DETERMINATION OF THE ERYTHROCYTE SEDIMENTATION RATE (ESR) ON TWO AUTOMATED SYSTEMS USING EDTA SAMPLES IN PATIENTS WITH RHEUMATOLOGIC DISEASES

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Background

Monitoring disease activity in patients with rheumatologic diseases includes determination of ESR. The use of Westergren method with diluted citrate blood is recommended, which takes 60 minutes. In order to reduce time for determination but still get reliable results for ESR, we test two automated systems using undiluted EDTA samples.

Methods

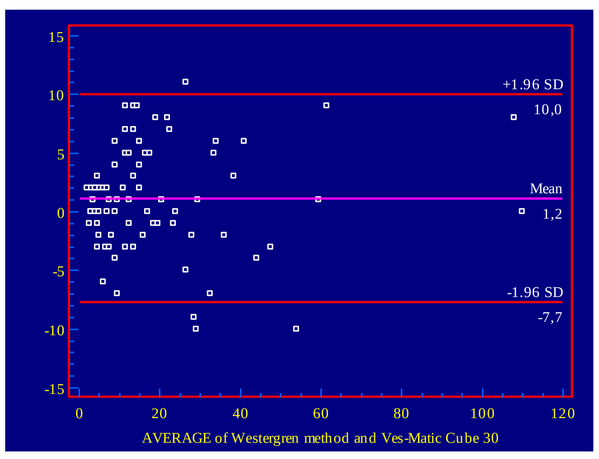
Citrate and EDTA blood samples were obtained from 80 patients suffering from rheumatologic diseases. Both automated methods use standard primary EDTA tubes for determination of ESR. The **Roller Test-1 (Alifax, Italy)** measures the sedimentation and aggregation capacity of erythrocytes via optical density using an infrared ray microphotometer. A mathematical algorithm converts the raw data into ESR results, which are transformed to comparable Westergren values. The duration of the analysis is three minutes including mixing. The **Ves-Matic Cube 30 (Diesse, Italy)** determines ESR directly in closed primary tube with EDTA blood samples using infrared sensor to measure the level of opacity of the column of blood in tube in vertical position. The results obtained after 33 minute analysis correspond to the Westergren method results after 60minutes of sedimentation. We used Westergren method as a reference. The **Westergren method** was performed according to ICSH specifications on diluted blood samples anticoagulated with citrate (4 vols of blood and 1 vol of 0,129M citrate) using plastic pipettes. During sedimentation, the pipettes were mounted vertically on appropriate supporting racks and kept at room temperature, which never exceeded 25°C.

Figure 1. Roller Test-1 (Alifax, Italy) analyser.

Figure 2. Ves-Matic Cube 30 (Deisse, Italy) analyser.

Results

Bland and Altman analysis of ESR results measured by Westergren method and Ves-Matic: limits of agreement between -7,7 and 10 mm/h, bias 1,2 mm/h, by Westergren method and Roller Test-1: limits of agreement between -31,5 and 22,8 mm/h, bias -4,4 mm/h. Passing and Bablok regression of ESR results for Westergren method vs Ves-Matic: slope 1,0000 (95% CI 0,9000 to 1,0435), intercept -1,0000 (95% CI -1,7391 to 0,3500), for Westergren method vs Roller Test-1: slope 1,2000 (95% CI 1,0381 to 1,3898), intercept -0,2000 (95% CI -2,1186 to 2,1333). Spearman's coefficient of rank correlation for Westergren method vs Ves-Matic: r=0,928 (95% CI 0,8896 to 0,9533, p<0,0001), for Westergren method vs Roller Test-1: r=0,905 (95% CI 0,8534 to 0,9384, p<0,0001).



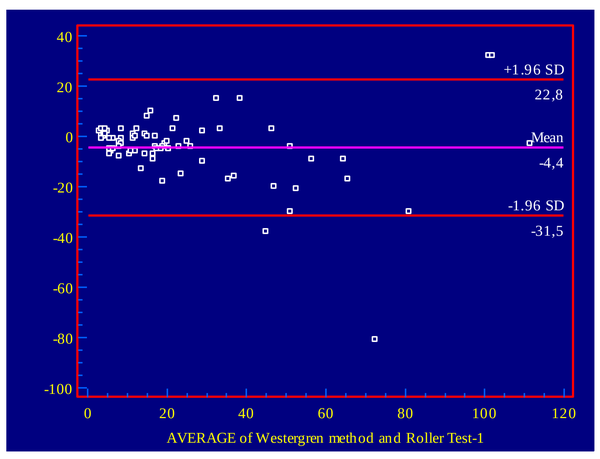
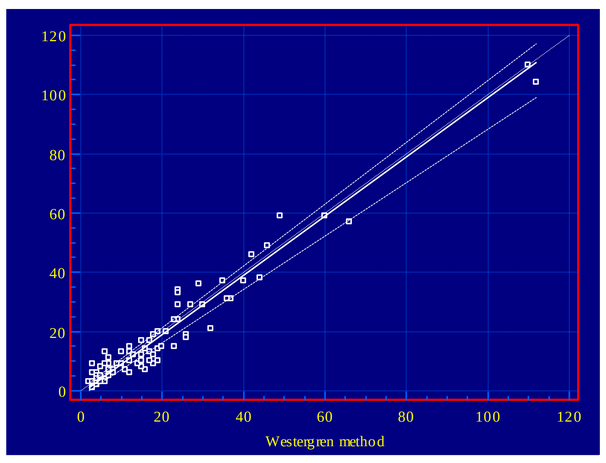


Figure 3. Bland and Altman analysis of ESR results measured by Westergren method and Ves-Matic Cube 30 and by Westergren method and Roller Test-1.



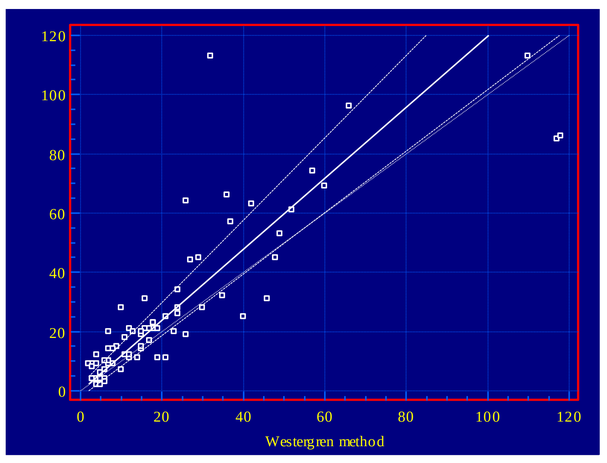


Figure 4. Passing and Bablok regression of ESR results measured by Westergren method vs Ves-Matic Cube 30 and by Westergren method vs Roller Test-1.

Conclusions

In both automated systems, EDTA blood is used, so no extra citrate tube is required. Other advantages of the automated systems are safer work and less mistakes during the possibility of direct data transmission to LIS. Both systems provide fast results that are highly correlated with the reference method; however, the results obtained on Roller Test-1 (Alifax, Italy) sometimes deviate too much from the real value, indicating that this is, in contrast to Diesse method, not a reliable method for determination of ESR in patients with rheumatologic diseases.