Conventional ESR V/S Automated VES- MATIC 20/20 Plus New ESR- A Comparative Study Of 100 Cases.

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ABSTRACT

Background: To compare the ESR values by Ves- matic 20/20 plus new with the conventional Westergren method, aiming to validate the automated methods. **Methods:** A cross – sectional study was conducted in Government Medical College, Patiala. A total of 100 blood samples were subjected to ESR estimation by manual Westergren method and by automated (Ves – Matic) method. Results were analysed, compared and their correlation was calculated using Pearson correlation coefficient. **Results:** There is a strong positive correlation between Westergren method and Ves- matic 20/20 plus new with correlation coefficient 0.99. **Conclusion:** Ves-matic method (automated) shows good correlation with manual Westergren method and is reliable and suitable for use in high work load clinical laboratory.

Keywords: ESR, Westergren, Ves- matic, Automated.

INTRODUCTION

The erythrocyte sedimentation rate was introduced in the medical practice in 1897 and referred to as the Biernacki or Fahraeus – Westergren method. It describes the distance in millimeters that red blood cells settle in a vertical tube during a specified period of time.[1] The erythrocyte sedimentation rate (ESR) is a most widely used test in clinical practice. It increases in various infectious diseases, inflammations, malignancies and autoimmune diseases reflecting both the plasma (acute phase proteins) and cellular properties (red blood cell concentration, RBC surface charge and aggregation).[2-5] ESR is a particularly sensitive indicator of silent and chronic inflammation that is the underlying process in many diseases and the most widely measured index of acute phase response.[6-7]

The Westergren method is considered as the reference methodology.[1] Subsequently modifications have been made and ICSH guidelines allow for the use of alternative newer and safer ESR techniques. The Ves-matic analyser is a new automated instrument for measuring ESR and the

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advantage conferred by this method is that it can generate ESR readings in 25 minutes. Additionally the same EDTA sample collected for complete blood counts can also be used for ESR analysis by this machine.[8]

MATERIALS AND METHODS

A cross – sectional study was conducted in the Clinical Pathology Department, Government Medical College, Patiala. A total of 100 blood samples were subjected to ESR estimation by manual Westergren method and by automated (Ves – Matic) method.

In the Westergren method, venous blood was collected in 3.8% tri- sodium citrate solution in 4:1 (blood: citrate) proportion. Anti coagulated blood sample was mixed thoroughly and the Westergren tube was filled with the blood sample upto the ''0'' mark. The tube was placed in a strictly vertical postion in the ESR stand and was left undisturbed for one hour. After exactly one hour the height of the column of plasma above the red cell column was read in millimeters.

The Ves- matic 20/20 plus new is a bench instrument designed and programmed to simultaneously determine the ESR in a maximum of 20 samples of blood contained in specific cuvettes. By this procedure result was obtained in 25 minutes. It uses specially designed evacuated plastic tubes (Vacu-tec) containing sodium citrate as anticoagulant, to

draw 1ml of blood. The tubes are the key component of the system, as they double as collection tubes and testing cuvettes. The cuvettes after being filled with 1.1ml carefully mixed blood to an intended height of 60 mm, were placed in the instrument. The instrument maintained the cuvettes at an angle 18° to the vertical and a photoelectric cell then passes up the outside of each cuvette to record the height of the column of red cells at which light transmission occurs. After 25 minutes of sedimentation, timed electronically, the new level at which light passes through the column was recorded and the decrease in height was corrected mathematically to give a result. The results of Westergren and automated method were divided into 3 groups: Group 1: ESR 0-20, Group 2: 21-50, Group 3: 51-100. Means of the results were compared in all samples and in 3 groups and coefficient of variation was calculated.

Figure 1: ESR Estimation By Manual Westergren Method.

Figure 2: Automated Ves-Matic 20/20 Plus New For ESR Estimation

Table 1: Evaluation of results of various groups by manual and automated methods (n=100).

Methods	Mean+/- SD (mm/time)	Difference of means	Coefficient of variation (%)
All cases (n=100)			
Westergren	31.48+/- 26.43	-	83.95%
Ves Matic	31.19+/- 26.49	0.29	84.95%
Group 1 (n= 48)			
Westergren	10.67+/- 5.62	-	52.74%
Ves Matic	10.89+/- 5.47	-0.22	50.24%
Group 2 (n= 33)			
Westergren	32.84+/- 8.93	-	27.20%
Ves Matic	34.21+/- 9.46	-1.37	27.67%
Group 3 (n= 19)			
Westergren	74.90+/- 16.73	-	22.34%
Ves Matic	77.21+/- 16.54	-2.31	21.42%

Table 2: Pearson correlation between Westergren and Ves-matic method.

Methods	Correlation coefficient
Westergren and Ves-matic method	r = 0.99

RESULTS

[Table 1] Shows the mean and SD values, difference of means and coefficient of variation calculated for Westergren and Ves-matic method in a total of 100 samples as well as among the 3 groups. As shown in the table the difference of means with Ves-matic method is insignificant at higher values of ESR (group 3).

[Table 2] shows the pearson correlation between the two methods and suggest that there is a strong positive correlation between Westergren and Ves-matic method with pearson coefficient 0.99. (significant at 0.01)

DISCUSSION

Erythrocyte sedimentation rate continues to be used as an indicator of inflammation and infection in all levels of laboratory services; despite being a non-specific test. The gold standard technique for measuring ESR is the Westergren method. However, this method has distinct disadvantages which limit its applications.[9] Over the years, several attempts to introduce automated systems such as SEDI system (Becton Dickinson), Sedimatic (AnalysInstrument), Starrsed (R & R Mechatronics), Test1 System (SIRE) for measuring ESR have evolved. The modifications introduced include the use of unopened blood collection tubes, vacuum-controlled aspiration of the sample (which intends to provide a

correct dilution with the anticoagulant) and automated mixing.[10-13] Due to the rise in the prevalence of diseases such as hepatitis B and HIV, transmitted by blood, safety precautions against contamination of laboratory personnel are imperative. Using an automatic analyzer such as Ves- matic 20/20 Plus new is one evolutionary step in this regard. Despite these advantages, it is important to validate the automatic techniques against the commonly used manual Westergren method. In recognition of the need for a standardization of the measurement of ESR, the ICSH has proposed a protocol for the evaluation of alternative methodologies against the reference method. The new technologies must be tested over a range of ESR values of 2–120 mm. In this comparison, 95%of the differences should be 5 mm or less, with larger differences associated with higher ESR values. The statistical methods recommended for ESR evaluations are the coefficient of correlation, the Passing-Bablock regression and the Bland- Altman statistical method.[14]

In the present study majority of the differences in ESR values were 5mm or less , in Group 1 and 2 while differences in values of ESR of > 5mm were seen in group 3 as recommended in ICSH guidelines.

A strong positive correlation was found between the Westergren and Ves- matic method (r=0.99) and the results were comparable with the following studies.

Table 3:

Author and year of study	Correlation coefficient	Significance
Fiorucci et al[15] 2000	r = 0.99	Strongly positive
Pirovic et al[16] 2010	r = 0.95	Strongly positive
Asif et al[17] 2012	r = 0.97	Strongly positive
Present study 2018	r = 0.99	Strongly positive

In the present study, the difference of means with Ves-matic method was insignificant at higher values of ESR (group 3) which might possibly be due to the lesser number of cases in this group. This is comparable to the study conducted by Asif et al.[17]

CONCLUSION

Both the methods i.e. Westergren and Ves matic shows good correlation and are equally reliable and suitable for ESR estimation.

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