VOLUME - XII ISSUE - LXVIII MAR/APR 2015



BIMONTHLY FORUM FOR THE LABORATORIANS





PUBLISHED FOR THE TULIP GROUP CUSTOMERS

FOR PRIVATECIRCULATION ONLY



DISEASE DIAGNOSIS

BASICS OF ESR Introduction



THE ERYTHROCYTE SEDIMENTATION rate (ESR) is a simple and inexpensive laboratory test for assessing the inflammatory or acute response. The ESR has also been found to be of clinical significance in the follow-up and prognosis of non-inflammatory conditions such as prostate cancer, coronary artery disease, and stroke. Therefore, the ESR is important in the diagnosis of inflammatory conditions and in the prognosis of non-inflammatory conditions. Erythrocyte sedimentation rate, one of the four most frequently performed laboratory tests, reflects the rate at which red blood cells separate from the plasma in a gravity field. Plasma, due to a lower density, moves to the top while the blood cells precipitate at the bottom of a sedimentation system. The sedimentation rate (mm/h) is determined macromorphologically by measuring the distance from the top cellular level to the top of plasma level. To perform the test, anticoagulated blood (sodium citrate to blood ratio 1:4) was traditionally placed in an upright tube, known as a Westergren tube, and the rate at which the red blood cells fall was measured and reported in mm/h.

History

Edmund Biernacki (1866-1912), a Polish physician, first noted the increased sedimentation rate of blood from ill individuals and realized that it was due to the presence of fibrinogen. In 1918, Robin Fahraeus (1888-1968) furthered Biernacki's work. His initial motivation to study the ESR was as a pregnancy test but his interest expanded to the study of the ESR in disease states. Alf Westergren (1981-1968) refined the technique of performing the ESR and reported its usefulness in determining the prognosis of patients with tuberculosis. A variation of the methodology of the ESR was published by Wintrobe in 1935 and was at one time in wide use. In 1977, the International Committee for Standardization in Hematology recommended the adoption of the Westergren method worldwide.

Principle of ESR

The erythrocyte sedimentation rate (ESR) is a non-specific measurement used to detect and monitor an inflammatory response to tissue injury. It denotes the presence of disease but not its severity. ESR is affected by three factors: erythrocytes, plasma concentration, and mechanical/technical factors. In normal blood, the red blood cells remain more or less separated by being negatively charged. When a disease or an inflammatory process is present, the high proportion of fibrinogen in the blood reduces the negative charge and causes red blood cells to stick to each other. The red cells form stacks called 'rouleaux,' which settle faster, causing high ESR levels. Apart from this paraproteins which

are positively charged molecules, when present abundantly as in multiple myeloma or Waldenstrom's macroglobulinemia will increase the ESR levels by enhancing rouleaux formation and elevating plasma viscosity.



Fig: Rouleaux formation of red blood cells

Conditions which causes rouleaux formation include infections, inflammatory and connective tissue disorders, and cancers. It also occurs in Diabetes mellitus and is one of the causative factors for microvascular occlusion in diabetic nephropathy. Anisocytosis and poikilocytosis reduce the ability of the erythrocytes to form aggregates, and the ESR is subsequently falsely low. In severe anemia, the ESR is markedly elevated. Increased albumin will tend to lower the ESR. The ESR may be used to follow the progress of certain diseases such as tuberculosis and rheumatoid arthritis. The ESR is increased in pregnancy, acute and chronic infections, menstruation, hypo- and hyperthyroidism, and acute hepatitis. A decreased ESR will be present in polycythemia, congestive heart failure, and in the presence of red blood cell abnormalities.

Stages in erythrocyte sedimentation:

There are 3 stages in erythrocyte sedimentation 1) Stage 1 : Rouleaux formation - First 10 minutes 2) Stage 2 : Stage of sedimentation or settling - 40 mins 3) Stage 3 : Stage of packing - 10 minutes, sedimentation slows and cells start to pack at the bottom of the tube.



