COMPARATIVE STUDY BETWEEN THE WESTERGREN AND AUTOMATED METHOD FOR DETERMINATION OF THE ERYTHROCYTE SEDIMENTATION RATE

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Abstract A comparative study between the standard Westergren and a new automated method for the determination of erythrocyte sedimentation rate (ESR) was performed on 80 individual subjects. From this study, the comparison-of-methods plot automated method (X) and VS Westergren method (Y) gave the least square linear regression equation of Y=0.978 X + 0.64 (r=0.98). Precision analysis gave a coefficient of variation below 3%. At present the new automated method seems to be an effective and safe technique for determination of the erythrocyte sedimentation rate. Chiang Mai Med Bull 2001;40(3):139-141.

Suitable and effective techniques for erythrocyte sedimentation rate (ESR) determination are necessary for the success laboratory processes. Several methods to determine the ESR have been developed. Among these, the Westergren method is accepted as a standard technique that has been widely used in Thailand.

Although the Westergren method has been popular for its many advantages, the risk to the practitioner regarding contact with blood specimens, which can lead to blood-borne infection, is still high. At present, many new methods to determine the ESR have been developed to decrease the risk. Automated erythrocyte sedimentation determination is an example of newly developed equipment. The automated R tube is a specially designed erythrocyte sedimentation analyzer based on the principle of the electrical impedance of human blood. By using this new technology, the ESR can be easily performed. After application of the collected specimen tube onto the analyzer, determination can be carried out automatically.

This new method is currently used in Thailand, but there is no report about its efficacy. Therefore, this study was set as a pilot study to compare this new technique to the Westergren method for determination of ESR.

Materials and methods This study was comparative between the classical Westergren and automated method for determination of the ESR. Eighty individual volunteer subjects were included. For each subject, two methods of ESR determination were performed. The first was the Westergren method, which was as standard method, and the second was the automated tube method (Forli Lab, Italy). The automated method was new and made
use of the electrical impedance principle.

The erythrocyte sedimentation rate for each sample was read, and recorded after 1 hour.

All recorded data were collected, analyzed and interpreted. Linear regression was performed in order to assess the significant difference in the ESR obtained by the Westergren and automated methods.

**Results**

All 80 samples were analyzed for ESR by the Westergren and automated methods. The data from this study are summarized in Table 1. The average difference in value between both methods was 0.240±0.128 mm/hr (p=0.072). The comparison-of-methods plot automated method (X) VS Westergren method (Y) gave the least square linear regression equation of Y=0.978 X+ 0.64 (r=0.98) (Figure 1). Using the cut off value of 20 mm/hr, the correlation coefficients were 0.958 (p>0.05) and 0.954

<table>
<thead>
<tr>
<th>Assays</th>
<th>Values (mm/hr)</th>
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<tbody>
<tr>
<td>Westergren method</td>
<td>33.63±23.55</td>
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<tr>
<td>Automated method</td>
<td>33.39±23.45</td>
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(p>0.05) for higher and lower values. Precision analysis gave a variation coefficient of below 3%.

**Discussion**

The ESR\(^1\) is an important laboratory investigation in medicine. Although it is a non-specific parameter, it can help physicians to diagnose and follow-up many diseases. Therefore, a number of methods for ESR determination have been performed. The Westergren method\(^{1-2}\) is accepted currently as standard, but there are some

![Fig. 1. Comparison of standard Westergren and automated method for erythrocyte sedimentation rate determination.](image-url)
limitations to this technique. Firstly, it is an open method, therefore, practitioners have to make direct with contact blood specimens. At present, there are a number of blood-borne pathogens, the cause diseases, especially hepatitis and HIV infection. Furthermore, the classical Westergren erythrocyte sedimentation tube is made of glass and must be washed each time before use. Hazards are not only possible from damaged glassware, but contaminated blood can also be expected. Therefore, the Westergren method seems inappropriate as blood borne infection carries a rather high risk and this technique does not match the concept of laboratory safety.

In view of this a number of methods have been developed to overcome these problems. The automated method is new and based on the measurement of change in blood impedance after the red cell aggregation – sedimentation phenomenon occurs. From the response to determine the ESR of the piezoelectric crystal impedance (PCI) sensor, the erythrocyte aggregation time and sedimentation rate could be obtained during erythrocyte aggregation and sedimentation.

From this study, it was revealed that the usage of this new technique could provide a very good correlation \( r = 0.98 \). Applying cut off value, the correlation coefficients are also very good for both high and low levels. Therefore it could used as a potential be tool in performing ESR determination, especially in a setting where the rate of blood–borne infectious diseases is rather high, such as in Thailand.\(^{(3)}\)

However, the cost of the automated method is another point to consider before making a decision to use it. Due to its high cost, it seems suitable for a large setting where there is a great demand for ESR determinations.

This is only a pilot study in one specific laboratory setting. Some variables of the test can be expected due to the setting, therefore, further studies in a multicenter should be performed.

References