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Detection value of D-dimer, C-reactive protein, ESR and blood routine in the perioperative treatment of orthopaedic trauma patients

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ABSTRACT

The objective of this study was to analyze the detection value of D-dimer, C-reactive protein, ESR and blood routine in the perioperative treatment of orthopaedic trauma patients. For this aim, 86 orthopedic trauma patients who were treated at our hospital from December 2020 to December 2021 were selected as the study group, including 40 patients in the infected group and 46 patients in the uninfected group. 86 healthy people who were examined in our hospital were selected as the control group. D-dimer, C-reactive protein, ESR and blood routine test were given to the patients in the study group to evaluate the detection value of D-dimer, C-reactive protein, ESR and blood routine test in the perioperative treatment of orthopaedic trauma patients. Results indicated that compared with the control group, the levels of D-dimer, C-reactive protein, erythrocyte sedimentation rate, white blood cell and neutrophil in the study group were higher than those in the control group, With statistical difference ($P < 0.05$); Compared with the uninfected group, the levels of D-dimer, C-reactive protein, erythrocyte sedimentation rate, white blood cell and neutrophil in the infected group were higher than those in the uninfected group, With statistical difference ($P < 0.05$). Conclusion: Using D-dimer, C-reactive protein, ESR and blood routine to treat orthopaedic trauma patients in the perioperative period has good clinical detection value.

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Introduction

Limb fractures, dislocations, muscle and tendon injuries, skin and soft tissue defects, and open injuries, as well as spinal fractures, dislocations, and vascular and nerve injuries of extremities, are common diseases in traumatic orthopedics(1). Surgical treatment is the most commonly used treatment for orthopedic trauma patients, but some patients will develop complications such as lower extremity venous thrombosis after surgical treatment. Therefore, it is urgent to find an index that can detect surgical conditions. In recent years, with the development of testing technology, many new examination items have emerged. For example, D-dimer and erythrocyte sedimentation rates can better reflect the process of coagulation and fibrinolysis of patients, which are important indicators to evaluate the coagulation and fibrinolysis of patients in clinical practice. The detection of C-reactive protein and blood routine can effectively reflect the infection of patients, but only the use of C-reactive protein and blood routine detection has shortcomings(2-3). D-dimer, C-reactive protein, erythrocyte sedimentation rate (ESR) and blood routine examination is commonly used in the detection of orthopedic trauma, which has good diagnostic value in clinical diagnosis. However, there are few literatures about the diagnosis of perioperative conditions of orthopedic trauma. And no scholars have reported the value of the combination of the four in the detection of perioperative conditions of orthopaedic trauma patients. Based on this, this paper selected D dimer, C-reactive protein, erythrocyte sedimentation rate and blood routine to analyze the perioperative conditions of orthopaedic trauma patients, aiming to analyze the value of the above indicators in the detection of the perioperative conditions of orthopaedic trauma patients.

Materials and Methods

Clinical Data

From September 2021 to September 2022, 86 patients with traumatic orthopedics treated in our hospital were selected as the study group, and 86 healthy people who underwent physical examination in our hospital were selected as the control group.According to the surgical treatment, the patients were divided into infection group (n = 40) and non-infection group (n = 46).There was no significant difference in baseline data between healthy people and traumatic orthopedic patients (P 0.05).See Table 1. Ethical principles were strictly followed and approved by the ethics committee of the hospital.

Inclusion criteria: no history of malignancy;No history of thrombotic disease;No history of coagulopathy or hematological diseases;The participants and their family members agreed and signed consent forms

Exclusion criteria: severe mental disorders;Patients with severe heart, liver and kidney disease;Incomplete clinical data;Systemic diseases;Pain diseases;Severe chronic bone diseases;Rheumatoid arthritis;Accompanied by skin ulcer, hematoma.

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Table 1. Comparison of baseline data in the selected population.

Clinical data	The control group (n = 86)	Study group (n=86)	*T/x²*value	*P values*
Age (years)	20.50 + / - 60.54	22.61 + / - 65.74	0.219	0.827
Gender (example) Male/female	44/42	46/40	0.093	0.760
Duration of disease (H)	15.64 + / - 3.51	16.31 + / - 2.75	1.393	0.165

Detection Methods

Serum collection

Five ml of fasting elbow venous blood was collected from all people, centrifuged at 3000r/min for 15min, and the serum was separated and placed in an EP tube, which was then stored at -40℃ for use.After 2 days of surgery, 5ml of fasting elbow venous blood was collected from patients in the infected group and the uninfected group, and centrifuged for 15min at 3000r/min after standing. Serum was separated and placed in the EP tube, and then stored at -40℃ for replacement.

Days dimer detection

Elisa kit (manufacturer: Shanghai Jingkang Bioengineering Co., LTD.) was used to detect D dimer in the selected population and the infected and uninfected populations after surgery. The detection was carried out in strict accordance with the kit instructions to avoid errors.

