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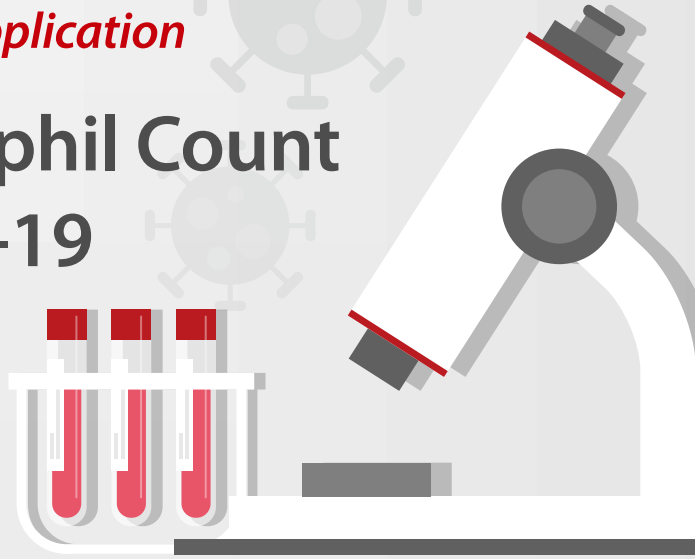
Common parameter, new application

How Does Eosinophil Count Change in COVID-19 Patients?



Is prophylactic anticoagulant therapy a common treatment for clinicians to deal with thrombotic events in COVID-19?

Is there a connection between the eosinophil count and anticoagulation monitoring in COVID-19 patients?

Thrombotic events in COVID-19 patients

Thrombosis has emerged as an important complication among hospitalized patients with COVID-19. A prothrombotic state induced by SARS-Cov-2 can manifest in venous thromboembolism (VTE), arterial thrombosis and disseminated intravenous coagulation (DIC). [1]

In 28 studies including 2928 patients, thrombotic complications occurred in 34% of ICU patients, deep venous thrombosis (DVT) reported in 16.1% and pulmonary embolism in 12.6% of patients, and were associated with high mortality. [2]

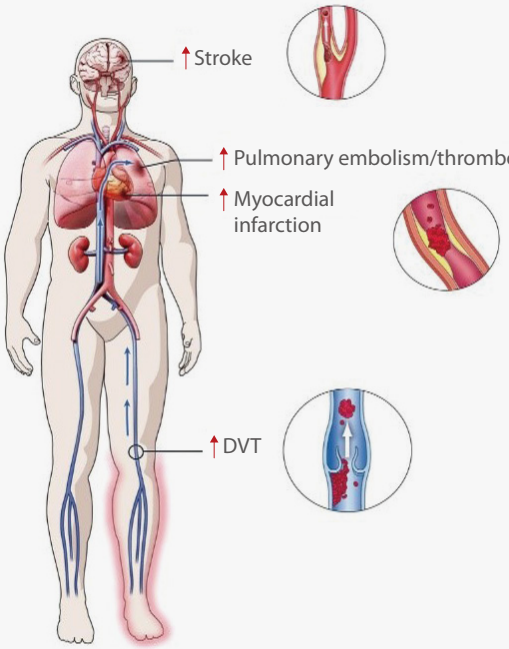


Figure 1. Possible venous and arterial thrombotic complications associated with COVID-19. [1]

Antithrombotic treatment of low molecular weight heparin in COVID-19 patients

Low molecular weight heparin (LMWH) and unfractionated heparin (UFH) are recommended by the international society for thrombosis on hemostasis (ISTH), American Society of Hematology (ASH) for the treatment of thrombotic events associated with SARS-CoV-2 infection. Particularly, LMWH has a stronger antithrombotic effect than UFH.

