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SIGNIFICANCE OF INCREASED D-DIMER VALUES IN FRESH FRACTURES IN ORTHOPEDICS AND CORRELATIONS WITH THROMBOEMBOLIC COMPLICATIONS

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Abstract: Background/aim. At the end of the process of separating clots composed of fibrin we have a D-dimer. This process involves thrombin, which is formed during the process where fibrinogen is converted into fibrin, a factor whose role is to bind the basic units of clots and plasmin, the final participant in the breakdown of fibrin. In medicine, we should not use value of D-dimers as the only parameter for thrombosis. The aims of are research is to investigate correlation between clinical signs of venous thrombosis and D-dimer values in fresh bone fractures and demonstrate, that there is momentous correlation between high values of D-dimers and clinical signs of venous thrombosis, which is often a contraindication for surgical treatment of fractures.

Methods: D-dimer levels of 211 patients with fresh bone fractures. They are classified into groups based on D-dimer values as follows: <250 ng/ml, 250–1000 ng/ml, 1000-5000 ng/ml, 5000-10 000ng/ml.

Results: D-dimer values are not statistically significant with clinical symptoms of venous thrombosis in recent fractures in orthopedics.

Discussion: D-dimer is an indicator related to fibrin degradation that has been used in the past as a prevalence in patients with chances of venous thrombosis. In inflammatory processes, we also have increased values of this parameter, which suggests the existence of some inflammatory change in the body or infection. Our research is among the first to compare D-dimer values in recent fractures in orthopedics and thromboembolic complications. In our research, we showed that there is no significant correlation between elevated D-dimer values in hospitalizations of fresh fractures with clinical signs and a diagnosis of vascular thrombosis. We showed that there is no significant correlation between elevated D-dimer values in hospitalizations of fresh fractures with clinical signs and a diagnosis of vascular thrombosis. With this study, we proved that elevated D dimer is a consequence of trauma and disruption of the continuity and integrity of bone blood vessels, both endosteal and periosteal, which results in thrombosis of small blood vessels.

Conclusions: There is no momentous correlation between elevated D-dimer values in fresh fractures and venous thrombosis. High values of D-dimer are not a contraindication for surgical treatment of fresh fractures.

Keywords: D-dimer, thromboembolism, fractures, prediction.
Field: Medical sciences and Health

INTRODUCTION

At the end of the process of separating clots composed of fibrin we have a D dimer. This process involves thrombin, which is formed during the process where fibrinogen is converted into fibrin, a factor whose role is to bind the basic units of clots and plasmin, the final participant in the breakdown of fibrin. (Wang et al., 2019). In medicine, various diseases give increased values of D-dimer (Tripodi et al., 2011). Laboratory increased values can be used both for the diagnosis and treatment of diseases in which we have venous blood vessel thrombosis (Bounameaux et al., 1994, Hansrani et al., 2017), DIC (Palareti et al., 2002), conditions with reduced heart function and cerebral palsy. However, there are some diseases that do not have points of contact with vascular thrombosis and in which we have increased values of D-dimer, so we can say that it is not trombotically specific. Today, acute infections of the organism caused by the coronavirus known as COVID-19, give laboratory increased values of D-Dimer and these patients

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have a higher percentage of thromboembolic complications of venous blood vessels (Atzrodt et al., 2020, Rabi et al., 2020,). The higher the values of D-dimer, the higher the percentage of worse outcomes per patient, and this isa bad sign for the prognosis of the patient's further condition (Li Y et al., 2020, Li C et al. 2020, Kollias et al., 2020, Artifoni et al., 2020, Vidali et al., 2020, Hunt et al., 2020). Many studies have shown that in orthopedic patients there is no statistically significant difference in laboratory values of D-Dimer between COVID-positive and COVID-negative patients. Therefore, non-adjustable laboratory measurement of D dimers is not recommended in patients who underwent orthopedic surgery (Jungwirth-Weinberger et al., 2021). Also, as a consequence of fractures, the continuity and integrity of arterial and venous blood vessels, both endosteal and periosteal, are interrupted. Consequently, microthrombosis of small blood vessels occurs in the first days of fracture healing as a consequence of the organization of hematomas caused by bone rupture, as well as activation of the healing system in terms of organization of dead cells at the ends of bone fragments.

Aim: This study shows that there is no momentous correlation between increased levels of D dimers and clinical signs of venous thrombosis, which is often a contraindication for surgical treatment of fractures.

