PTCP caused abnormal PLT results

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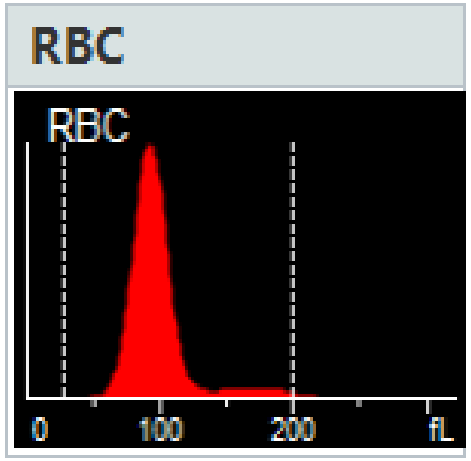
Clinical Information

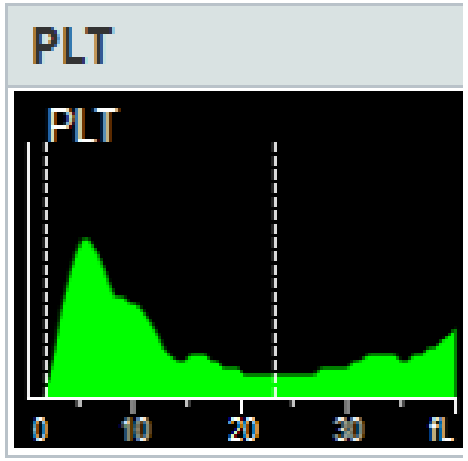
The laboratory is one of the top of China side, Mindray CAL8000 always used to test in hospital sample. The customer typically pays close attention to abnormal platelet conditions and conducts microscopic examinations on almost all abnormal samples.

The patient, male, 66 years old, was diagnosed with "gastric malignancy" on 3 July 2023 after a gastroscopy. Since the onset of the disease, the patient has been in a good general condition, with normal urination and defecation and weight loss.

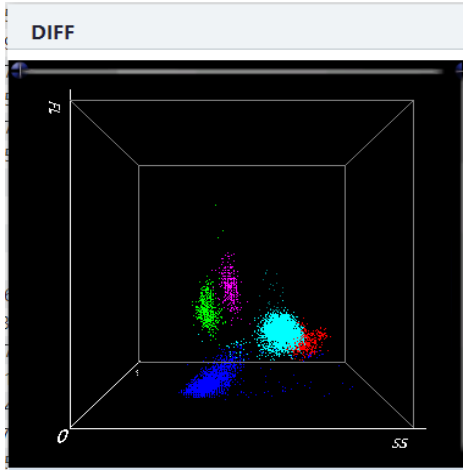
HA result in Jul.4

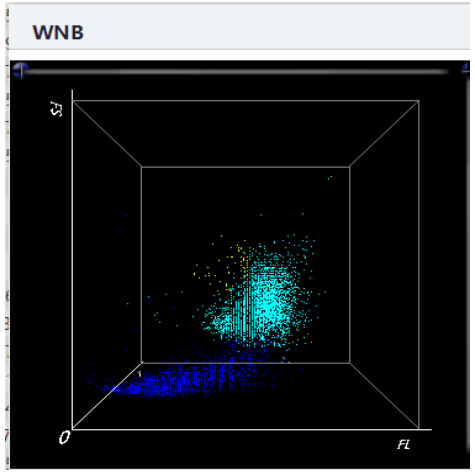
Para.	Flag	Result	Unit
WBC	R	8.14	10^9/L
Neu#	R	5.91	10^9/L
Lym#		1.02	10^9/L
Mon#		0.45	10^9/L
Eos#	RH	0.69	10^9/L
Bas#		0.07	10^9/L
IMG#		0.05	10^9/L
Neu%	RH	72.7	%
Lym%	L	12.5	%
Mon%		5.5	%
Eos%	RH	8.4	%
Bas%		0.9	%
IMG%		0.6	%
RBC		4.86	10^12/L
HGB		153	g/L
HCT		46.7	%
MCV		96.1	fL
MCH		31.4	pg
MCHC		327	g/L
RDW-CV		13.5	%
RDW-SD		46.0	fL
PLT	&R	175	10^9/L
MPV	R	9.8	fL
PDW	R	16.6	
PCT	RL	0.037	%
P-LCC	R	49	10^9/L
P-LCR	R	28.2	%
IPF	R	3.3	%
RET#		95.7	10^9/L
RET%		1.97	%





Para.	Flag	Result	Unit
FRC%		0.25	%
H-IPF	R	1.5	%
IPF#	R	1	10^9/L
RBC-O		4.93	10^12/L
PLT-O	R	175	10^9/L
PLT-I	R	38	10^9/L