LMWH dose monitoring

LMWH predominantly acts on factor Xa. For this reason, LMWH activity is monitored using serum anti-factor Xa activity (AFXa) levels instead of activated Partial Thromboplastin Time (aPTT) (Figure 2). [3]

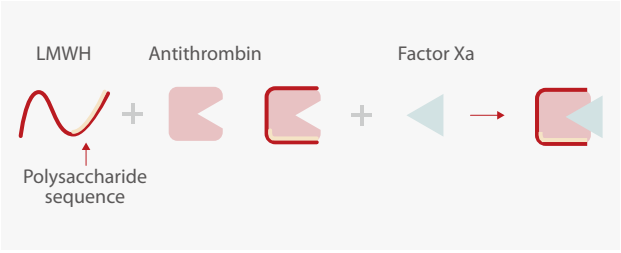


Figure 2. The antithrombotic mechanism of LMWH. [3]

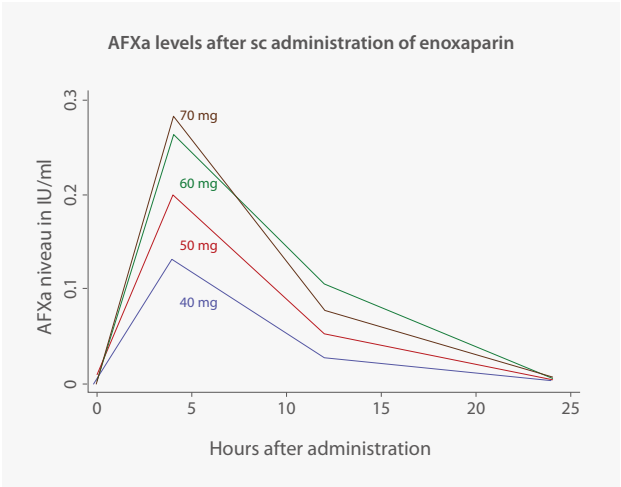


Figure 3. Variation in AFXa over time for each dose of enoxaparin. [4]

Enoxaparin is one of the most important LMWH. The AFXa level reached peak 3-5 hours after administration. The AFXa levels below 0.2 IU/mL may increase the risk of VTE in COVID-19 patients, due to the hypercoagulability. [4]

Eosinophil counts in antithrombotic treatment to COVID-19 patients

Dr. Selma Ari has found the increased eosinophil count is associated with the level of subprophylactic anticoagulation in COVID-19 patients. [5]

Table 1 Results of laboratory parameters at admission

Variable	Subprophylactic anticoagulation group (13 patients) anti-factor Xa < 0.2 IU/mL	Prophylactic anticoagulation group (67 patients) anti-factor Xa > 0.2 IU/mL	*p* value
WBC X10³ /mL	5.91 ± 1.31	5.54 ± 1.89	0.51
Neutrophil	3.57 ± 1.27	3.51 ± 1.71	0.91
Lymphocyte	1.76 ± 0.60	1.54 ± 0.66	0.25
Eosinophil (%)	2.96 ± 2.55	0.90 ± 1.28	*0.001*
Eosinophil count	168.42 ± 147.25	50.32 ± 73.42	*0.001*
Platelet X10³ /mL	232.00 ± 62.21	197.57 ± 57.87	0.06
CRP (mg/L)	12.18 ± 16.66	25.12 ± 31.04	0.08
Fibrinogen (mg/dl)	367.08 ± 134.97	410.00 ± 117.34	0.24
D-dimer (µgr/mL)	0.57 ± 0.38	1.21 ± 3.35	0.50
PT	11.55 ± 0.91	11.82 ± 1.92	0.62
aPTT (s)	23.25 ± 3.24	25.62 ± 8.45	0.32
INR	0.95 ± 0.06	0.96 ± 0.19	0.89
Baseline anti-factor Xa level (IU/mL)	0.18 ± 0.06	0.43 ± 0.23	*<0.001*

Parameters whose p<0.05 are written in italics

In the laboratory results, only eosinophil counts and AFXa are significantly different between subprophylactic anticoagulation group and prophylactic anticoagulation group when the patients are admitted to hospital (Table 1). [5]

