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CHANGES IN THE BLOOD COAGULATION SYSTEM IN DESTRUCTIVE TUBERCULOSIS

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ABSTRACT

The article presents the results of a study of changes in the blood coagulation system in patients with destructive and non-destructive forms of pulmonary tuberculosis. The analysis of the coagulogram of 72 patients showed significant disturbances in the blood coagulation system in patients with destructive tuberculosis. The most pronounced changes were an increase in the prothrombin index, fibrinogen and D-dimer levels, indicating a hypercoagulable state and an increased risk of thrombosis. In patients with non-destructive forms of tuberculosis, the coagulogram indices remained close to normal, indicating a lower risk of thrombosis and bleeding. The study also did not reveal significant differences in the blood coagulation system between men and women. The results emphasize the importance of continuous monitoring of the blood coagulation system in patients with destructive forms of tuberculosis for the timely prevention of thromboembolic complications.

Key words: tuberculosis, blood coagulation system, coagulogram, destructive tuberculosis, hypercoagulation, fibrinogen, D-dimer, thrombosis, thromboembolic complications.

INTRODUCTION

This article is relevant because tuberculosis, especially its destructive forms, continues to be one of the leading causes of morbidity and mortality worldwide. Despite advances in the diagnosis and treatment of tuberculosis, complications associated with the blood coagulation system can significantly worsen the

prognosis of patients, especially in severe forms of the disease [4,3,6**Ошибка! Источник ссылки не найден.**].

Studying changes in the coagulation system in patients with tuberculosis allows for a deeper understanding of the mechanisms of hypercoagulation, which is important for timely recognition of the risks of thromboembolic complications and their prevention. The impact of infectious and inflammatory processes on the coagulogram indicates the importance of monitoring the coagulation system in patients with tuberculosis, especially in conditions of high risk of complications, such as thrombosis and bleeding [5,2,7].

The study highlights the need for a personalized approach to the treatment of patients with destructive tuberculosis and monitoring the state of the coagulation system to improve prognosis and prevent serious complications [1].

The aim of this study. By analyzing hypercoagulation mechanisms and their role in thromboembolic complications, the study aims to improve understanding of how infectious and inflammatory processes impact the coagulation system. It highlights the importance of personalized treatment approaches and timely monitoring to prevent complications such as thrombosis and bleeding in tuberculosis patients.

Material and methods

Our results showed that changes in the coagulogram in destructive pulmonary tuberculosis indicate serious disorders in the blood coagulation system in patients. Due to the active inflammatory and infectious process in destructive tuberculosis, changes associated with blood coagulation are observed. These changes are associated with an imbalance between the blood coagulation system and anticoagulation. Changes in the coagulogram in destructive pulmonary tuberculosis indicate significant disorders in both the intrinsic and extrinsic pathways of blood coagulation. An increase in prothrombin time and APTT indicates a slowdown in the coagulation process, and an increase in fibrinogen and D-dimer levels indicate a hypercoagulable state and an increasing risk of thrombosis. These changes require constant monitoring of the blood coagulation system to prevent complications such as bleeding or thrombosis.

We analyzed changes in the coagulogram in 72 patients. The patients were divided into two groups:

- Patients with destructive pulmonary tuberculosis - 47 people.
- Patients with non-destructive pulmonary tuberculosis - 25 people.

Discussion result

Based on the results of the table, it can be concluded that in severe cases of tuberculosis, significant changes in the parameters of the blood coagulation system

are observed, which can increase the risk of hypercoagulation and thromboembolic complications.

Table 1

Changes in the coagulogram in clinical forms of tuberculosis.