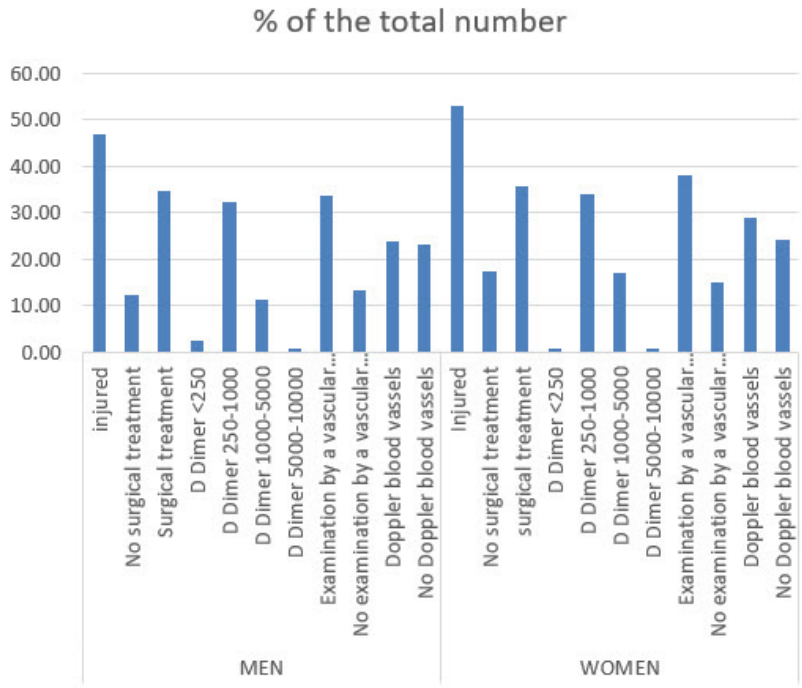
MATERIALS AND METHODS

Patients

The presented retrospective study was approved by the Ethics Committee of KBC Kosovska Mitrovica, in which 211 patients participated, of which 63 were treated non-operatively and 148 were treated operatively between August 2020 and August 2021. Of course, all patients gave their consent to participate in the study. They are classified into groups depending on: gender, age, laboratory values of D-dimer at the hospital, consultation with a vascular surgeon, results of blood vessel Doppler. Each patient was given a laboratory D-dimer value due to the administration of thromboembolic prophylaxis. All fractures in which there were no clear indications for surgical treatment were treated non-operatively. In contrast, those patients who had fractures with clear indications set by the AO group were treated surgically and AO techniques were used to address them.

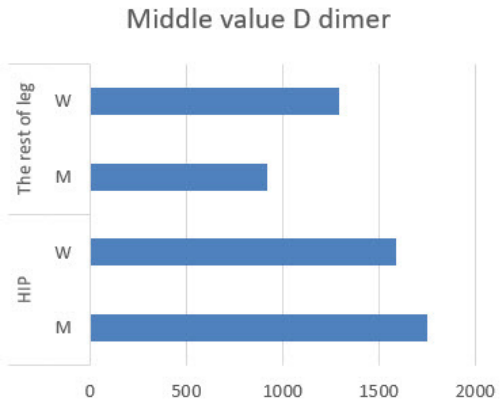
RESULTS

Out of the total number of patients, 53.08% were females and 46.92% were males. From grapf 1, we can see that the largest number of women was between 61-80 years of age, 57 of them, and 35 of them with D-dimer values between 250-1000 ng/ ml. Of the total number of injured - 112, in 80 patients we have consultation I examination by a vascular surgeon, as well as 60 performed Doppler blood vessels. 75 patients or 35.55% were treated surgically. As for men, the largest number of injured, 36 of them were between 61-80 years old, with D-dimer values between 250-1000 ng / ml of 21. Of the total number of injured, ie. 99 patients, in 71 patients a consultation with a vascular surgeon and 50 Doppler blood vessels were performed. 73 patients or 34.60% were treated surgically.



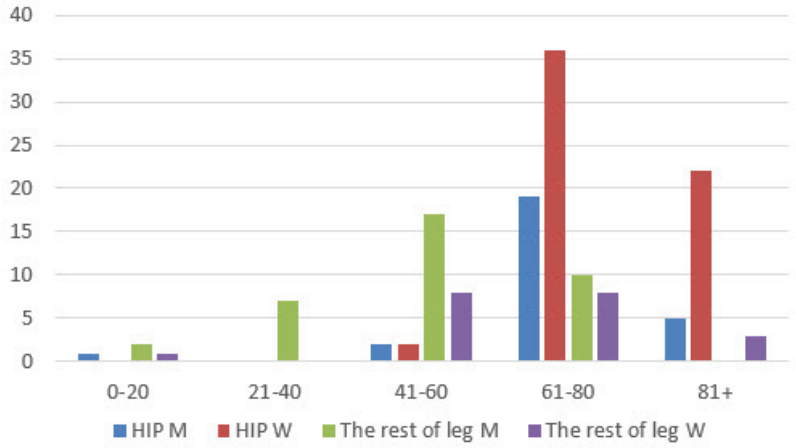
*The D value of the dimer is expressed in ng / ml, and is normal <250 ng / mL
Graph 1. Summary chart of all patients who participated in the study

The largest number of patients have fresh leg fractures, 179 of them. Considering the graph 2 values of D dimers, we came to the data that the middle value of D dimers in men with fractures of hip is 1754 ng / ml, and in women the mean is slightly lower and it is 1587 ng / ml We can conclude that in women the largest number of hip fractures was 60, and as for men, 27 of them had hip fractures