报警

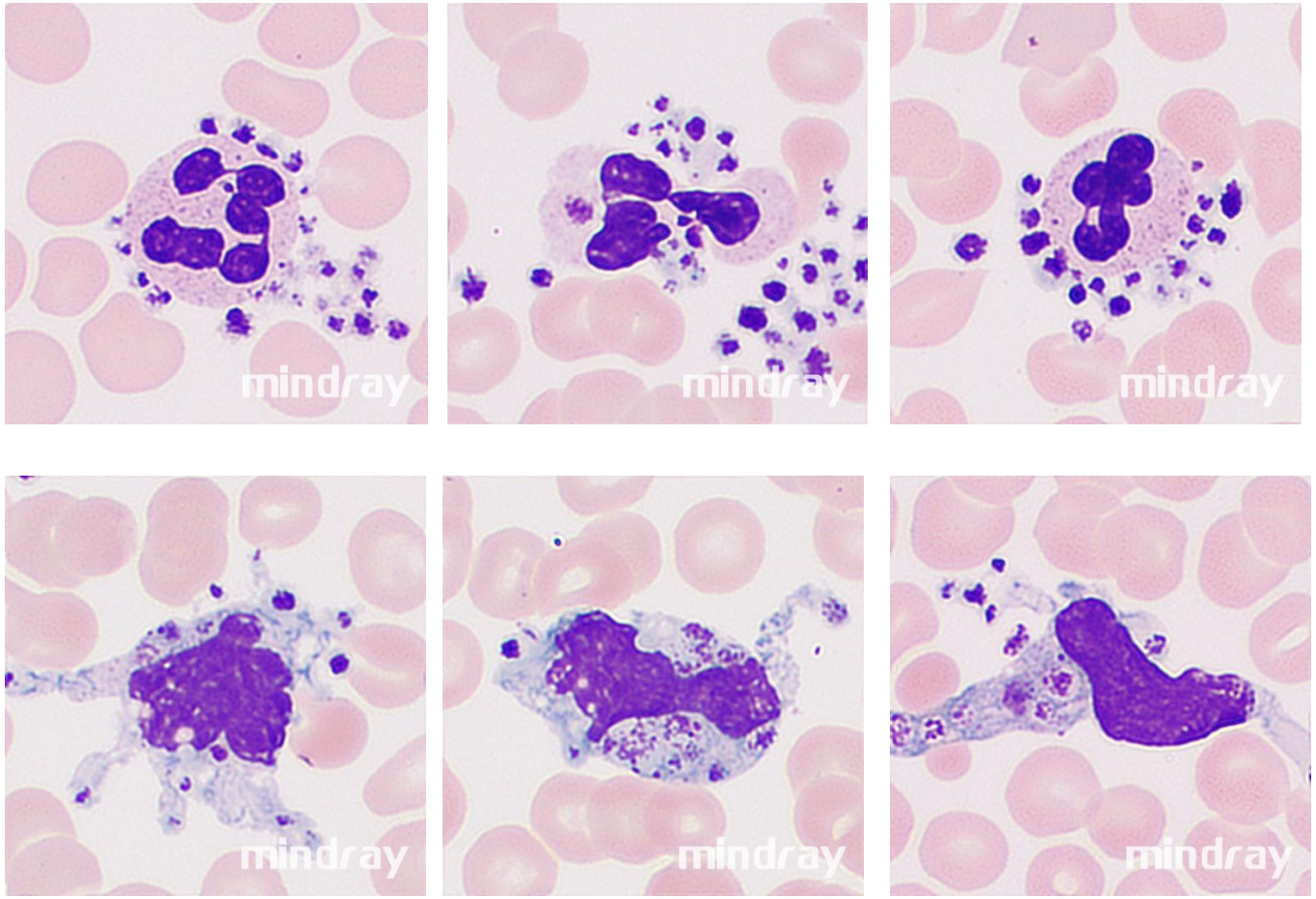
- WNB Scattergram Abn
- Left Shift?
- PLT Clump?

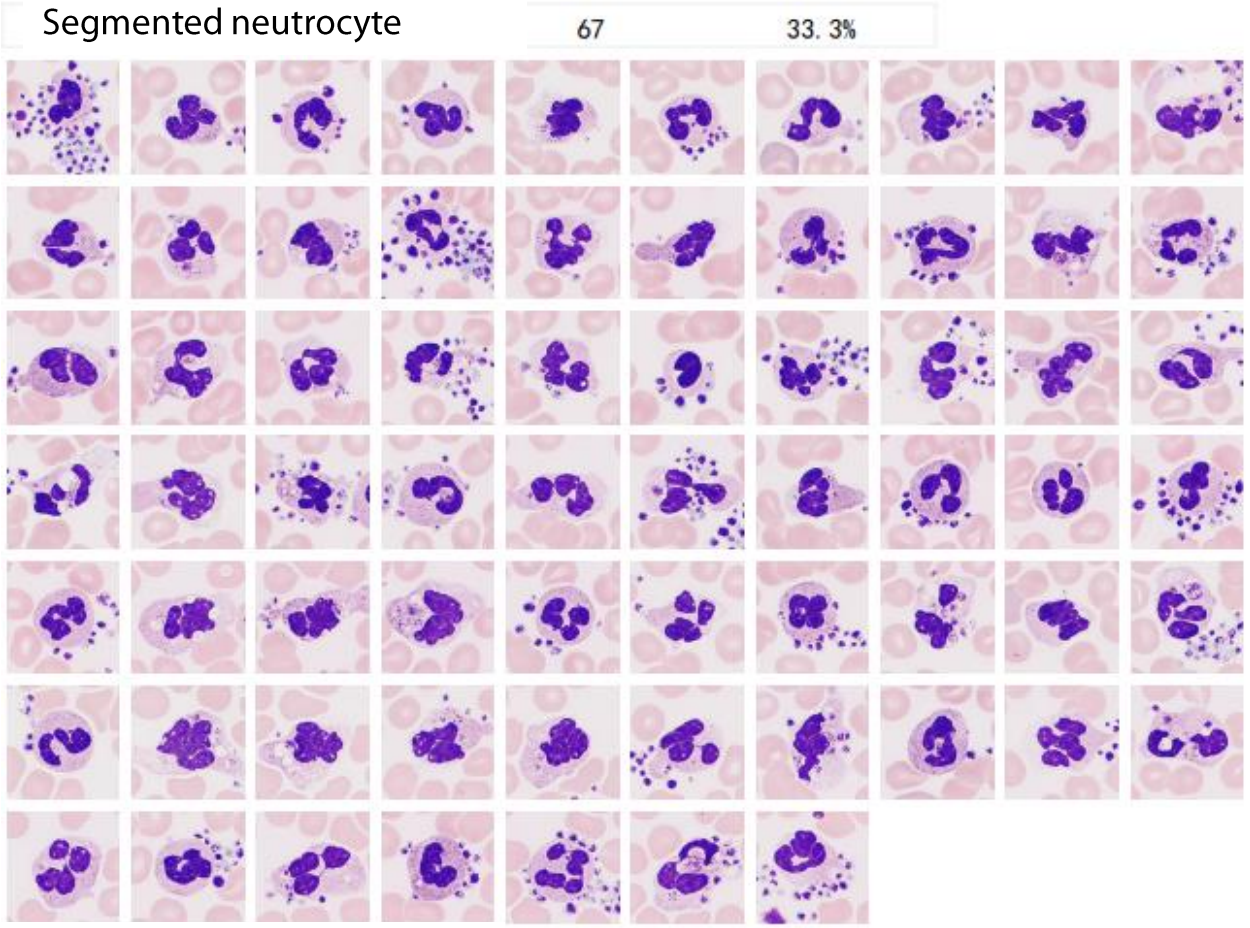
PLT Histogram Abn.

