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Letter to Editor

PROTEIN C ANTIGEN LEVELS IN TUBERCULOSIS*

*Güler Kanra MD**, *İ. Zafer Ecevit MD****, *Gülten Seçmeer MD***

*Serdar Tuncer MD*****, *Mehmet Ceyhan MD***, *Neslihan Mutluay MD******

*Nihal Başay MD*******

Protein C is a vitamin K-dependent serine protease zymogen. Protein C functions in the vascular system as a potent anticoagulant, due largely to a rapid inactivation of the coagulation factors Va and VIIIa, the cofactors of the two rate-limiting steps of the coagulation cascade[1,2]. deficiencies of protein C, both inherited and acquired, have been described[3,4]. In the protein C deficiency, patients have developed cerebral thrombosis, ophthalmic thrombosis, disseminated intravascular coagulation and purpura fulminans[3-5].

Many investigators have studied protein C antigen levels and activity in various age groups and healthy populations[6,7]. It has been suggested that protein C antigen levels show variation related to age, sex, illness or medication[6-8]. Some of the infectious diseases can cause acquired protein C deficiency. For example, meningococcemia has been reported in association with acquired deficiency of protein C[10].

Because protein C levels in tuberculosis have not been studied to date, we investigated protein C antigen levels in relation to this disease.

In 46 cases of pulmonary tuberculosis, protein C antigen levels were measured by electroimmunodiffusion (EID) assay, according to Laurell[11]. There were no cases of diabetes mellitus, renal or liver disease, or of strokes with venous thrombosis among these patients, nor was any on anticoagulant therapy.

A total of 46 patients (35 male and 11 female) with pulmonary tuberculosis were included in the sutdy. The patients were between 20 and 35 years of age. For 13 normal adults, the mean level of protein C was 99.1 ± 11.8 percent. Individual values of protein C level ranged from 38 to 118 percent of pooled normal plasma. The mean level of protein C antigen was 70.3 ± 19.9 percent in all patients. The actual ranges and the means ± standard deviation (SD) ranges for male and female patients are shown in Table I.

* From the Pediatric Infectious Disease Unit, Department of Pediatrics, Hacettepe University Faculty of Medicine, Ankara.

** Professor of Pediatrics, Hacettepe University Faculty of Medicine.

*** Associate Professor of Pediatrics, Hacettepe University Faculty of Medicine.

**** Microbiologist, Hacettepe University Faculty of Medicine.

***** Specialist of Chest Disease, Atatürk Chest Diseases Hospital, Ankara.

Table I: Mean ± SD of Protein C Levels in Female and Male Patients

Patients	Number of Patients	Protein C Level (%)	
		Range	Mean ± SD*
All patients	46	38-118	70.26 ± 19.90
Males	35	38-116	69.65 ± 18.75
Females	11	43-118	72.18 ± 24.11

* $p > 0.05$ (Mann-Whitney U test).

The mean protein C level for males was not significantly lower than that for females. There was not a statistically significant difference between male and female patients.

Protein C was significantly decreased (less than 70% of normal) in 23 (50%) of 46 patients. Eight (17%) patients had protein C levels less than 50 percent of normal. Only one patient had a protein C level under 40 percent of normal.

Since activated protein C plays an important regulatory role in blood coagulation, reduced levels of protein C result in thromboembolic disease[3-6]. Thrombophlebitis or recurring pulmonary emboli often appear later in adolescents or in young adults with protein C deficiency. In affected individuals, these findings are typical but not necessarily indications of protein C deficiency[3, 5, 7]. Congenital protein C deficiency occurs but at a low frequency and results in fatal neonatal thrombosis characterized by purpura fulminans[6]. A great variety of disease states resulting from alterations in protein C have been documented. Decreases in protein C are found to be associated with liver disease, disseminated intravascular coagulation, major surgery and use of oral anticoagulants, while increases in protein C are shown in nephrotic syndrome, in pregnancy and in individuals taking oral contraceptives[4, 9, 12]. Potential variation of protein C in relation to other diseases is limited.

This is the first study in literature about protein C levels and pumonary tuberculosis, in which mean values of protein C were normal in patients with tuberculosis but individual levels varied. In cases of acquired protein C deficiency, protein C antigen levels were usually less than 50 percent of normal. In this study, 17 percent of the patients had protein C levels less than 50 percent of normal. Although very low levels of protein C were not detectable, these findings suggest that patients with tuberculosis have low levels of protein C. Thus protein C levels can be evaluated in patients with tuberculosis, especially those with thromboembolic disease, and this study can be taken as a basis for future assessment.

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