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Original Research Article

Automated Corrected Reticulocyte Count Superiority above Manual Methods

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Abstract: Corrected Reticulocyte Count is necessary because the raw reticulocyte count is misleading in anemic patients. The problem arises because the reticulocyte count is not really a count but rather a percentage: it reports the number of reticulocytes as a percentage of the number of red blood cells. In anemia, the patient's red blood cells are depleted, creating an erroneously elevated reticulocyte count. 30 adult male and female anemic patients were randomly selected from the Arth Diagnostics laboratory, Rajasthan. Automated CRC was performed through Pentra XLR from Horiba Medicals, Japan. Manual reticulocyte count was performed traditional method with Methylene Blue dye and light microscopy. Manual PCV was performed through graduated tube centrifuging at high speed. There is significant difference in the values of CRC in manual vs automated method. The variation is huge and it varied from minimum 2.2% to 211%. The average percentage deviation is 34.1%. The p value of difference between Manual CRC and Automated CRC is significant (p value <0.1). The difference was not skewed in one direction rather it was on either side i.e. it varied from positive to negative both significantly. Automated methods are counting through measurement error free methods along with more number of cells in comparison to manual methods. So undoubtedly Pentra XLR from Horiba Medicals, Japan is superior and reliable for estimating Corrected Reticulocyte Count. It will of definite help for better diagnosis and management of anemic patients.
Keywords: Reticulocyte, anemia, Pentra XLR, Methylene Blue, light microscope

INTRODUCTION:

A reticulocyte count is a measurement and percentage of how many reticulocytes are in the blood. This count indicates whether enough red blood cells are being produced in the bone marrow [1]. The reticulocyte count is used mainly:

- As a follow up to abnormal results on a complete blood count (CBC), RBC count, hemoglobin or hematocrit, to help determine the cause
- To determine if the bone marrow is functioning properly and responding adequately to the body's need for red blood cells
- To help detect and distinguish between different types of anemia
- To monitor response to treatment, such as that for iron-deficiency anemia
- To monitor bone marrow function following treatments such as chemotherapy
- To monitor function following a bone marrow transplant

However alone reticulocyte percentage is misleading and it has to be corrected in reference to Packed Cell volume (PCV) as below:

Corrected Reticulocyte Count = Reticulocyte count (%) X [Measured hematocrit / Normal hematocrit

This calculation is necessary because the raw reticulocyte count is misleading in anemic patients. The problem arises because the reticulocyte count is not really a count but rather a percentage: it reports the number of reticulocytes as a percentage of the number of red blood cells [2].

In anemia, the patient's red blood cells are depleted, creating an erroneously elevated reticulocyte count. This is in part due to the immature cells' early release from the bone marrow into circulation and the longer time they spend maturing in the blood (from the

normal 1 day to 3 or 4 days) [3]. In order to get a more accurate assessment of bone marrow function, the reticulocyte percentage (%) is often corrected with a calculation called a corrected reticulocyte count (CRC) or a reticulocyte index (RI) [4]. This calculation compares the person's hematocrit with a normal hematocrit value:

REVIEW OF LITERATURE:

J. David Bess man mentioned that reticulocyte percentage in the peripheral blood is an indication of the rapidity of red cell turnover if the patient is in a steady state[6]. However, the number of reticulocytes released into the blood reflects the amount of erythropoiesis on a given day. The absolute number of reticulocytes is determined as the reticulocyte index, or "corrected" reticulocyte count. To determine this, the reticulocyte percentage is adjusted by the ratio of the observed hematocrit to the expected hematocrit, yielding an absolute number of reticulocytes. Reka G Szigeti suggested reticulocyte count is used to estimate the degree of effective erythropoiesis, which can be reported as absolute reticulocyte count or as a reticulocyte index[7]. Gilmer PR, Koepke JA stated that degree of imprecision between reticulocyte counts performed on the same blood sample is dependent on the total number of reticulocytes and the individual or individuals who perform the counts[8]. If the reticulocyte count is within the reference interval, the error may be as great as 25%, whereas the error associated with a reticulocyte count of 5% or greater may be 10%. In general, the error will decrease as the uncorrected reticulocyte count increases.