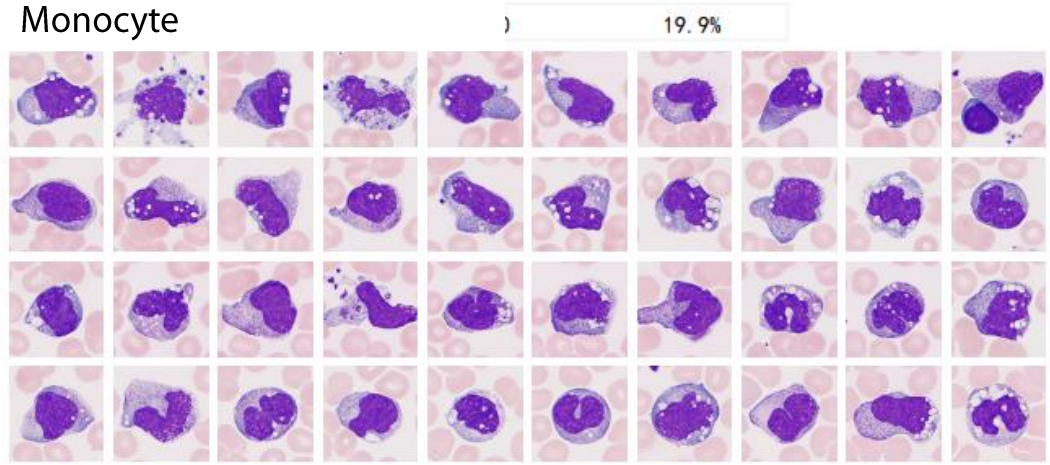
- PLT histogram is jagged and undulating, with alarming of PLT histogram abnormal
- The number of eosinophils and neutrophils are increase in the DIFF channel, and NRBC have scattered in the WNB channel.
- There shown a dramatic difference between PLT-I and PLT-O results after CDR mode testing, indicating that PLT clumps was present in the sample and the clumps were depolymerized in the RET channel.

Detection of morphology

WBC	201	100. 0%
Segmented neutrocyte	67	33. 3
lymphocyte	68	33. 8
Monocyte	40	19. 9
Eosinophils	20	10. 0
Basophils	5	2. 5
Promyelocyte	1	0. 5
Non-WBC	252	%
Giant platelet	1	
Large platelet	14	
PLT clumps	61	
Smear	63	31. 3
Artefacts	113	







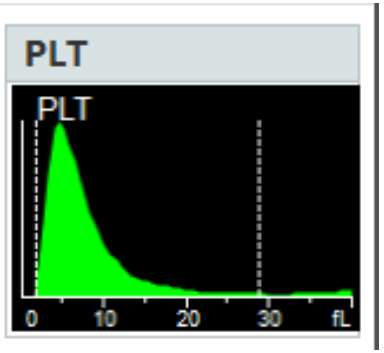
Morphology result shown as 67% neutrophils, 68% lymphocytes, 40% monocytes, 20% eosinophilia, platelet aggregates were seen in non-WBC 61 and a large number of smear cells were present.

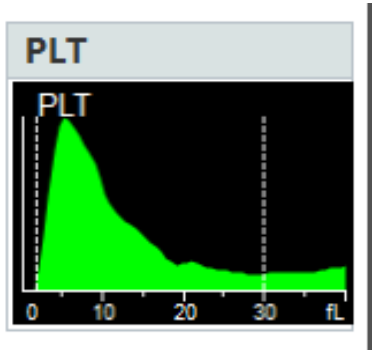
The phenomenon of large platelet satellites around neutrocyte has been commonly reported during the testing of samples from different cancer patients. This phenomenon is usually thought to be related to platelet activation induced by ethylenediaminetetraacetic acid anticoagulant (EDTA), and clinically this EDTA-dependent pseudothrombocytopenia of platelets is known as EDTA-PTCP.