Indicators	destructive form		non- destructive form		p	average	
	M	m	M	m		M	m
Prothrombin time (sec)	11.0	0.9	11.0	1,1	**0.87**	11.0	1.0
Prothrombin index (%)	87.0	17.4	96.2	17.2	**0.03**	90.2	17.8
INR (International Normalized Ratio)	1,1	0,1	1,1	0,1	**0.16**	1,1	0,1
APTT (Activated Partial Thromboplastin Time) (sec)	26.1	3.7	27.6	5.2	**0.19**	26.6	4.3
Fibrinogen time (sec)	6.5	2.6	8.2	2.7	**0,00**	7.1	2.8
Fibrinogen (g /l)	4.7	1.6	3.0	1.0	**0,00**	4.1	1.6
Thrombin time (TT) (sec)	19.6	2.6	23.2	8.4	**0.05**	20.8	5.6
D- dimer (mcg/ml)	2.7	2.1	0.9	0.3	**0,00**	2.1	1.9

The table shows changes in coagulogram indices in various clinical forms of tuberculosis. In destructive tuberculosis, prothrombin index, fibrinogen and D-dimer indices were significantly higher ($p < 0.05$), indicating hypercoagulation in the blood coagulation system. In the non-destructive form of tuberculosis, fibrinogen time and thrombin time are increased, indicating a slowdown in the blood coagulation process.

Prothrombin time and index: According to the results of the study, the prothrombin time between destructive and non-destructive forms of tuberculosis had no significant difference ($P> 0.05$). This indicates that the blood clotting speed in both groups is similar. However, the prothrombin index was significantly lower in destructive tuberculosis ($P=0.03$), indicating increased blood clotting and hypercoagulability.

INR (International Normalized Ratio): The INR value between destructive and non-destructive forms of tuberculosis did not differ significantly ($P=0.16$). This indicates that the blood clotting process in both groups complies with international standards.

APTT (activated partial thromboplastin time): APTT was slightly shortened in destructive tuberculosis, but the changes were not statistically significant (P=0.19). This indicates no significant changes in the intrinsic coagulation pathway.

Fibrinogen time and amount: The study found that in destructive tuberculosis, fibrinogen time was significantly reduced ($P < 0.05$), indicating the acceleration of blood clotting and hypercoagulation. Fibrinogen amount was significantly higher in destructive tuberculosis ($P < 0.05$), which increases the likelihood of thrombus formation in blood vessels.

Thrombin time (TT): Thrombin time was shortened in destructive tuberculosis (P=0.05), indicating that the blood clotting process was accelerated. This result confirms the increased tendency to form blood clots in destructive tuberculosis.

D-dimer: D-dimer level was significantly elevated in destructive tuberculosis ($P < 0.05$), indicating increased fibrin breakdown during thrombus formation. Elevated D-dimer level indicates high activity of thrombus formation and breakdown process, indicating increased risk of thromboembolic complications in destructive tuberculosis.

Based on the data in the table, it can be concluded that the destructive form of tuberculosis is associated with serious changes in the blood coagulation system associated with hypercoagulation. A decreased prothrombin index, increased fibrinogen, shortened thrombin time, and a high D-dimer level indicate increased blood coagulation activity and a high risk of thrombus formation. In non-destructive tuberculosis, blood coagulation indices remained normal or close to normal. These results emphasize the importance of assessing the coagulation system in various forms of tuberculosis to assess the risk of complications and improve patient control.

Table 2

Changes in coagulogram (by gender)

Indicators	men (n=25)		women (n=47)		P	average	
	M	m	M	m		M	m
Prothrombin time (sec)	11 ,1	0.9	10.9	1.0	**0.37**	11.0	1.0
Prothrombin index (%)	86.4	15.6	92.2	18.7	**0.17**	90.2	17.8
INR (International Normalized Ratio)	1,1	0,1	1,1	0,1	**0.16**	1,1	0,1
APTT (Activated Partial Thromboplastin	26.8	4.6	26.6	4.2	**0.99**	26.6	4.3

Time) (sec)							
Fibrinogen time (sec)	7.3	2.1	6.9	3.1	**0.18**	7.1	2.8
Fibrinogen (g /l)	3.8	1.3	4.3	1.7	**0.25**	4.1	1.6
Thrombin time (TT) (sec)	20.5	4.2	20.9	6.3	**0.99**	20.8	5.6
D- dimer (mcg/ml)	1.9	1.5	2,2	2.1	**0.79**	2.1	1.9

