Leukocyte differential in hematology analyzers according to white blood cell count.

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Introduction

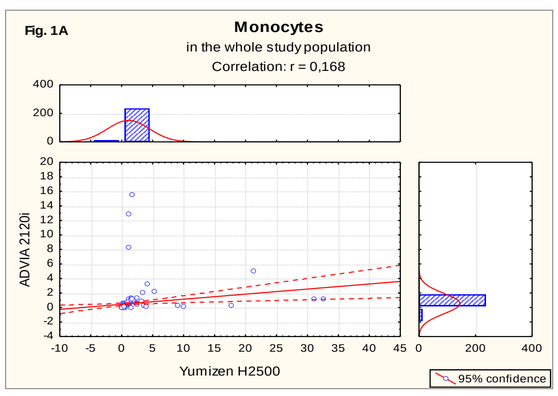
Measurement technologies used in hematology analyzers have undergone continuous improvement, which has been mainly associated with the development of various flow cytometry techniques. Leukocytes are differentiated into subpopulations basing on cell volume as well as their size and complexity of the nucleus. Basic measurement technologies are supported by application of specific cytochemical reactions. The combination is to provide a high sensitivity and specificity of the determinations. Differential analysis of leukocytes in hematology analyzers is an important contribution to clinical practice. The aim of the study was to evaluate the analytical efficiency of new methodological solutions, used in hematology analyzer Yumizen H2500, compared with the ADVIA 2120i in the assessment of peripheral complete cell blood count (CBC) in difficult clinical situation, which is hematological oncology.

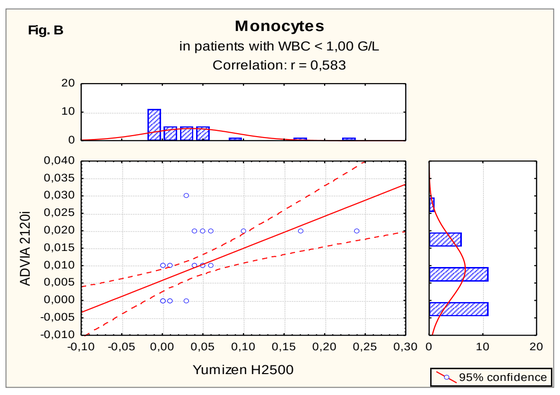
Materials and Methods

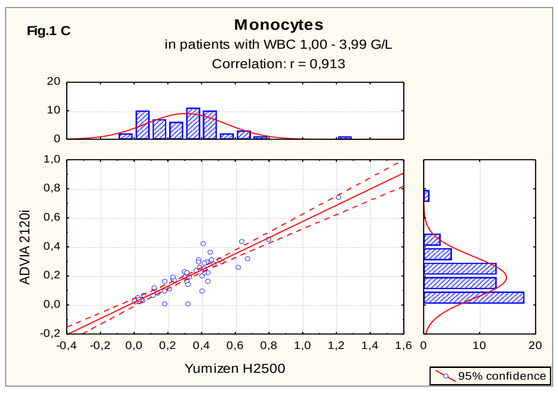
In 254 patients with hematological oncology diseases (126 women and 128 men; aged 25 to 84 years), in the same venous blood sample, CBC determinations using two hematology analyzers were performed in parallel.
Statistical analysis was performed using Statistica 10.0 version, taking into consideration the whole study population and 4 subgroups characterized by leukocytes count (WBC): WBC <1,00 x10^9/L; WBC 1,00-3,99 x10^9/L; WBC 4,00-10,00 x10^9/L, WBC >10,00 x10^9/L.