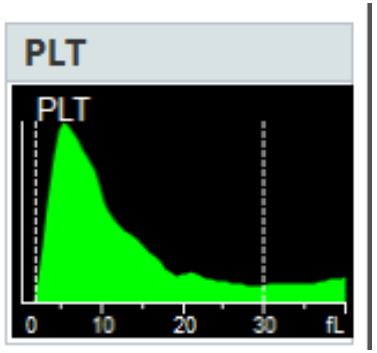
PTCP can occur in autoimmune diseases, inflammatory conditions, tumours and pregnancy, even in healthy people, suggesting that there is no association between this type of autoantibody and disease in the population.

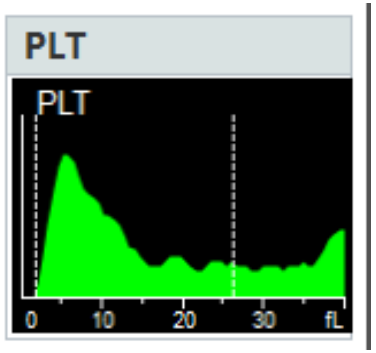
HA result in Jul.6 (EDTA anticoagulant)

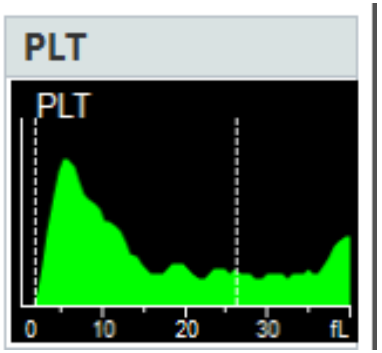
After collection in 5r		30min		1H		2H			3H		
PLT-O	240	PLT-O	220	PLT-O	197	PLT-O	R	162	PLT-O	R	99
PLT-I	224	PLT-I	157	PLT-I	83	PLT-I	R	47	PLT-I	R	27
WBC-O	5.26	WBC-O	5.34	WBC-O	5.18	WBC-O		5.62	WBC-O		4.42
WBC-D	6.12	WBC-D	6.05	WBC-D	6.95	WBC-D		7.59	WBC-D		8.29
TNC-D	6.12	TNC-D	6.05	TNC-D	6.95	TNC-D		7.59	TNC-D		8.29
WBC-N	6.01	WBC-N	6.17	WBC-N	6.14	WBC-N	R	7.70	WBC-N	R	8.13
TNC-N	6.01	TNC-N	6.17	TNC-N	6.14	TNC-N	R	7.70	TNC-N	R	8.13







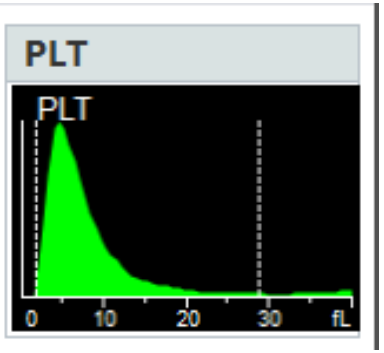


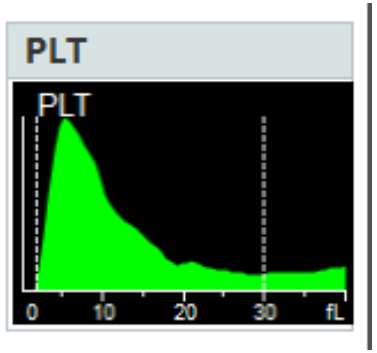


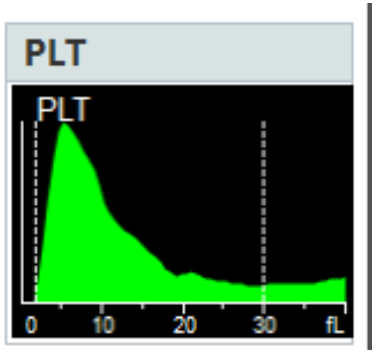
As can be seen from the histogram, the graph is normally in within 5min of blood collection on the analyzer. With the increase of the detection time, 30min after blood collection, the test has appeared histogram tail elevation tendency, and accompanied by jagged changes. A clear indication of platelet aggregation histogram had appeared at 3H after blood collection.

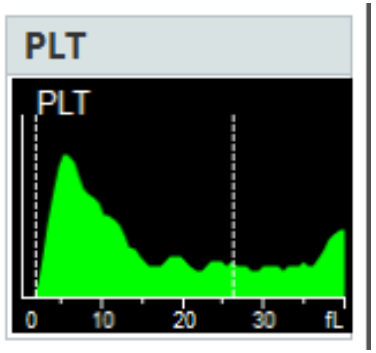
HA result in Jul.6 (EDTA anticoagulant)