Table 2 Results of laboratory parameters before discharge

Variable	Subprophylactic anticoagulation group (13 patients) anti-factor Xa < 0.2 IU/mL	Prophylactic anticoagulation group (67 patients) anti-factor Xa > 0.2 IU/mL	*p* value
WBC X10³ /mL	6.25 ± 0.82	5.55 ± 1.95	0.08
Neutrophil	3.81 ± 1.14	3.26 ± 1.58	0.08
Lymphocyte	1.81 ± 0.69	1.79 ± 0.78	0.52
Eosinophil (%)	3.06 ± 1.49	2.07 ± 1.92	*0.001*
Eosinophil count	182.49 ± 95.81	112.18 ± 102.54	*0.009*
Platelet X10³ /mL	264.42 ± 117.14	226.94 ± 89.08	0.25
CRP (mg/L)	8.54 ± 11.47	19.45 ± 35.44	0.19
Fibrinogen (mg/dl)	377.33 ± 145.03	416.98 ± 148.71	0.31
D-dimer (µgr/mL)	0.72 ± 0.77	0.78 ± 1.08	0.91
PT	11.72 ± 0.59	11.93 ± 1.28	0.65
aPTT (s)	22.34 ± 1.38	24.38 ± 3.58	0.01
INR	0.96 ± 0.05	0.98 ± 0.11	0.46
Control anti-factor Xa level (IU/mL)	0.16 ± 0.04	0.53 ± 0.26	*<0.001*

Parameters whose p<0.05 are written in italics

Laboratory analysis collected before the discharge of patients revealed that eosinophil counts in subprophylactic anticoagulation group were higher than in prophylactic anticoagulation group , whereas AFXa were lower in subprophylactic anticoagulation group (Table 2). [5]

Eosinophils and thrombosis

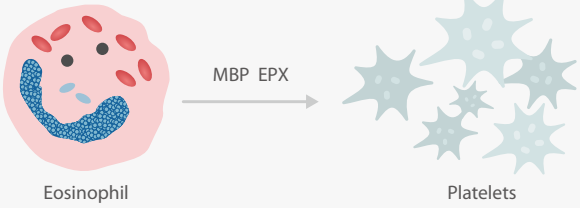


Figure 4. Eosinophil induces platelet aggregation.

Eosinophil induces platelet aggregation and thrombus formation through the production of major basic protein (MBP) and eosinophil peroxidase (EPX). [6]

Enzymes released from eosinophils (peroxidases, cationic proteins, and neurotoxins) may decrease the anticoagulant activity of heparin. [7]

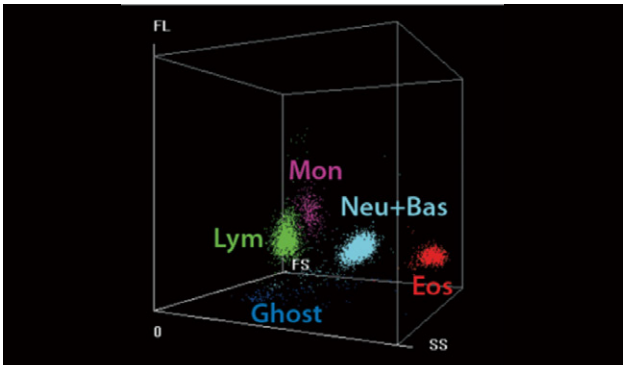


Figure 5. SF Cube on Mindray BC-6800.

In this study, in subprophylactic anticoagulation group, high eosinophil levels had lower anticoagulant activity in COVID-19 patients. Eosinophil counts were examined with Mindray BC- 6800 auto hematology analyzer. Its SF Cube analysis technology can produce three-dimensional scattergram which can help doctors better identify and differentiate blood cell populations, especially to reveal abnormal cell population undetected by other techniques.

Nowadays a large number of parameters on BC-6800 can be used in clinical diagnosis and scientific research. There fore, clinicians are welcome to do more research on COVID-19 on Mindray BC-6200/BC-6800/BC-6800Plus/ CAL 6000/CAL 8000.

References

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