(Sigmoid Sedimentation Curve)



Effect of Age and Race

Normal ESR values increase with age3 and a formula for calculating the maximal normal ESR at any age has been proposed. A study by Caswell et al showed that the highest normal ESR values are among those aged 65 years to 74 years. Using the same reference range for old and young, however, has also been suggested. The probability of disease at any age increases with increased ESR and becomes more significant when the ESR exceeds 50 mm/hr. It appears that age alone has only a marginal effect, if any, on the ESR. In blacks, normal values of the ESR are at least 2 mm/hr to 13 mm/hr higher even after correcting for age, hemoglobin concentration, and certain chronic diseases.

Note: mm/h. = millimeters per hour.

Westergren's original normal values (men 3 mm and women 7 mm) made no allowance for a person's age and in 1967 it was confirmed that ESR values tend to rise with age and to be generally higher in women. Values are increased in states of anemia.

<u>Adults:</u> The widely used rule calculating normal maximum ESR values in adults (98% confidence limit) is given by a formula devised in 1983:

$$ESR (mm/h) \le \underline{Age (in years) + 10 (if female)}{2}$$

This formula is no longer credited. Other studies show only a small dependence of ESR on age and much lower values, as seen in the following:

ESR reference ranges from a large 1996 study of 3,910 healthy adults:

Age	20	55	90
Men—5% exceed	12	14	19
Women—5% exceed	18	21	23

Children

Normal values of ESR have been quoted as 1 to 2 mm/h at birth, rising to 4 mm/h 8 days after delivery, and then to 17 mm/h by day 14.

Normal ranges quoted are:

Newborn: 0 to 2 mm/h. Neonatal to puberty: 3 to 13 mm/h, but other laboratories place an upper limit of 20.

As with other laboratory tests, the actual reference range used for the ESR should be established by the laboratory performing the test. Women tend to have higher ESR values, as do the elderly. For unknown reasons, obese people have also been noted to have slightly elevated ESRs, although this is not thought to have clinical significance.

ADULTS UPPER LIMIT OF REFERENCE RANGE (MM/HR)

	Men	Women
Age < 50 years	0-15	0-20
Age > 50 years	0-20	0-30

Indications of ESR

An ESR test may be performed in cases of: Unexplained fevers, Certain types of arthritis, Muscle symptoms, Other vague symptoms that cannot be explained. This test may also be used to monitor whether an illness is responding to treatment. This test can be used to monitor Typical inflammatory diseases or cancer. It is a screening test. This means it cannot be used to diagnose a specific disorder. However, the test is useful for detecting and monitoring: Autoimmune disorders, Bone infections, Certain forms of arthritis, Inflammatory diseases that cause vague symptoms, Tissue death. It can sometimes be useful in diagnosing some diseases, such as multiple myeloma, temporal arteritis, polymyalgia rheumatica, various auto-immune diseases,



systemic lupus erythematosus, rheumatoid arthritis, inflammatory bowel disease and chronic kidney diseases. In many of these cases, the ESR may exceed 100 mm/hour. It is commonly used for a differential diagnosis for Kawasaki's disease (from Takayasu's arteritis; which would have a markedly elevated ER) and it may be increased in some chronic infective conditions like tuberculosis and infective endocarditis.

ESR IN CLINICAL PRACTICE

Established Clinical Uses: Rheumatoid Arthritis (RA) and Other Autoimmune Conditions. Rheumatoid arthritis is a chronic inflammatory condition of unknown etiology whereby autoimmune destruction of the joints occurs usually in a symmetric fashion. ESR can aid in the diagnosis of RA, but it cannot be used solely for diagnosing RA. It is very useful when used with other parameters in the diagnosis and follow-up of RA patients. The ESR is also helpful in the follow-up of systemic lupus erythematosus, but of questionable value, if any, in inflammatory myopathy or spondyloarthropathy. Temporal Arteritis and Polymyalgia Rheumatica. Traditionally, the ESR is almost always elevated in both temporal arteritis and polymyalgia rheumatica. In temporal arteritis it may exceed 100 mm/hr. Multiple Myeloma and Other Paraproteins. The importance of ESR parallels that of plasma viscosity in these conditions. While an increased ESR is helpful in suspecting these conditions, the diagnosis depends on criteria such as monoclonal spike or serum electrophoresis, marrow plasmacytosis, and lytic bone lesions.