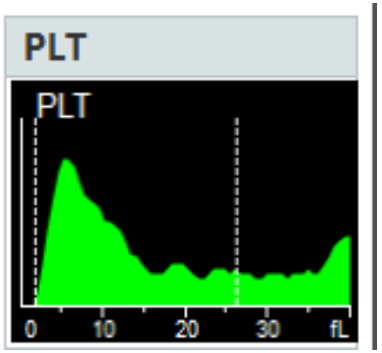
After collection in 5r		30min		1H		2H			3H		
PLT-O	240	PLT-O	220	PLT-O	197	PLT-O	R	162	PLT-O	R	99
PLT-I	224	PLT-I	157	PLT-I	83	PLT-I	R	47	PLT-I	R	27
WBC-O	5.26	WBC-O	5.34	WBC-O	5.18	WBC-O		5.62	WBC-O		4.42
WBC-D	6.12	WBC-D	6.05	WBC-D	6.95	WBC-D		7.59	WBC-D		8.29
TNC-D	6.12	TNC-D	6.05	TNC-D	6.95	TNC-D		7.59	TNC-D		8.29
WBC-N	6.01	WBC-N	6.17	WBC-N	6.14	WBC-N	R	7.70	WBC-N	R	8.13
TNC-N	6.01	TNC-N	6.17	TNC-N	6.14	TNC-N	R	7.70	TNC-N	R	8.13





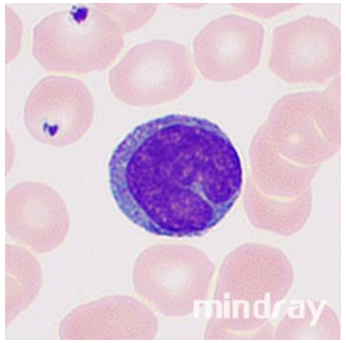
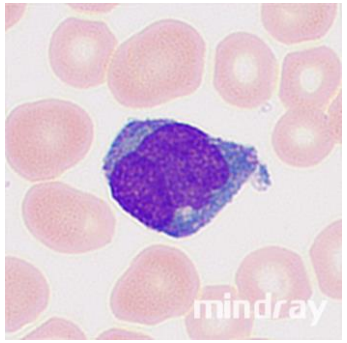
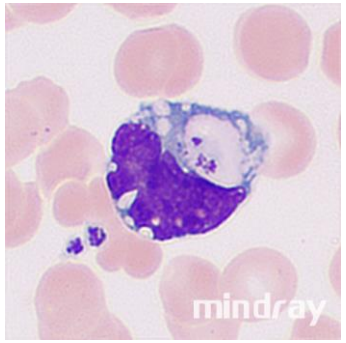
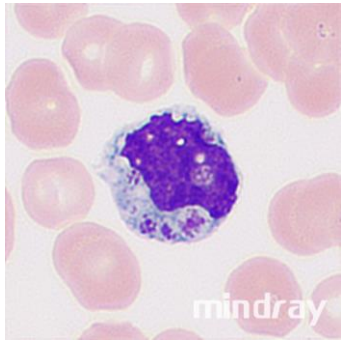
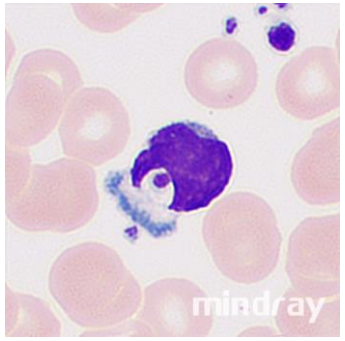
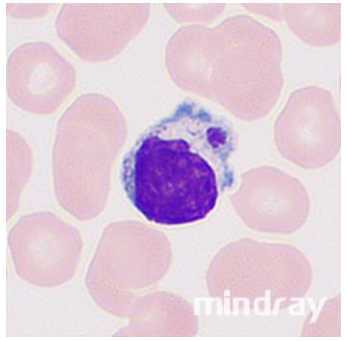
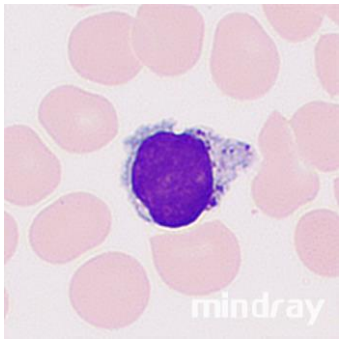
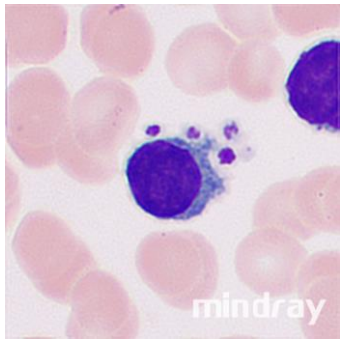
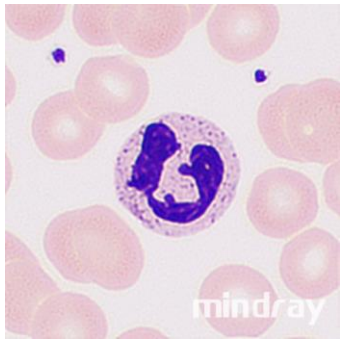
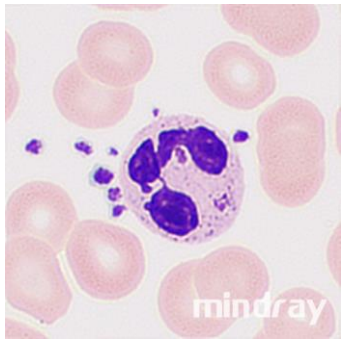
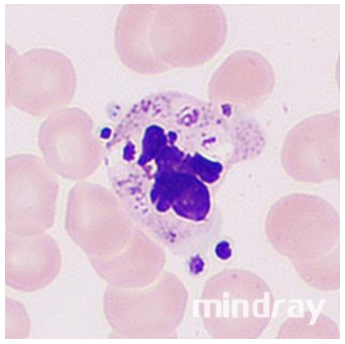
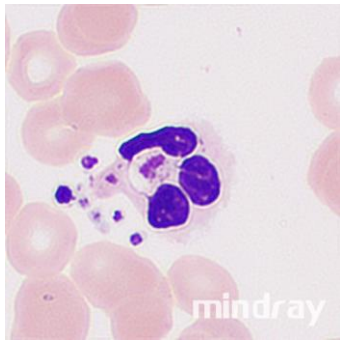
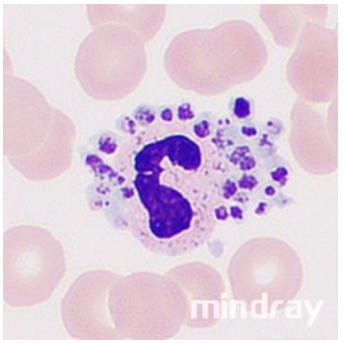