Detection of C-reactive protein

Immunoturbidimetry (manufacturer: Wuhan Jinghong Technology Co., LTD.) was used to detect C-reactive protein in the selected population. The test was carried out in strict accordance with the kit instructions to avoid errors.

Erythrocyte sedimentation rate test

Free sedimentation was performed (model: Moniter-100;Manufacturer: Nanjing Hanyu Medical Technology Co., LTD.), the ESR of the selected population was measured in strict accordance with the instructions of the instrument and carried out by two experienced doctors to avoid errors.

Routine blood test

Automatic cell analyzer (model: F580s;The manufacturer: Shanghai Jumu Medical Device Co., LTD.) was used to test the blood routine of the selected population. The test was carried out in strict accordance with the instructions of the instrument and carried out by two experienced doctors to avoid the occurrence of errors.

Statistical analysis

SPSS 19.0 statistical software was used for analysis and processing.Measurement data were described by mean ± standard deviation (), paired t-test was used for comparison within groups, count data were expressed as %, and X was used for comparison between groups $\bar{x} \pm s$ [2]In the test, $P < 0.05$ was considered statistically significant.

Results

Comparison of serum D dimer, C-reactive protein, erythrocyte sedimentation rate (ESR) and blood routine indexes between healthy people and patients

As shown in Table 2 and Table 3, compared with the control group, the levels of D-dimer, C-reactive protein, ESR, white blood cells and neutrophils in the study group were higher than those in the control group, with statistical differences ($P < 0.05$).

Comparison of D-dimer, C-reactive protein and erythrocyte sedimentation rate between infected and uninfected groups

As shown in Table 4 and Table 5, compared with the uninfected group, the levels of D-dimer, C-reactive protein, erythrocyte sedimentation rate, white blood cell and neutrophil in the infected group were higher than those in the uninfected group, with statistical differences ($P < 0.05$).

Discussion

Traumatic orthopedics is a small branch of osteology and the most basic discipline in orthopedics, which is

Table 2. Comparison of serum D-dimer, C-reactive protein, and erythrocyte sedimentation rate between healthy people and patients ($\bar{x} \pm s$).

group	Number of cases (n)	D dimer (mg/L)	C-reactive protein (mg/L)	Erythrocyte sedimentation rate (mm/h)
The control group	86	2.52 + / - 1.07	48.63 + / - 5.01	35.87 + / - 6.01
The team	86	4.10 + / - 1.52	80.57 + / - 5.34	45.67 + / - 4.62
T value		7.882	40.450	11.990
P values		0.001	0.001	0.001

Table 3. Analysis of blood routine indicators in the selected population ($\bar{x} \pm s$).

group	Number of cases (n)	White blood cells ($\times 10^9$/ L)	Neutrophils (%)
The control group	86	12.52 + / - 4.07	58.42 + / - 8.01
The team	86	15.10 + / - 5.12	67.57 + / - 8.34
T value		3.589	7.338
P values		0.001	0.001

Table 4. Comparison of D-dimer, C-reactive protein, erythrocyte sedimentation rate, and blood routine between the infected group and uninfected group ($\overline{x} \pm s$).

group	Number of cases (n)	D dimer (mg/L)	C-reactive protein (mg/L)	Erythrocyte sedimentation rate (mm/h)
Uninfected group	40	4.31 + / - 1.00	75.34 + / - 5.07	45.37 + / - 4.17
Infection group	46	5.52 + / - 1.63	89.36 + / - 6.17	51.36 + / - 4.58
T value		7.440	20.210	10.230
P values		0.001	0.001	0.001

Table 5. Analysis of blood routine indicators in the two groups ($\overline{x} \pm s$).

group	Number of cases (n)	White blood cells ($\times 10^9$/ L)	Neutrophils (%)
Uninfected group	40	15.85 + / - 5.10	70.96 + / - 8.31
Infection group	46	22.74 + / - 4.92	80.96 + / - 7.81
T value		6.368	5.749
P values		0.001	0.001

caused by accident or violence to break the integrity or continuity of bone. It is aimed at the masses of various traumatic diseases(4-5). Trauma orthopedics is generally divided into spinal trauma, pelvic trauma, joint trauma, and limb trauma;Spinal trauma was subdivided into three segments: neck trauma, chest trauma and lumbar trauma. The injuries of extremities were divided into diaphyseal fractures of extremities, hand injuries and foot and ankle fractures(6-7).

D-dimer is a very important index in blood testing, which refers to the products of fibrin and fibrin under the action of fibrase lysis. It has certain specificity and is mainly used in the detection and diagnosis of deep vein thrombosis, pulmonary embolism and venous thrombosis in clinical examination(8-9-). Some scholars have pointed out in studies that increased D-dimer is manifested by the recent significant thrombosis degradation, which also represents the recent definite thrombosis, which is commonly seen in myocardial infarction, pulmonary embolism, brain infarction, organ transplant rejection and venous thrombosis(10-11). Studies have pointed out that it has a clear significance for the differentiation of primary hyperfibrinolytic disease and secondary hyperfibrinolytic disease. When patients have the hyperfibrinolytic disease, D-dimer results show normal detection results. When patients with secondary hyperfibrinolytic diseases, such as thrombotic diseases, D-dimer results were positive or significantly increased(12-13).In this paper, we study found that D dimer level in patients with traumatic fractures presents a high expression in serum, and with the emergence of postoperative infection, the D-dimer level shows a rising trend, the result shows that when patients with traumatic orthopedic surgery appear infected cases may lead to the formation of thrombus, affect the prognosis of patients.