USE IN A SYMPTOMATIC PATIENTS

The ESR should never be used as a screening test in asymptomatic patients. Normal ESR in general practice is more reassuring to the patient with minor and unrelated complaints. A review of the literature on the diagnosis of low back pain using ESR revealed that ESR has a limited value in ankylosing spondylitis but significant in vertebral cancer when coupled with the history and physical examination. In another prospective trial, the ESR when normal was more reassuring to the patient and doctor when no pathology was suspected rather than in confirming the presence of inflammatory disease and malignancy. The same study noted pathology in 68% (36 patients with pathology; patients with suspected pathology) of the time before the ESR was known to the doctor, and the ESR value when known confirmed the doctor's expectations. This is in agreement with previous findings that the ESR should serve only as a guide and not as a screen, and only in symptomatic patients. Current evidence also suggests that the ESR when elevated remains high until the primary inflammatory process is resolved. Therefore, an ESR \geq 100 even in asymptomatic patients should prompt the clinician to search for occult infection such as infectious mononucleosis, metastasis, or early temporal arteritis.

POTENTIAL NEW APPLICATIONS OF THE ESR

It may be difficult to conceive that an old test that has been used since ancient Greek times may have new potential uses in modern medicine. Some data on the relevance of the ESR in some clinical conditions is available whereby both infection and inflammation is predominant and in few non-inflammatory conditions. These were only a few studies but they illustrate that the ESR may have uses in clinical practice more than what is expected from a simple, old test. Bacterial Otitis Media. The ESR or CRP has been shown to be elevated in 55% of 31 patients with otitis media. The infection was documented by culturing the microorganism via tympanocentesis. These children were otherwise healthy. Most of them were afebrile (90%) and none of them was seriously ill or had signs of other bacterial infection during the study. Those with elevated ESR or CRP have a much higher risk for recurrence. Since this study was small, a larger study is needed before confirming this data. These data, however, may indicate a unique systemic inflammatory response in