From the results of CDR, it can be seen that there was almost no difference between PLT-I and PLT-O results within 5 min after blood collection, and with the increase of the assay time, the PLT-O results were much larger than PLT-I, indicating that the EDTA-dependent platelet aggregation samples could be improved by the detection of the RET channel, but the PLT-O results also decreased with the increase of the time, which indicates that with the increase of time, the RET channel decreasing ability to depolymerize platelets

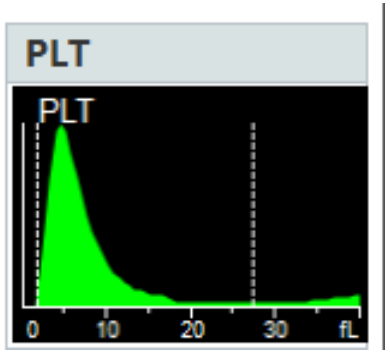
Detection of morphology in Jul.6 （EDTA)

	After collection in 5min	30min	1H	2H	3H
Mon					
Lym					
Neu					

HA result in Jul.6 (Sodium citrate)

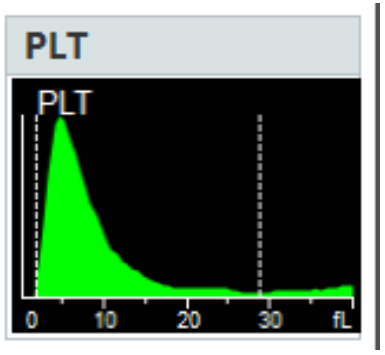
After collection in 5min

PLT-O	225
PLT-I	189
WBC-O	5.54
WBC-D	5.60
TNC-D	5.60
WBC-N	5.62
TNC-N	5.62



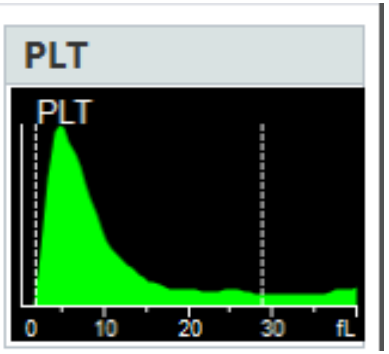
30min

PLT-O	185
PLT-I	174
WBC-O	4.22
WBC-D	5.35
TNC-D	5.35
WBC-N	5.36
TNC-N	5.36



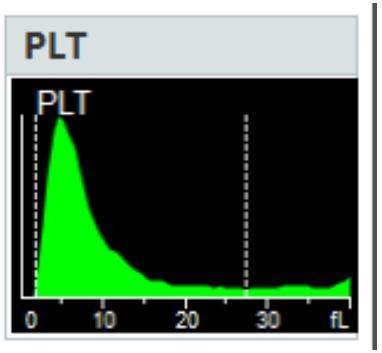
1H

PLT-O	170
PLT-I	129
WBC-O	4.70
WBC-D	5.25
TNC-D	5.25
WBC-N	5.26
TNC-N	5.26



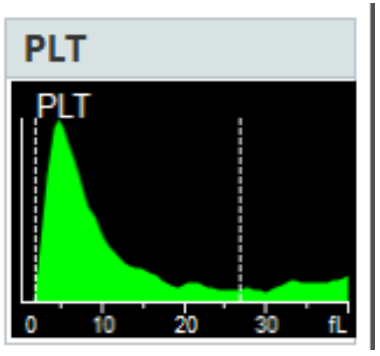
2H

PLT-O	140
PLT-I	115
WBC-O	4.02
WBC-D	5.92
TNC-D	5.92
WBC-N	5.42
TNC-N	5.42



3H

PLT-O	116
PLT-I	93
WBC-O	3.94
WBC-D	6.30
TNC-D	6.30
WBC-N	5.41
TNC-N	5.41

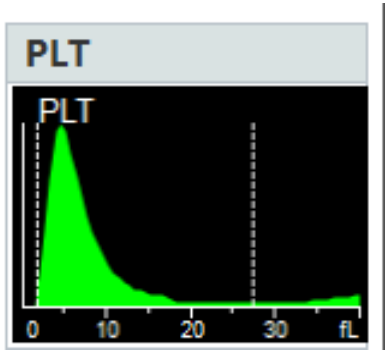


From the histogram, the graph does not change in PLT clumps within 5 min of blood collection using sodium citrate blood collection tubes on the machine. The histogram did not change significantly with increasing detection time, and only after 3 hours of blood collection did the histogram show an elevated trend.

