Comparison of ESR Measurements Obtained Using the Modified Westergren Method and an Integrated Method on a Hematology Analyzer

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Introduction

In the context of high analytical workloads, modern laboratories require optimized workflows. Integrating erythrocyte sedimentation rate (ESR) measurement into a hematology analyzer alongside a complete blood count (CBC) presents a promising strategy for improving efficiency, standardization, and turnaround time. Mindray has developed an easy ESR, integrated into its hematology analyzer. The objective of this study was to evaluate the analytical agreement between the Ves-Matic Cube 200 (modified Westergren method) and the Mindray BC-6800 Plus (integrated method) for ESR measurement, ensuring result consistency during a technology transition.

Methods

A method comparison study was performed using 414 clinical samples with ESR values distributed across the entire analytical range. Agreement was assessed using Passing-Bablok regression and Bland-Altman plot analysis (Figures 1 and 2). Precision and reproducibility of ESR measurement results on the Ves-Matic Cube 200 and BC-6800 Plus analytical systems were evaluated based on 20 internal quality control (IQC) for each corresponding system in accordance with recommendation by their manufacturers (Table 1). Precision is presented as the coefficient of variation (CV%).

Results

1. Strong Correlation Between the Methods

A high correlation was observed between the ESR results obtained using the BC-6800 and Plus and Ves-Matic Cube 200 ($r = 0.93$), with a Passing-Bablok regression equation of $y = 3.387 + 0.695x$ (Figure 1).

There are no statistically significant systematic differences between the results of measurements performed on the two analyzers ($P > 0.05$).

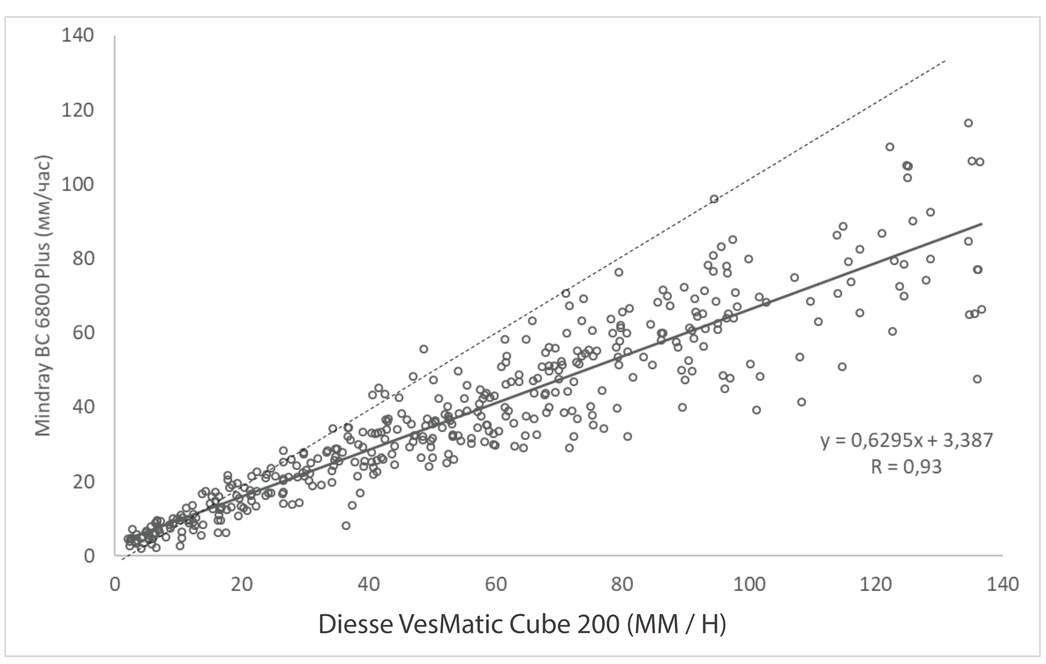

Figure 1. Analytical comparison of ESR results in clinical samples measured using the BC-6800 Plus hematology analyzer and the Ves-Matic Cube 200 system (N = 414).

