezi

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SUMMARY

Aim: To determine differences in plasma cholinesterase levels in non-pregnant, normal pregnant and preeclamptic patients.

Method: Plasma cholinesterase levels were determined on 32 women with preeclampsia and 44 healthy third trimester pregnant women attending the Obstetrics Department as outpatients and on 30 non-pregnant gynecology outpatients of reproductive age. Results were analysed with Kruskal-Wallis, Mann-Whitney U and Student's *t* test.

Results: Levels were found significantly lower for both normal pregnant women and those with preeclampsia compared with non-pregnant women. There was no significant difference between normal pregnant women and those with preeclampsia.

Conclusion: We confirmed that, plasma cholinesterase levels are lowered in pregnancy but we did not find any further lowering in preeclampsia.

Key words: plasma cholinesterase, pregnancy, preeclampsia, anaesthesia

BACKGROUND

Succinylcholine (suxamethonium chloride) is regularly used as an adjunct to anesthesia, including in caesarean section. It acts as an acetylcholine receptor agonist at the neuromuscular junction, causing prolonged depolarisation of the postsynaptic junction of the motor end-plate. Flaccid paralysis of skeletal muscles develops within one minute. Succinylcholine is metabolized by the

plasma cholinesterase (pseudo-cholinesterase). In individuals with normal plasma levels of plasma cholinesterase, skeletal muscle function returns to normal approximately five minutes after a single bolus injection of succinylcholine, but in those with low levels of the enzyme, the paralytic effect can continue for as long as eight hours. This sustained paralysis of the respiratory and other skeletal muscles can result in serious complications and may even be fatal.

Lowered plasma cholinesterase values in pregnancy have been reported from a number of studies (1-5), while some have

also found a further reduction in preeclampsia (4,5).

At Harran University Hospital Gynecology and Obstetrics Department, plasma cholinesterase values are routinely determined on women who may require caesarean section. This study was carried out to determine the extent of the risk of using succinylcholine as an adjunct to anesthesia in these women.

MATERIALS AND METHODS

The study included three groups of women: 32 women with preeclampsia; 44 healthy third trimester pregnant women; and 30 non-pregnant Gynecology outpatients of reproductive age serving as controls. The diagnosis of preeclampsia was established in accordance with the American College of Obstetrics and Gynecology definition (6).

For all 106 subjects, 10 mL samples of heparin-stabilised venous blood were drawn from the antecubital vein. Plasma was separated from red cells and then stored at -20°C . Plasma cholinesterase activity was determined within 24 hours after withdrawal, using a commercial kit (Rocholinesterase, Germany) employing a

colorimetric method and using an automatic analyser (Hitachi 911, Germany).

Student's *t* test and correlation analyses were performed using SPSS for Windows Release 11.5 (SPSS Inc., Chicago, USA). $P \leq 0.05$ was considered statistically significant. Data presented as means \pm SD (standard deviation).

RESULTS

Demographic characteristics of the three groups are shown in Table 1. No statistical differences were found between the three groups for any of the variables.

Mean plasma cholinesterase activities for all 106 subjects are shown in Table 2. Plasma cholinesterase activity was found to be significantly lower ($P < 0.05$) in pregnant women than in non-pregnant women but there was no significant difference in levels between healthy pregnant women and those with preeclampsia.

Table 1. Demographic characteristics of subjects (means \pm SD [standard deviation])

	Preeclamptic (n=32)	Healthy pregnant (n=44)	Non-pregnant (n=30)	<i>P</i>
Age (year)	31.38 \pm 6.90	29.18 \pm 7.03	30.56 \pm 7.04	NS*
Gravidity	4.46 \pm 3.50	4.68 \pm 2.85	4.16 \pm 2.71	NS
Parity	2.93 \pm 3.05	3.02 \pm 2.55	2.80 \pm 2.28	NS
Live children	2.90 \pm 3.05	2.65 \pm 2.20	2.23 \pm 1.81	NS
Abortus	0.53 \pm 1.45	0.65 \pm 1.34	0.80 \pm 1.21	NS

*NS, not significant

Table 2. Plasma cholinesterase activity (means \pm SD [standard deviation])

Patients	n	Cholinesterase activity \pm SD	P value
		(units/ml)	
With preeclampsia	32	7063.03 \pm 2115.55	0.035* 0.752†
Healthy pregnant	44	7379.04 \pm 2380.63	0.035*
Healthy non-pregnant	30	8800.60 \pm 3093.12	-

* Versus healthy, non-pregnant women

† Versus healthy, pregnant women

DISCUSSION

In this study we did not find any significant difference in plasma cholinesterase activity between healthy third trimester women and those with preeclampsia.