MATERIAL AND METHODS:

30 adult male and female anemic patients were randomly selected from the Arth Diagnostics laboratory, Rajasthan. Automated CRC was performed through Pentra XLR from Horiba Medicals, Japan. Manual reticulocyte count was performed by traditional method with Brilliant Cresyl Blue dye and light microscopy. Manual PCV was performed through graduated tube centrifuging at high speed.

DISCUSSION:

Results are listed in this table-1.

S. No.	Automated PCV	Manual PCV	Automated RC	Manual RC	Automated CRC	Manual CRC	% Deviation CRC Automated vs Manual (±)
1	31.90	34	1.57	1	1.09	0.76	30.7%
2	29.00	31.5	1.90	**1.1**	1.18	0.77	34.7%
3	33.30	**31**	2.27	**1.6**	1.52	1.10	27.5%
4	24.60	**27.5**	3.74	**2.8**	1.85	1.71	7.5%
5	29.40	32.5	6.32	4.3	3.96	3.11	21.6%
6	27.30	29.4	6.40	5.1	1.07	3.33	211.4%
7	30.50	28.3	2.85	2	1.83	1.26	31.3%
8	31.20	33.6	2.57	1.9	1.64	1.42	13.5%
9	22.40	17.5	0.79	0.5	0.35	0.19	44.4%
10	31.10	33.6	2.02	1.6	1.24	1.19	3.7%
11	31.40	33.2	1.56	1.7	1.01	1.25	24.2%
12	30.70	32.9	3.50	3	2.30	2.19	4.6%
13	32.70	35	2.50	2	1.76	1.56	11.6%
14	28.70	26.3	1.81	1.2	1.05	0.70	33.2%
15	29.50	32.8	2.98	2	1.93	1.46	24.5%
16	17.10	20.1	2.57	3	0.87	1.34	54.0%
17	33.60	31.2	1.36	0.9	0.93	0.62	32.9%
18	28.50	31.5	2.65	1.9	1.64	1.33	18.9%
19	30.90	32.5	1.92	2.1	1.24	1.52	22.3%
20	28.60	31.8	2.46	3.1	1.51	2.19	45.1%
21	24.60	27	0.67	0.3	0.33	0.18	45.5%
22	28.10	25.3	2.52	1.6	1.55	0.90	42.0%
23	12.00	13.9	1.46	0.8	0.37	0.25	33.2%
24	28.40	31.9	2.39	0.6	1.45	0.43	70.7%
25	26.80	30.3	2.41	1.8	1.29	1.21	6.0%
26	14.70	17.1	8.12	9	2.54	3.42	34.6%
27	22.60	25.9	1.84	1.9	0.90	1.09	21.5%
28	30.80	27.1	2.43	2.8	1.65	1.69	2.2%
29	28.10	25	2.31	1.8	1.40	1.00	28.6%
30	28.40	25.3	1.38	0.9	0.85	0.51	40.5%

As evident from the above table that there is significant difference in the values of CRC in manual vs automated method. The variation is huge and it varied from minimum 2.2% to 211%. The average percentage deviation is 34.1%. The p value of difference between Manual CRC and Automated CRC is significant (p value <0.1). The difference was not skewed in one direction rather it was on either side i.e. it varied from positive to negative both significantly.

CONCLUSION:

Corrected Reticulocyte Count is essential and superior parameter than raw reticulocyte count. It has to be corrected with relation to PCV [5]. There is significant difference between automated corrected reticulocyte count vs manual method. Because automated methods are counting through measurement error free methods along with more number of cells in comparison to manual methods. So undoubtedlyPentra XLR from Horiba Medicals, Japan is superior and reliable for estimating Corrected Reticulocyte Count. It will of definite help for better diagnosis and management of anemic patients.

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