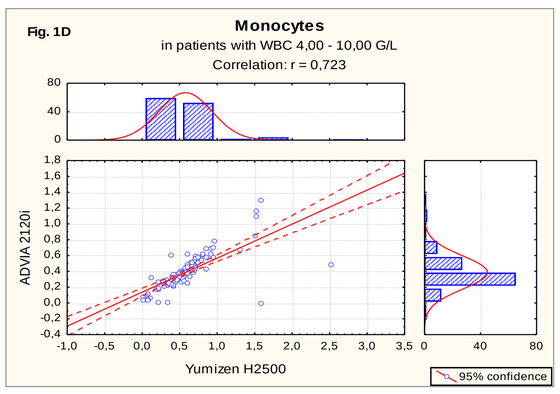
Results

Complete or almost complete correlations for routine CBC parameters were obtained from the two analyzers (RBC r=0,989, HGB r=0,998, HCT r=0,980, MCV r=0,928, PLT r=0,994, WBC r=0,997, Neu r=0,988, Lym r=0,998) in the whole study population. Among them in 35 patients, who were ordered Reticulocyte count, the correlation r=0,948 was observed. WBC, Neutrocytes, Lymphocytes continued very high coefficient of correlation in subgroups, excluding WBC <1,00 x10^9/L group. The best relationships were observed for Monocytes (r=0,913), Eosinocytes (r=0,968) and Basocytes (r=0,765) when WBC 1,00-3,99 x10^9/L. Extended differential parameters of Yumizen H2500, especially IMM (Immature Monocytic cells absolute value), IMG (Immature Granulocytic cells absolute value) and IML (Immature Lymphocytic cells absolute value) presented high/very high correlation to Advia 2120i Monocytic cell count, if regular relationships between Monocytes decreased in WBC <1,00 x10^9/L and WBC >10,00 x10^9/L groups.









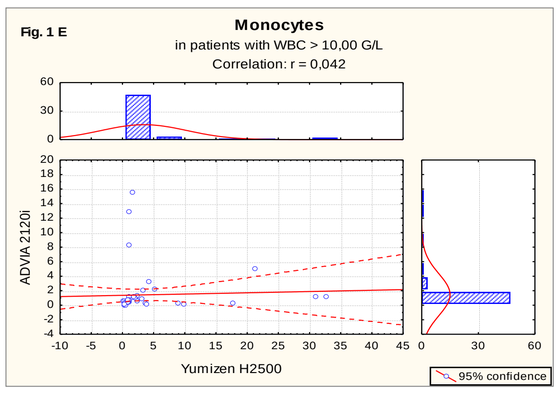


Table 1. Brief characteristics of analyzers: Yumizen H2500 and Advia2120i.

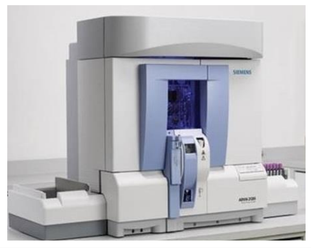
	Yumizen H2500	**ADVIA 2120i**
		
Parameters	CBC + 5 DIFF + RETIC	CBC + 5 DIFF + RETIC
Technology	optical + impedance	optical + cytochemical reaction
Efficiency (Throughput)	120 samples/hour	120 samples/hour
Blood sample volume	110 µl	175 µl
Operating mode	Manual and automatic - closed tube + autosampler	Manual and automatic - open or closed tube + autosampler
Weight	*112 kg*	193 kg

Table 2. Correlation of routine CBC parameters and WBC differential – in whole population and subgroups.

	The whole population n=254	WBC <1,00 x10^9/L n=29	WBC 1,00-3,99 x10^9/L n=53	WBC 4,00-10,00 x10^9/L n=118	WBC >10 x10^9/L n=54
RBC [x10^{12}/L]	0,989	0,938	0,981	0,988	0,987
HGB [mmol/L]	0,998	0,994	0,998	0,997	0,998
HCT [L/L]	0,980	0,857	0,971	0,983	0,969
MCV [fL]	0,928	0,641	0,969	0,950	0,879
PLT [x10^9/L]	0,994	0,985	0,994	0,991	0,995
WBC [x10^9/L]	0,997	0,892	0,980	0,937	0,999
Neu [x10^9/L]	0,988	0,864	0,942	0,927	0,985
Lym [x10^9/L]	0,998	0,863	0,983	0,978	0,997
Mono [x10^9/L]	*0,168*	0,583	**0,913**	0,723	*0,042*
Eos [x10^9/L]	0,839	0,962	**0,968**	0,462	0,935
Baso [x10^9/L]	0,654	0,444	**0,765**	0,568	0,630
LUC/LIC [x10^9/L]	0,552	*0,241*	--	--	0,497
A-Mono-& Y-LIC	0,917	**0,600**	--	0,250	**0,933**
A-Mono & IMM	0,932	**0,640**	--	0,264	**0,937**
A-Mono & IMG	0,820	0,254	--	*0,187*	**0,868**
A-Mono & IML	0,761	--	--	*0,003*	**0,743**

Conclusion

White blood cell differentiation could be an important challenge in specific hematology disorders and microscopy of peripheral blood smear remains the method of choice. However, the different immature leukocyte absolute value could improve the laboratory and clinical practice in the extreme white blood cell value patients.

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