Howard et al found a significant fall in plasma cholinesterase activity in six healthy young women in the first three months of normal pregnancy but some evidence of a return to normal pre-pregnancy levels in later pregnancy (1).

Evans et al discerned three patterns of change in the 44 pregnancies they observed: (a) a decline in activity after conception, with no return towards pre-conception values before delivery (20 pregnancies); (b) a decline in activity accompanied by a partial or complete return to pre-conception values before delivery (20 pregnancies); and (c) either no discernible decline or increased activity during gestation (five pregnancies) (2).

However, in a repeated measures analysis of 259 pregnant women compared with 25 non-pregnant volunteers, de Peyster et al found plasma cholinesterase levels significantly lower throughout gestation in all the pregnant women observed (3).

In two separate studies, Kambam and co-workers found, not only a significant lowering of plasma cholinesterase activity in pregnant women as compared with non- and those with preeclampsia. The suggestion from this is that all pregnant

pregnant, but also a significant difference between healthy pregnant women and those with preeclampsia (4,5). Both studies were, however, rather small, involving 11 women in each of the three groups in the first and 15 in each in the second.

Further studies are needed to validate our results and explore differences between our results and those of previous studies. In the meantime, it would appear prudent to regard all pregnant women as probably having low plasma cholinesterase levels and exercise suitable precautions if succinylcholine is to be used.

There have been varying reports of the significance of low plasma cholinesterase levels in pregnancy. Blitt et al found that, despite significantly lower values in pregnant women, their time to 90 percent recovery of control twitch height following succinylcholine administration was not significantly different from that for non-pregnant patients (7). On the other hand, Gyasi et al, using observation of thumb adduction following stimulation of the ulnar nerve at the wrist as an indicator, found a significant prolongation of action of succinylcholine in pregnant women (8). Again, it would appear prudent to err on the side of caution.

In conclusion, our results showed significantly lower values for both healthy third trimester pregnant women

women are at risk from succinylcholine

exposure and that this risk is not further increased by the presence of preeclampsia.

REFERENCES

1. Howard JK, East NJ, Chaney JL. Plasma cholinesterase activity in early pregnancy. *Arch Environ Health* 1978; 33: 277-9.
2. Evans RT, O'Callaghan J, Norman A. A longitudinal study of cholinesterase changes in pregnancy. *Clin Chem* 1988; 34: 2249-52.
3. De Peyster A, Willis WO, Liebhaber M. Cholinesterase activity in pregnant women and newborns. *J Toxicol Clin Toxicol* 1994; 32: 683-96.
4. Kambam JR, Mouton S, Entman S, Sastry BV, Smith BE. Effect of pre-eclampsia on plasma cholinesterase activity. *Can J Anaesth* 1987; 34: 509-11.
5. Kambam JR, Perry SM, Entman S, Smith BE. Effect of magnesium on plasma cholinesterase activity. *Am J Obstet Gynecol* 1988; 159: 309-11.
6. ACOG Committee on Obstetric Practice. ACOG practice bulletin. Diagnosis and management of preeclampsia and eclampsia. Number 33, January 2002. American College of Obstetricians and Gynecologists. *Int J Gynaecol Obstet.* 2002; 77: 67-75.
7. Blitt CD, Petty WC, Alberternst EE, Wright BJ. Correlation of plasma cholinesterase activity and duration of action of succinylcholine during pregnancy. *Anesth Analg* 1977; 56: 78-83.
8. Gyasi HK, Mohy O, Adu-Gyamfi Y, Naguib M. Plasma cholinesterase in pregnancy—effect of enzyme activity on the duration of action of succinylcholine. *Middle East J Anesthesiol* 1986; 8: 379-85.

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