2. Excellent Precision of the BC-6800 Plus Method

The alternative method on the BC-6800 Plus demonstrated excellent precision, with CVs ranging from 0.78 to 2.18%. Under the respective quality-control conditions, the Ves-Matic Cube 200 showed CVs ranging from 5.26% to 5.76%.

Table 1. The mean values and average precision of the IQC results based on 20 measurements.

Analyzer/QC name	Level 1		Level 2	
	Mean, mm/h	CV, %	Mean, mm/h	CV, %
Ves-Matic Cube 200/ ESR-Chex	7.62	5.76	46.25	5.26
BC-6800 Plus / BC-6D	14.83	2.18	33.52	0.78

The BC-6800 Plus exhibited highly reproducible results at both quality-control levels, supporting the analytical stability of the integrated ESR method.

3. Limited Overall Bias Between Methods

Bland–Altman analysis showed a small overall negative bias, with a mean relative difference of approximately –5% between the BC-6800 Plus and Ves-Matic Cube 200. Most measurements fell within the 95% limits of agreement. Although the overall mean bias was limited, the relatively wide limits indicated that larger differences could occur for individual samples.

Greater dispersion at higher ESR levels was consistent with the proportional difference identified by Passing–Bablok regression, suggesting method-dependent variation, particularly at elevated ESR values.

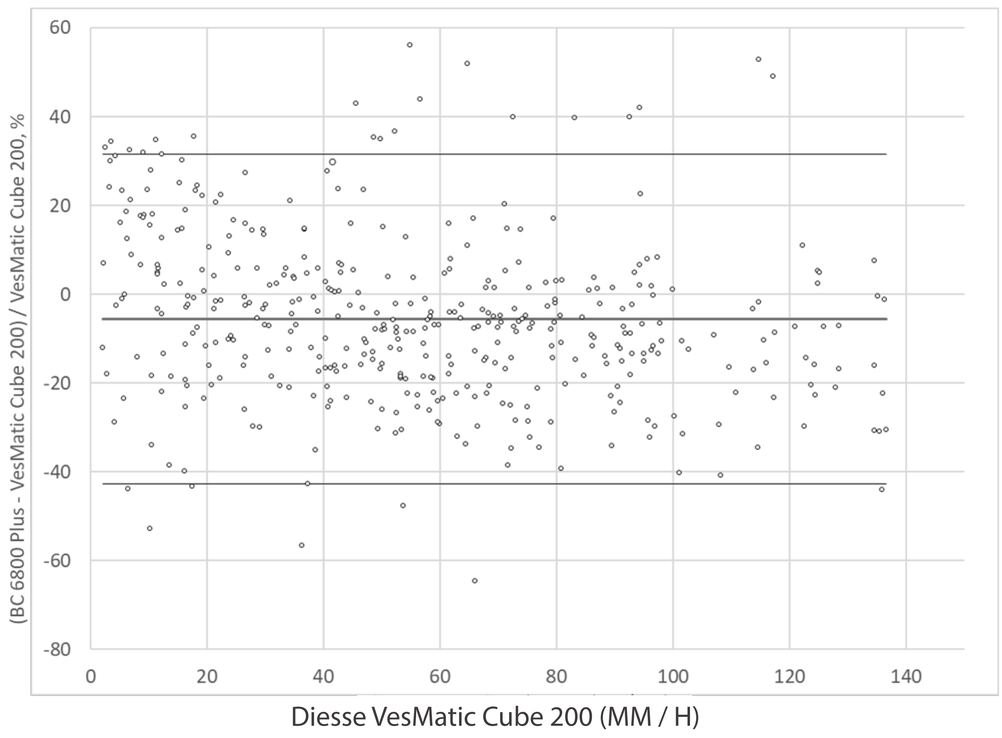

Figure 2. Comparison of ESR measurements between the modified Westergren and an integrated alternative method on the BC-6800 Plus using Bland-Altman analysis

Conclusions

The integrated ESR module of the Mindray BC-6800 Plus analyzer delivers accurate and reproducible results, ensuring consistency when transitioning from standalone Westergren-based systems. For high-volume laboratories, this integration enables simultaneous CBC and ESR testing from a single tube, improving workflow efficiency, reducing costs, and shortening turnaround time. Overall, it provides a rapid, reliable, and efficient approach for ESR determination.