In this study, blood coagulation parameters were compared between men and women. Prothrombin time, prothrombin index, international normalized ratio (INR), activated partial thromboplastin time (APTT), fibrinogen, thrombin time (TT) and D-dimer level were measured and analyzed by gender. No significant statistical differences were found between these parameters (all p-values > 0.05), indicating that gender does not have a significant effect on blood coagulation parameters. The differences between men and women were minimal and clinically insignificant. These results indicate that gender is not a major factor to consider when conducting studies of blood coagulation parameters.

Table 3

Changes in the coagulogram in destructive forms of pulmonary tuberculosis

Indicators	**Infiltrative with decay**		**Cavernous**		**Cirrhotic**		**Chronic dissemination**		**P**
	M	m	M	m	M	m	M	m	
Prothrombin time (sec)	11.1	1.0	10.7	0.5	10.8	0.6	10.8	1.0	**0.83**
Prothrombin index (%)	85.8	18.9	90.2	12.8	89.0	12.4	90.6	22.3	**0.90**
INR (International Normalized Ratio)	1,1	0,1	1,1	0,1	1,1	0,1	1,1	0,1	**0.70**
APTT (Activated Partial Thromboplastin Time) (sec)	26.4	3.6	22.7	1.5	25.2	1.4	30.9	6.1	**0.01**
Fibrinogen time (sec)	6.4	2.8	6.7	2.4	7.6	1.4	5.5	3.4	**0.13**
Fibrinogen (g /l)	4.9	1.3	4.2	1.6	3.2	0.7	5.7	3.6	**0.03**
Thrombin time (TT) (sec)	19.4	2.8	19.7	1.5	19.0	1.9	21.0	3.4	**0.66**
D- dimer (mcg/ml)	2.9	2.0	1.4	0.6	1.4	0.6	4.7	4.6	**0.04**

The study analyzed the coagulogram indices in destructive forms of pulmonary tuberculosis and examined changes in the blood coagulation system. Prothrombin time and prothrombin index were the same in all groups, and no

significant changes were observed (P> 0.05). INR also remained normal in all groups (P> 0.05). The APTT index was significantly prolonged in the chronic dissemination group (P=0.01), indicating dysfunction of the intrinsic blood coagulation pathway. Fibrinogen levels were high in the groups with infiltrative tuberculosis in the decay stage and with chronic dissemination (P=0.03), indicating hypercoagulation. Thrombin time was similar in all groups, indicating no significant changes at the final stage of the coagulation process (P> 0.05). The D-dimer level was significantly increased in the chronic dissemination group (P = 0.04), indicating increased fibrin breakdown during thrombus formation. These results show changes in the blood coagulation system in various forms of tuberculosis, especially in infiltrative tuberculosis in the decay stage, indicating an increased risk of hypercoagulability and thromboembolic complications.

Conclusion

The results of the study show that destructive forms of pulmonary tuberculosis are associated with significant changes in the blood coagulation system. The main indicators of the coagulogram, such as the prothrombin index, fibrinogen and D-dimer levels, indicate hypercoagulation, which increases the risk of thrombus formation in patients with destructive forms of the disease. These changes reflect an imbalance in the blood coagulation system, where the coagulation process prevails over anticoagulation.

In patients with non-destructive forms of tuberculosis, changes in the coagulation system were less pronounced, and coagulogram indicators remained within normal limits or close to it, which indicates a lower risk of thrombosis and bleeding.

In addition, no significant differences were found between men and women in blood coagulation parameters, indicating a minimal influence of gender on the state of the coagulation system.

Thus, the study data confirm the importance of monitoring the blood coagulation system in patients with tuberculosis, especially in severe and destructive forms of the disease, for the timely prevention of thromboembolic complications.

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