HA result in Jul.6 (Sodium citrate)

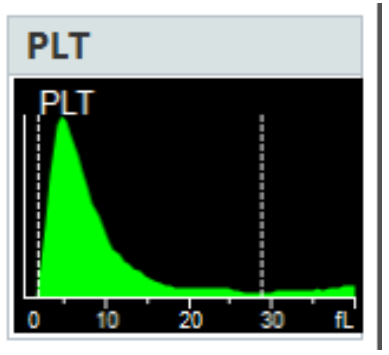
After collection in 5min

PLT-O	225
PLT-I	189
WBC-O	5.54
WBC-D	5.60
TNC-D	5.60
WBC-N	5.62
TNC-N	5.62



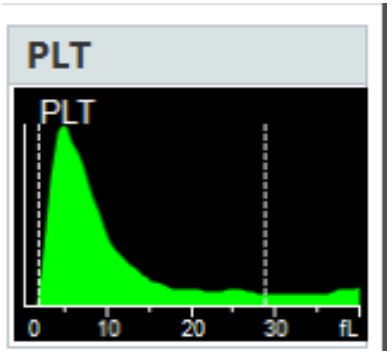
30min

PLT-O	185
PLT-I	174
WBC-O	4.22
WBC-D	5.35
TNC-D	5.35
WBC-N	5.36
TNC-N	5.36



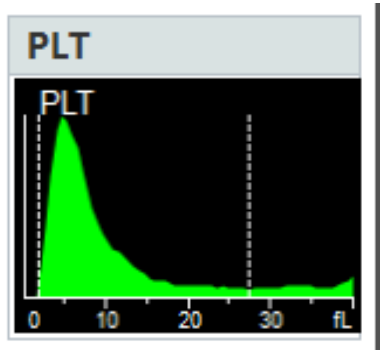
1H

PLT-O	170
PLT-I	129
WBC-O	4.70
WBC-D	5.25
TNC-D	5.25
WBC-N	5.26
TNC-N	5.26



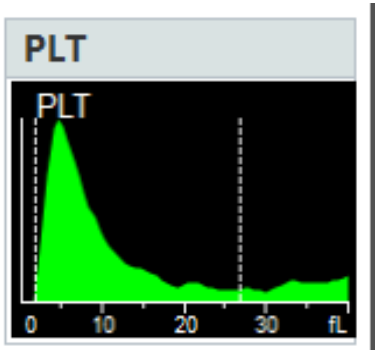
2H

PLT-O	140
PLT-I	115
WBC-O	4.02
WBC-D	5.92
TNC-D	5.92
WBC-N	5.42
TNC-N	5.42



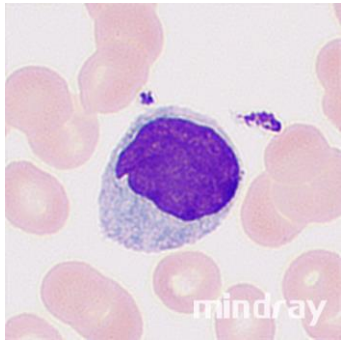
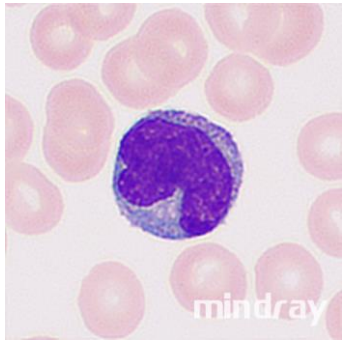
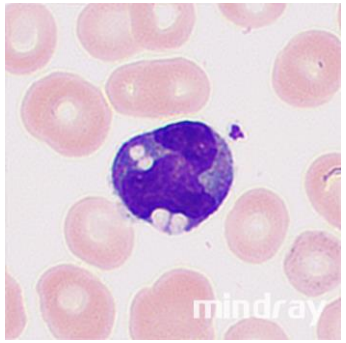
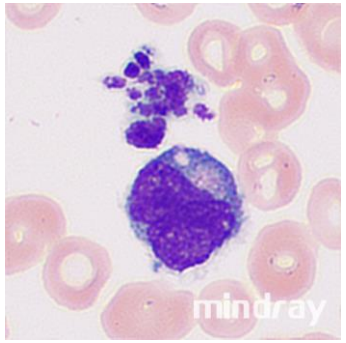
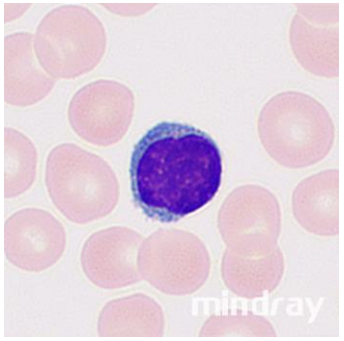
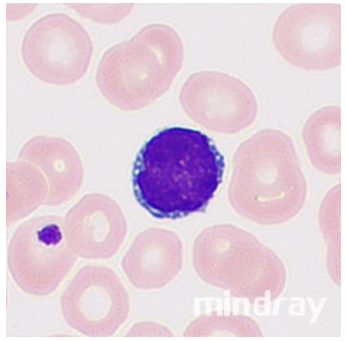
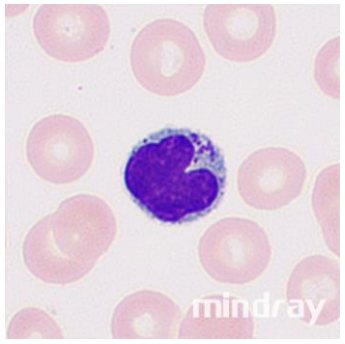
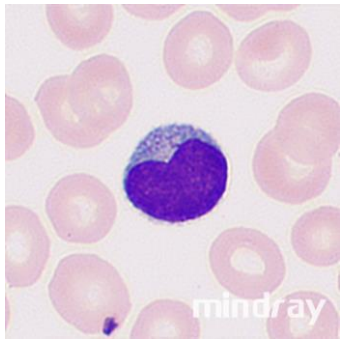
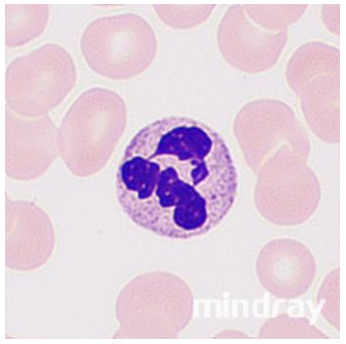
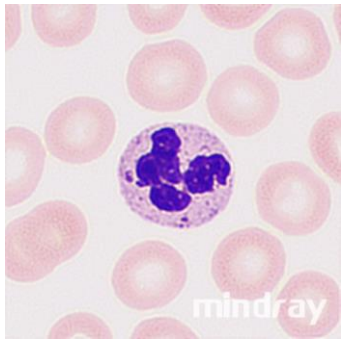
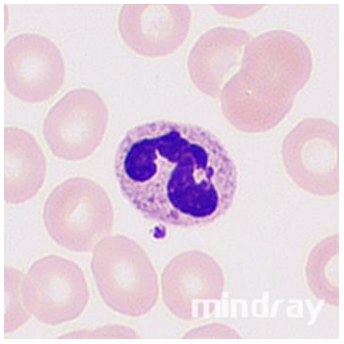
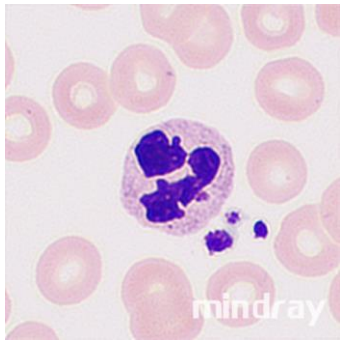
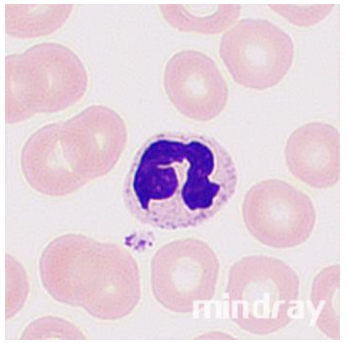
3H