some children with uncomplicated otitis media. Acute Hematogenous Osteomyelitis in Children. In a prospective study of 48 children with acute hematogenous osteomyelitis, the ESR and CRP were both elevated (> 20 mm/hr and > 19 mg/L, respectively) in 92% and 98%, respectively. Both declined rapidly with treatment. The decline in CRP was faster than that of the ESR. The white blood cell count was a poor predictor of recovery. Although the authors favor CRP over ESR in the diagnosis and monitoring of osteomyelitis in children, in this study, the ESR still appears to be of major significance in this disease process. The ESR was elevated in all 44 patients and the CRP was elevated in all but one patient. Obviously, the ESR is of little value in the diagnosis of osteomyelitis, but when elevated in the presence of osteomyelitis, it can be of clinical significance to monitor the response to therapy. Sickle Cell Disease (SCD). In sickle cell anemia, the ESR is usually low in the absence of a painful crisis. In fact, a low ESR is an intrinsic property of the sickle red blood cell rheology. During a severely painful crisis that requires hospitalization and that is not complicated by infection, the ESR is moderately increased during the 4th and last stage of the crisis known as the resolving phase. This phase occurs approximately one week into the crisis. In another recent study, in patients with fever, SCD, and hospitalization, an elevated ESR raises the suspicion of bacterial infection. In 32 children with SCD and an elevated ESR (> 21 mm/hr), 72% had documented bacterial infection in contrast with 23% of 31 children with SCD whose ESR at admission was < 20 mm/hr. Both groups had similar levels of mean hemoglobin to control for the anemia effect on ESR levels. In this study in contrast to uncomplicated painful crisis, the ESR was elevated at presentation. Acquired Immune Deficiency Syndrome (AIDS). The ESR determination in a prospective study of 447 human immunodeficiency virus (HIV) infected patients was a predictor of the development of AIDS, but only when coupled with a CD4 count of < 500 x 10⁶/mL and an elevated b2-microglobulin. In this study, an ESR \geq 9 mm/hr was considered clinically significant. The authors suggest that the elevated ESR may be a reflection of advanced immune deficiency and the resultant increase in severe opportunistic infections. A major critique of this study is that an abnormal ESR of 9 is still within the normal range. In addition, the ESR is only of additional, perhaps minor, value in predicting the progressing to AIDS. Pelvic Inflammatory Disease. In 72 women with pelvic inflammatory disease, 35 had severe disease. The ESR and CRP were both elevated with a positive predictive value of 70%. An ESR \geq 40 mm/hr or a CRP of \geq 60 mg/L had high sensitivity and specificity for severe disease. Although this is a small study, the ESR and CRP levels were found to be of significantly logistic regression analysis. Febrile Intravenous Drug Users. In 106 intravenous drug users who were febrile, an ESR \geq 100 mm/hr was found to be the only variable associated with severe illness requiring intensive care unit monitoring or even hospitalization. In this study, however, it was also noted that a normal ESR may still be associated with serious infection. Thus, a high ESR in these patients is a strong positive predictor for a serious infection, but the reverse may be true. Prostate Cancer. In a prospective follow-up of 300 population-based, consecutive patients, an ESR \geq 37 mm/hr was associated with a higher incidence of disease progression and death. These findings were synergistic with other factors such as M and T categories, grade, performance status, hemoglobin level and age. Whether this finding will continue to hold true will need to be determined in larger populationbased studies. Coronary Artery Disease. In the National Health and Nutrition Examination Survey I, a slight rise in the ESR in white men aged 45 years to 64 years was found to be a high risk for coronary artery disease after 15 years of follow-up. This finding was independent of



other risk factors. The risk was highest when the ESR was > 22. It was hypothesized that an elevated ESR when present is associated with elevated blood fibrinogen levels, which might facilitate atherogenesis. This is a large-based population study and this finding is interesting and may be significant. Early Predication of Stroke Severity. A prospective evaluation of 208 patients with ischemic stroke revealed that infarct size and clinical severity on admission were strong predictors of short-term functional outcome. However, the ESR was also an independent predictor of short-term stroke outcome. An ESR≥ 28 was associated with a poorer prognosis. This study is a preliminary study; nevertheless, the statistical analysis was excellent and the findings on the ESR role on prognosis in stroke poses an interesting finding. The ESR test has a role in rheumatoid arthritis, temporal arteritis, polymyalgia rheumatica, and myeloma. It may have an additional role in follow-up of patients with otitis media, osteomyelitis, sickle cell disease, HIV, pelvic inflammatory disease, intravenous drug users, prostate cancer, coronary artery disease, and stroke. The ESR can be helpful in patients with symptoms. The ESR, however, should only be used as a guide. The clinician, when ordering an ESR, should realize that this test is only one parameter that could be helpful in the diagnosis and follow-up of certain inflammatory conditions. The ESR can also have an important prognostic role in noninflammatory conditions such as prostate cancer, stroke, and coronary artery disease.