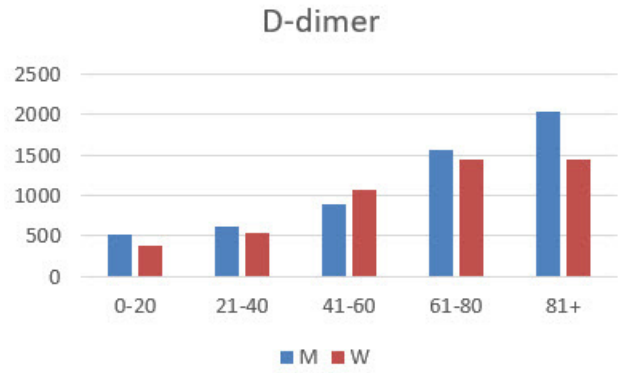
* The D value of the dimer is expressed in ng / ml, and the normal value is <250 ng / mL
Graph 2. Middle value of D dimer in male/female with leg fractures

Graph 3 shows that the largest number of male patients with hip fractures is between 61-80 years old, 19 of them. Also in women, 36 of them were between 61-80 years old.

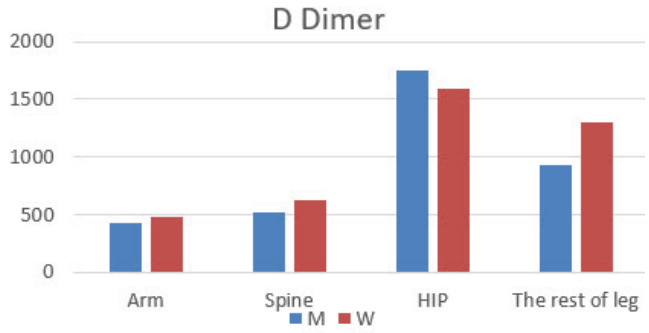


Graph 3. Number of patients with hip fracture in relation to age

In relation to age, the highest mean value of D dimers is in patients aged 81 years and older. In men aged 81+, the mean value of D dimer is 2024 ng / ml, and in female patients this value is 1445 ng / ml. (Graph 4).



*The value of D dimer is expressed in ng / ml, the normal value is <250 ng / mL
Graf 4.Mean value of D dimer in relation to age



*The value of D dimer is expressed in ng / ml, the normal value is <250 ng / mL
Graph 5: Mean value of D dimer in relation to fractures of the upper, lower extremity (hip and other part of the leg) and spine

What is most important to us is that all 211 patients who participated in the study did not have clinical signs of venous thrombosis, as well as a confirmed diagnosis of venous thrombosis. Which means that there is no statistically momentous correlation between increased values of D dimer and venous thrombosis in fresh fractures. Comparing our retrospective study with the latest research conducted by Wang ZI et al., Palareti et al., As well as in the light of Covid infection where D dimers are measured daily by Atzrodt et al. tissue trauma itself as well as natural fracture organizations and not a consequence of venous thrombosis. Given that we had the largest number of patients with hip fractures, we conclude that increased D-dimer is not a contraindication for surgical treatment of hip fractures, any method according to the AO classification and fractures and the choice of surgical treatment.

DISCUSSION

D-dimer is an indicator related to fibrin degradation that has been used in the past as a prevalence in patients with chances of venous thrombosis. In inflammatory processes, we also have increased values of this parameter, which suggests the existence of some inflammatory change in the body or infection(Ribera et al., 2011, Gris et al., 2011, Schwameis et al. 2015). Many studies do not prove the difference in laboratory values of d dimers in COVID 19 positive and negative orthopedic patients, so daily testing of D-dimers is irrational. Our research is among the first to compare D-dimer values in recent fractures in orthopedics and thromboembolic complications. In our research, we showed that there is no significant correlation between elevated D-dimer values in hospitalizations of fresh fractures with clinical signs and a diagnosis of vascular thrombosis. With this study, we proved that elevated D-dimer is a consequence of trauma and disruption of the continuity and integrity of bone blood vessels, both endosteal and periosteal, which results in thrombosis of small blood vessels. The healing process itself, when going through its physiological phases, monitors the high value of D dimers in fresh fractures. In addition to the fact that elevated D-dimers were used to diagnose venous thrombosis, they have been shown to be illegitimate in many studies (Chen et al., 2008). Rahhe et al. didn't prove differences in laboratory parameters of D-dimers in operated patients with and without vascular thrombosis (Rafee et al., 2008). Likewise Niimi et al. recommend a two-stage examination for thrombosis, including vascular Doppler (Niimi et al., 2009). Therefore, in medicine, we should not use value of D dimers as the only parameter for thrombosis.

CONCLUSION

Our research shows that high values of D-dimer (>250ng/mL) don't have to indicate thrombosis of blood vessels in fresh fractures in orthopedics. Diagnosis should be made by a combination of laboratory D-dimer values, clinical examination, consultation and examination by a vascular surgeon, as well as the use of radiological procedures. We had the largest number of patients with hip fractures, we conclude that increased D-dimer is not a contraindication for surgical treatment of hip fractures, any method according to the AO classification and fractures and the choice of surgical treatment.

In our study there is no conflict of interest by the author

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