PLT-O	116
PLT-I	93
WBC-O	3.94
WBC-D	6.30
TNC-D	6.30
WBC-N	5.41
TNC-N	5.41



As shown by the CDR test results, the degree of platelet aggregation using the sodium citrate blood collection tube was much lower than that of the EDTA anticoagulant tube, indicating that the platelet satellite phenomenon in this patient was induced by the EDTA anticoagulant. However, the results showed that different degrees of platelet aggregation also occurred in the sodium citrate anticoagulation tube, suggesting that EDTA anticoagulant interference may also be accompanied by sodium citrate anticoagulant interference.

Detection of morphology in Jul.6 （Sodium citrate）

	After collection in 5min	30min	1H	2H	3H
Mon					
Lym					
Neu					

Case analysis

Ethylenediaminetetraacetic acid (EDTA) is widely used in clinical work because it can prevent blood coagulation by binding to Ca^{2+} in the blood to form a chelate, while rendering Ca^{2+} incapable of coagulation. However, EDTA has often been reported to induce platelet aggregation over a certain period of time, and causing a pseudo-reduced platelet count.

PLT satellite phenomenon is an in vitro phenomenon in which PLT forms rosette knots around polymorphonuclear neutrophils[1], This phenomenon can be seen in cancer, leukaemia and immune disorders and does not usually include platelet dysfunction.[2][3]。

Case analysis

Platelet satellite phenomenon caused by EDTA anticoagulants is also seen in normal individuals, but in most cases with certain diseases, the literature reports a case of a woman with urinary tract infection that presented with platelet satellite phenomenon, but the platelet satellite phenomenon disappeared after the patient was cured for three weeks [8]。 EDTA-dependent pseudothrombocytopenia has also been reported to be transmitted from pregnant women to newborns, causing transient pseudothrombocytopenia in newborns.

In the present case, a more severe EDTA-dependent thrombocytosis satellite phenomenon accompanied the patient's development of chronic gastric cancer and other diseases. It is worth noting that platelet satellite phenomenon usually occurs around neutrophils, but similar to this patient's lymphocytes and monocytes also appeared in the corresponding satellite and phagocytosis phenomenon is relatively rare, this in the lymphocytes around the emergence of platelet satellite phenomenon may be due to the surface of the lymphocyte protein molecules are abnormal and lead to adsorption of platelets.

Case analysis

In daily work, if the routine blood test has been using the resistive method for platelet counting, the counting results are easily interfered by platelet aggregation, large platelets or small red blood cells, resulting in a falsely lowered or elevated platelet count. The RET channel of Myriad instruments can largely circumvent such interference by adding depolymerising agents, fluorescent staining and other means. When we find similar interference from histograms or instrument alarms, we can ensure the correctness and accuracy of platelet counts by changing the detection channel and accelerating the completion of sample testing to the greatest extent possible, such as collecting blood next to the instrument.

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Thanks!

mindray 迈瑞