Indicators of Inflammatory Response Other Than ESR

There are tests other than ESR that measure acute phase responses, but these tests have limitations. These include the following: Plasma Viscosity. This is a readily available test but with a limited role in the measurement of acute phase response. It is significantly affected by long-term changes of chronic disease and has a weaker response to acute inflammatory conditions than the ESR. C-reactive Protein (CRP). This test is comparable to the ESR when used for screening elderly patients, but it is more expensive. In a prospective trial from the Netherlands, general practitioners found no diagnostic gain from CRP measurements as compared with the ESR. The CRP, however, may complement the ESR in the monitoring of chronic inflammation as in rheumatoid arthritis. Cytokines. Cytokines are glycoproteins produced by different cells involved in the immune response. They enhance or regulate inflammation by acting on different cells of the immune system. Some of these cytokines are pro-inflammatory and may be a measure of the inflammatory response. Their measurement, however, is more tedious than the ESR, takes longer time, and is more expensive. Some of these cytokines are interleukin-6 (IL-6), interleukin-1 (IL-1), and tumor necrosis factor-alpha (TNF-alpha). In a double-blind, randomized study involving 267 patients with rheumatoid arthritis treated with naproxen versus prinomide, elevated baseline levels of IL-6 did not change with treatment. The ESR and the CRP, however, decreased significantly in the prinomide treated patients.19 Interleukin-6 is also a more cumbersome and expensive test. Similarly, IL-1 alpha surface expression in active rheumatoid arthritis synovium correlated with the ESR in vitro. In another controlled prospective study of 40 patients with juvenile chronic arthritis, soluble levels of TNF receptors were useful in monitoring disease flare-up. The future role of these glycoproteins in monitoring inflammatory conditions is uncertain, but appears to be promising. At present, the ESR is still the easiest and most convenient way to monitor such activity. Others. Other proteins such as serum amyloid A and alpha-1 antitrypsin rise within 6 hours to 10 hours and 24 hours to 48 hours, respectively, in inflammation. These are expensive tests and their levels rarely rise above twofold, making them of very limited use in clinical practice.





TROUBLESHOOTING

ICSH (International Council of Standardization of Hematology) recommendations for measurement of ESR

The increased mobility of patients and the benefits to laboratories of sharing their experience has led to the need for measurements between laboratories to be comparable. This can be achieved by using a reference method. ICSH has defined this as exactly described technique which, in the opinion of and Expert Panel, provides sufficiently accurate and precise measurement for it to be used to assess the validity of other such laboratory methods.

The original ICSH reference method for measuring ESR was based on the methodology of Fahreaeus and Westergren using diluted blood (4 vols blood plus 1 vol of citrate) in an open ended glass tubing of 300 mm in length, mounted vertically in a rack or stand. Modifications of these specifications in particular to use of undiluted blood, are now recommended as a basis of a new ICSH reference method.

Recent developments, including biohazard awareness and difficulty in obtaining equipment to perform the reference method, have prompted ICSH to introduce a standardized method as an alternative to, and potential replacement for, the reference method.

For working (routine) methods, ICSH now recommends specifications for selected methods. These are procedures whose reliability has been verified against the reference or standardized method and which minimize the biohazard risk of the test procedure.

ICSH has prepared new recommendations for measurement of erythrocyte sedimentation rate (ESR) under the following categories:

1. ICSH reference method:

ICSH now recognizes, as its reference method for the ESR, the sedimentation of EDTA- anticoagulated but undiluted blood in traditional Westergren pipettes that meet ICSH specifications.

2. ICSH standardised method:

ICSH recommends specifications for a new standardised method for the ESR based on the sedimentation of EDTA- anticoagulated, but undiluted blood in pipettes with a 200 mm scale and which are designed to avoid spillage of blood or aerosol generation. This standardised method may be use for verification or quality control of other ESR methods and, in future, may replace the reference method.

3. ICSH selected methods

ICSH recommends specifications for working methods, using diluted or undiluted blood, which may be considered as ICSH selected methods for routine use. A protocol is outlined for evaluation of such working methods against ICSH reference method or the new ICSH standardised method.

TEMPERATURE CORRECTION OF WESTERGREN ESR (SED RATE) RESULTS

The International Council for Standardisation in Haematology and the Clinical Standards Institute recommend that the Erythrocyte Sedimentation Rate (Sed Rate) test be performed within the temperature range 18 to 25° C (64 to 77° C). However it is understood that these temperatures may be exceeded in some parts of the world where temperature control of the environment is not available or may have broken down.

