

Comparative study between Westergren and modified microhaematocrit method for determination for erythrocyte sedimentation rate

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Abstract. To compare between standard Westergren and modified microhaematocrit method for determination for erythrocyte sedimentation rate Study design: A laboratory method comparative study. Subjects: blood samples from 80 individual subjects. For each subject, two methods for erythrocyte sedimentation rate determination were performed. The first method was the Westergren method as a standard method and the second was the modified microhaematocrit method. Then comparison for both methods was performed. From the study, the comparison-of-methods plot and modified microhematocrit method (X) VS Westergren method (Y) gave the least square linear regression equation of $Y = 0.996 X + 0.77$ ($r = 0.99$). Precision analysis gave a coefficient of variation below 3%. The new erythrocyte sedimentation rate determination gave good correlation to the standard method. It seems to be an effective and safe method for erythrocyte sedimentation rate determination in the present day.

Key words: erythrocyte sedimentation rate determination

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INTRODUCTION

Suitable and effective techniques of erythrocyte sedimentation rate (ESR) determination have been necessary for the success of laboratory processes. Several methods of ESR determination have been developed¹. Among these techniques, Westergren method is accepted as the standard method¹⁻² and has been used worldwide.

Although the Westergren method has been popular for its many advantages, the risk (for contact) of

the practitioner with blood specimens, which can lead to blood-borne infection, is remains high. Furthermore, it still required many cubic centimeters of blood specimen into the sedimentation tube in the process. Therefore, any new method, that can reduce the risk of blood contact and reduce required collected blood is useful.

In this study, a modification from microhaematocrit method for determination for ESR rate was tested. This method uses an apparatus for microhaematocrit method determination, which is common in every clinical laboratory. This study was set as a comparative study between the Westergren method and the new modified microhaematocrit method for determination for ESR.

MATERIAL AND METHODS

This study was carried out as a comparative study between the classical Westergren method and new modified microhaematocrit method for determination of ESR. The setting was the clinical laboratory, Division of Laboratory Medicine, King Chulalongkorn Memorial Hospital. Eighty individual volunteer subjects were included. For each subject, two methods for ESR determination were performed. The first method was the Westergren method¹ as a standard method and the second was the modified microhaematocrit method.

The modified microhaematocrit method was the new developed making use of microhaematocrit apparatus. Microhaematocrit capillary tube (Terumo) filled with venous blood already treated with anticoagulant was set. One end is sealed with clay then it was placed vertically for 1 hour. Special microhaematocrit reading device was used in reading the percentage of sedimentation. Using the same method as reading the haematocrit value, the packed red cell height and the total height of the entire specimen was detect-

ed then a percentage value of the packed red cell as percentage of sedimentation can be obtained. Erythrocyte sedimentation rate was calculated by transformation to the Westergren tube scale (200 millimeter-height) using the following equation: $ESR = (1 - \text{percentage of sedimentation}) \times 200$. The unit of erythrocyte sedimentation by this method was millimeter per hour.

The ESR for each sample was read and recorded at 1 hour. All recorded data were collected, analyzed and interpreted. Linear regression was performed in order to assess significant difference in the ESR obtained by the Westergren and modified microhaematocrit methods.

RESULTS

All 80 samples were analyzed for ESR by the Westergren and modified microhaematocrit methods. The data from this study are summarized in Table 1. The comparison of methods plot modified microhaematocrit method (X) VS Westergren method (Y) gave the least square linear regression equation of $Y = 0.996X + 0.77$ ($r = 0.99$) (Figure 1). Precision analysis gave a coefficient of variation below 3%.

DISCUSSION

Erythrocyte sedimentation rate¹ is an important laboratory investigation in medicine. Although it is a non-specific parameter, it can help physicians diagnose and follow-up many diseases. Therefore, a number of methods for ESR determination have been performed.

The Westergren method¹⁻² is accepted as the standard method in the present day but there are some limitations to this technique. Firstly, it is an open method, therefore, practitioner have to contact the blood specimen directly. In the present day, there are a number of blood-borne pathogens, which cause diseases, especially hepatitis and HIV infection. The classical Westergren erythrocyte sedimentation tube was a large glass tube and washing for further use must be done. Transportation of the tube must be careful. Hazards not only from possibly damaged glassware but also contaminated blood can be expected. Therefore, it seems not applicable to the setting that blood borne infection is rather high and it does not match the concept of laboratory safety³.

In this study, a new modified microhaematocrit

Table 1. Characteristics of samples used in the study.

| Assays | Values (millimeter/hour) |
|----------------------------------|-----------------------------|
| Westergren method | 33.63 ± 23.55 |
| Modified microhaematocrit method | 33.53 ± 24.75 |

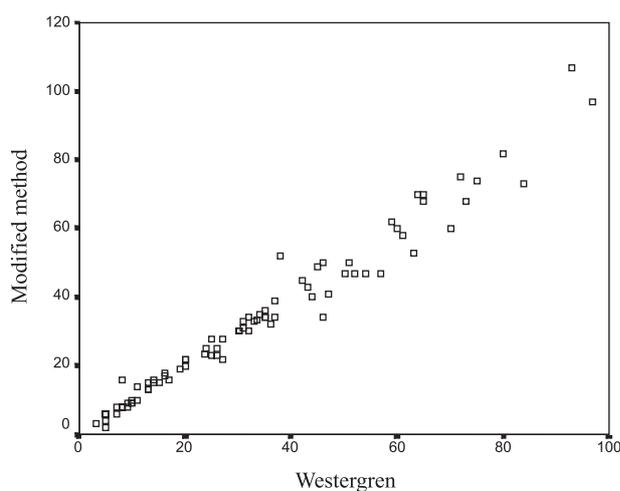


Figure 1. Comparison of standard Westergren and modified microhaematocrit method for erythrocyte sedimentation rate determination.

method was set and tested. This new method makes use of simple apparatus, which can be easily available in every laboratory. The microcapillary tube is easier to use, required little sample to fill and fit for transportable into field - work. Only a little amount of specimen is required for the test comparing to the classical Westergren method. Therefore, it seems to be an interesting method and can be used as a bedside test, especially for the patients with limitation of blood availability as paediatric patients.

This study, revealed that usage this new technique can provide very good correlation ($r=0.99$). Therefore, it can be a potentially useful tool in performing ESR determination especially in a setting where the rate of blood-borne infectious diseases is rather high³.

However, there are still some limitations with this new method. Firstly, it is also an open method, therefore, risk to the practitioner of contact with blood specimens may occur while filling the collected blood into the capillary tube, therefore, universal precaution is

still necessary.

This study is a pilot one in a specific laboratory setting. Some variations of the test due to the setting can be expected. Therefore, further studies in a multi center should be performed.

REFERENCES

1. Ravel R. Miscellaneous diagnostic procedures. In Richard R (ed): Clinical Laboratory Medicine. First edition. Williams & Wilkins, Maryland, 1994, pp. 179-182.
2. Thomas RD, Westergard JC, Hay KL et al. Calibration and validation for erythrocyte sedimentation rate tests. Roles of the International Committee on Standardization in Hematology reference procedure. Arch Pathol Lab Med 1993; 117: 719-723.
3. Wongsena W, Kunakorn M, Tanprasert S et al. Detection of HIV-1 window period infection in blood donors using borderline anti-HIV results, HIV-1 proviral DNA PCR, and HIV-1 antigen test. J Med Assoc Thai 1997; 80: S112-115.