C-reactive protein is not only a non-specific validation marker, but also plays an important protective role in the innate immune process of the body, and is involved in inflammation and atherosclerosis and other cardiovascular diseases. Therefore, C-reactive protein is also an important risk factor for cardiovascular diseases(14-15). C-reactive protein is increased in various acute inflammation, respiratory tract infection, malignant tumor and other diseases, but the specificity is not high. Some scholars in the study, point out that in normal plasma CRP levels are low, when acute bacterial, ischemia and tissue damage or malignant tumor, liver cells can synthesize more c-reactive protein in the blood, and a sharp rise in a short time, so the c-reactive protein is a state of the body's inflammatory response sensitivity index, especially in the acute bacterial infection, c-reactive protein increased significantly, It is directly proportional to the severity of infection, and it is also an indicator for differentiating bacterial infection from viral infection(16-17).In this paper, we study found that c-reactive protein levels in patients with traumatic fractures present a high expression in serum, and with the emergence of postoperative infection, c-reactive protein levels show a rising trend, the results show that when the infection after surgery in patients with traumatic orthopedic plane experience in inflammation, affect the prognosis of patients.

Erythrocyte sedimentation rate (ESR) is commonly known as erythrocyte sedimentation rate (ESR), which refers to placing anticoagulant blood in the ESR tube(18-19).In addition, the speed of ESR can also assist in observing the changes in the disease. Some scholars pointed out in the study, in rheumatic diseases, tuberculosis ESR accelerated the degree and severity of the disease. The active stage of the ESR is accelerated, and the disease is improved when the ESR is slowed down. Therefore, the measurement of ESR can be used to roughly infer the development of disease and to observe the effect of treatment. Some scholars have pointed out in their studies that, for malignant tumors with rapid development, ESR has a certain suggestive effect, and the treatment is effective, but the ESR slows down. The ESR is accelerated by tumor metastasis. The ESR of benign tumors did not increase or decrease. In this paper, we study found that blood sedimentation levels in patients with traumatic fractures present a high expression in serum, and with the emergence of postoperative infection, blood sedimentation level shows a rising trend, the results show that when patients with traumatic orthopedic surgical infection in the body under the condition of blood sedimentation after speeding up, the show appeared infection disease is still in the activity after the surgery, affect the prognosis of patients.

Blood contains red blood cells, white blood cells and platelets. Red blood cells occupy the largest number in the blood and are red in color. Research suggests that red blood cells carry oxygen is to carry oxygen to tissues and organs to the collective, such as the decrease in the num-

ber of red blood cells in the blood, that is people often say that anemia, anemia patients carry oxygen is less ingredients, anemia patients will feel dizzy and weak, and so on and so forth, these are all thought anemia led to a lack of oxygen to the body (20). Lymphocytes, monocytes and neutrophils are white blood cells, and neutrophils are the most abundant type of granulocyte, occupy about 65% of human leukocytes and neutrophils as host the first line of defense against invading pathogens and natural candidates in the medical mission, its inherent to gobble up ability, They can absorb rice particles and phagocytose dead red blood cells to activate foreign pathogens. The function of neutrophils is to prevent bleeding or stop bleeding after bleeding. Abnormal platelet function can cause clinically obvious symptoms, which can be divided into two stages in the process of hemostatic function. The first stage is the adhesion of platelets to the wound and the formation of loose hemostatic emboli. The second stage is mainly to promote blood coagulation and the formation of solid hemostatic emboli (21). This study found that the level of red blood cells and neutrophils in patients with traumatic fractures present a high expression in serum, and with the emergence of postoperative infection, the level of red blood cells, and neutrophils present a rising trend, the result shows that when patients with traumatic orthopedic surgery appear infected cases the body damage degree is bigger, It can promote the rapid operation of red blood cell and neutrophil levels.

Although it was found in this study that the treatment of traumatic orthopedic patients is closely related to D-dimer, C-reactive protein, erythrocyte sedimentation rate and blood routine. However, due to the small number of cases selected in this study, the data this study may be biased. A large number of clinical trials of orthopaedic trauma patients should be selected in the later stage to provide certain data for the later clinical treatment, so as to benefit more orthopaedic trauma patients.

In conclusion, the use of D-dimer, C-reactive protein, erythrocyte sedimentation rate and blood routine indicators to analyze the perioperative situation of orthopaedic trauma patients can provide certain reference data for the clinical treatment and detection of orthopaedic trauma patients in the later perioperative period.

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