Personnel performing the test must always keep a record of the temperature at the start of the timed hour and at the end when reading the result- thus being able to calculate and record an average temperature over the testing period. If the average temperature thus obtained is at or above 25° C (77 °C) the observed result should be corrected for temperature using the chart or nomogram devised and published in the Journal of Clinical Pathology in 1957; Volume 10, pages 354-356.

Note: This nomogram applies only to the Westergren Method of ESR estimation, the Wintrobe method requires a different chart and most automated systems have a correction system built into the software.

A sample of the correction chart and nomogram is presented below

Room Temperature°C	Observed ESR	Corrected ESR
34	100	68
33	24	14
25	40	32
25	80	68





INTERPRETATION

ESR Test methods

When anticoagulated whole blood is allowed to stand in a narrow vertical tube for a period of time, the RBCs - under the influence of gravity - settle out from the plasma. The rate at which they settle is measured as the number of millimeters of clear plasma present at the top of the column after one hour (mm/hr).



Fig: Wintrode sedimentation rack

There are two main methods used to measure the ESR: the Westergren method and the Wintrobe Method. Each method produces slightly different results. Most laboratories use the Westergren method.

Westergren method:

The Westergren method requires collecting 2 ml of venous blood into a tube containing 0.5 ml of sodium citrate. It should be stored no longer than 2 hours at room temperature or 6 hours at 4 °C. The blood is drawn into a Westergren-Katz tube to the 200 mm mark. The tube is placed in a rack in a strictly vertical position for 1 hour at room temperature, at which time the distance from the lowest point of the surface meniscus to the upper limit of the red cell sediment is measured. The distance of fall of erythrocytes, expressed as millimeters in 1 hour, is the ESR.

Wintrobe method:

The Wintrobe method is performed similarly except that the Wintrobe tube is smaller in diameter than the Westergren tube and only 100 mm long. EDTA anticoagulated blood without extra diluent is drawn into the tube, and the rate of fall of red blood cells is measured in millimeters after 1 hour. The shorter column makes this method less sensitive than the Westergren method because the maximal possible abnormal value is lower. However, this method is more practical for demonstration purposes.

Technical sources of error affecting ESR are:

- Specimen is too old (EDTA) results in crenation and sphering, decreasing the ESR
- Improper filling of ESR tube-bubbles will cause falsely increased ESR
- In accurate timing-less than or greater than 1 hour.
- In accurate reading.
- Contamination of ESR tube
- Diameter of ESR tube. Lesser the diameter lower the ESR
- Tilt/ inclination of ESR tube. ESR tube not vertical- results in an increased ESR.





Cru

This picture shows a rack holding Wintrobe tubes, in which anticoagulated whole blood has just been added. (Time: 0)

Red blood cells have settled, leaving plasma at the top of the tube. Reading: 18 mm/hour (Time: one hour)

- Temperature- an increase in temperature increases the ESR, a decrease in temperature decreases ESR.
- Human errors while performing the test is the Biggest problem.
- Improper position of the ESR tubes will give wrong results. •

Physiological and pathological factors:

Any condition that elevates fibrinogen (e.g., pregnancy, diabetes mellitus, end-stage renal failure, heart disease, collagen vascular diseases, malignancy) may also elevate the ESR. Anemia and macrocytosis increase the ESR. In anemia, with the hematocrit reduced, the velocity of the upward flow of plasma is altered so that red blood cell aggregates fall faster. Macrocytic red cells with a smaller surface-tovolume ratio also settle more rapidly. A decreased ESR is associated with a number of blood diseases in which red blood cells have an irregular or smaller shape that causes slower settling. In patients with polycythemia, too many red blood cells decrease the compactness of the rouleaux network and artifactually lower the ESR. An extreme elevation of the white blood cell count as observed in chronic lymphocytic leukemia has also been reported to lower the ESR. Hypofibrinogenemia, hypergammaglobulinemia associated with dysproteinemia, and hyperviscosity may each cause a marked decrease in the ESR. Although it has been reported that drug therapy with aspirin or other nonsteroidal anti-inflammatory agents may decrease the ESR, this has been disputed.

Automated methods

While the Westergren method is a simple test to perform manually, minor technical problems can cause erroneous test results. Common errors include dilution caused by liquid anticoagulant (sodium citrate solution), mixing errors, and handling errors such as tilted tubes and vibrations occurring during the sedimentation period.

Handling : As the ESR pipettes have to be filled by suction with the mouth, there are possibilities of coming in direct contact with specimens





Factors That May Influence ESR

Factors that increase ESR	Factors that decrease ESR	Factors with no clinically significant effect or questionable effect
Old age Female Pregnancy Anemia Red blood cell abnormalities Macrocytosis Technical factors Dilution problem Increased temperature of specimen Tilted ESR tube Elevated fibrinogen level Infection Inflammation Malignancy	Extreme leukocytosis Polycythemia Red blood cell abnormalities Spherocytosis Acanthocytosis Microcytosis Technical Factors Dilution problem Inadequate mixing Clotting of blood sample Short ESR tube Vibration during testing Protein abnormatilities Hypofibrinogenemia Hypogammaglobulinema Dysproteinemia with hyperviscosity state	Obesity Body temperature Recent meal Aspirin NSAIDs

NSAIDs= nonsteroidal anti-inflammatory drygs , ESR= erythrocyte sedimentation rate

of infected blood.

Anticoagulant : If the concentration of the anti-coagulant in the blood is greater than specified, it reduces ESR.

Cleanliness : If the ESR pipette is not clean and contains traces of detergents, alcohol, ether or other compounds. This can affect ESR results.

Position : If the ESR pipette is not completely vertical and is inclined, it can accelerate the ESR.

Time of the result : If reading is not taken exactly at 1 hour then the ESR result is affected.

Vibration : If the ESR stand is subject to vibrations, the ESR readings can alter.

Mixing of specimens : Error can occur during ESR pipette filing stage while using one specimen for another, imprecise resetting etc.

Automated Analysis

The gold standard technique for measuring ESR is the Westergren's method. However, as mentioned above it have many disadvantages like rise in blood borne diseases such as Hepatitis B, HIV etc. Today, there are automated ESR systems which can take care of all the above issues,

provide faster results and laboratory safety by minimizing contact with blood samples. The greatest advantage with the automated methods is that it can give the ESR readings in 30 minutes with all the temperature corrections at 18°C using infrared barriers which are not seen with the usual standardized methods for ESR. Many new automated systems have been introduced since 1990s and have been evaluated for performance with each other as well as with the gold standard Westergren's method. Although those automated techniques offer more benefits in terms of reduced biohazard risks, speedy processing time, and quicker results, it is essential to validate these equipments against the standard Westergren's method to enable routine use. The Westergren's ESR reading at 1 hour correlated with 30 minutes reading of automated analyser. The added advantage of automated systems are that there is no external influence on the final reading such as temperature, contaminating dust particles, tilting of tube, and ratio of diluents. The number of samples that can be processed with this method is higher (maximum of 10 samplescan be processed at a time) than the manual method. Therefore automated ESR methods offers significant improvement in the report turn-around time and in this way improve the service of the laboratory.



In Lighter Vein



A famous heart surgeon was waiting for his Mercedes at the shop when a loud-mouthed mechanic lured him into an argument.

"Look at this beautiful car I'm working on. I also open hearts, take out valves, grind them, put in new parts, and when I finish, they always purr like a kitten. So, how come you get the big bucks, when you and I are basically doing the same work?

The surgeon very calmly leaned over and whispered to the loud-mouth mechanic, "Try doing it with the engine running.



"Nurse, get on the internet, go to SURGERY.COM, scroll down and click on the 'Are you totally lost?" icon."







8

MAR/APR