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Research Article

Deformation of Red Blood Cells in Accordance with Age-Related Changes

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Abstract

The lifespan of red blood cells depends on the age-related changes of the body, and the degree of red blood cell deformity changes accordingly. This is the morphological characteristic of the greatest value: if it wasn't for the deformability, the erythrocyte would not be able to move into a capillary three times lowering diameter.

As it is known, red blood cells are the most important form of blood cells, the number of which depends on the motor structure or degree of deformation, depends not only on the longevity of the organism, but also on the quality of life and the overall incidence rate. Unlike other elements, they do not have a nucleus, therefore, due to the absence of mitochondria and, despite the limited possibilities of DNA, a large group of scientists found that they live and work for 120 days. At present, it is not known that the lifespan of red blood cells depends on the age-related changes of the body, and the degree of red blood cell deformity changes accordingly. As is known, this is the morphological characteristic of the greatest value: if it wasn't for the deformability, the erythrocyte would not be able to move into a capillary three times lower in diameter.

Keywords: *Deformation; Red Blood Cells; Age-Related Changes*

Introduction

The lifespan of red blood cells depends on the age-related changes of the body, and the degree of red blood cell deformity changes accordingly.

Purpose of the Study

The purpose of our research was:

1. To determine resistant of erythrocytes from practically healthy volunteers of different age.
2. Establishing a correlation between the quality and age of red blood cell deformation.

Materials and Methods

For this survey, has been selected 60 volunteers, allocated in 5 different groups: 1) 17 - 25, 2) 25 - 35, 3) 35 - 60, 4) 60 - 75, 5) 75 - 90.

As control group, we got adults (study results are processed using student's T criteria and are reliable). Individuals with alcohol addiction pregnant women and patients with chronic diseases were excluded from the study. The research was made at Tbilisi state medical university on the departments of Normal Human Anatomy and Medical Physics, Biophysics, Biomechanics and Informative Technologies in 2015 - 2017.

The deformability of erythrocytes was determined with computer filter-photometer method.

With the help of a general blood test, we determined the number of erythrocytes on it under different storage conditions; We observed for 7, 10, 15, 20, 40 and 60 days. Blood (heparinized) blood taken from each individual was divided into 18 tubes and stored under differ-

ent temperature conditions - 6 tubes were placed at room temperature, 6 - refrigerated (+5^0), 6 - canned (-17^0). On the specified days (7th, 10th, 15th, 20th, 40th and 60th days) we opened a new test tube and observed erythrocytes.

Results and Discussion

Table 1 and diagram 1 show erythrocyte deformity rates in people of different ages. Studies have shown that a decrease in the peripheral blood erythrocytes of elderly volunteers compared with the rate of erythrocyte deformity in the blood of young volunteers was observed. In particular, 17 - 25 years. Deformity in individuals is 4,5,0 ± 0,3, 25 - 35s. In volunteers - 4.8 ± 0.4, in the elderly - this figure decreases to -3.0 ± 0.3.

Groups	Quantity	Deformity (Seconds^{-1})
17 - 25 years	28	4,5,0 ± 0,3
25 - 35 years	28	4,8 ± 0,4
35 - 60 years	28	4,0 ± 0,7
60 - 75 years	28	3,0 ± 0,3
75 - 90 years	28	3,0 ± 0,3

Table 1

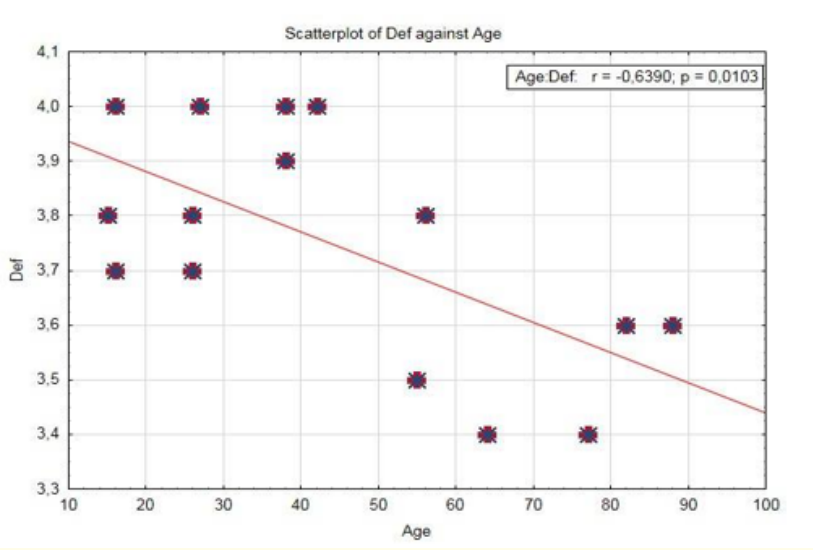

Diagram 1

As a result of observations on erythrocyte resistance, we obtained an interesting indicator in different ages groups under different temperature storage conditions.

Curve reflecting the viability (tolerance) of peripheral blood erythrocytes under storage at room temperature.

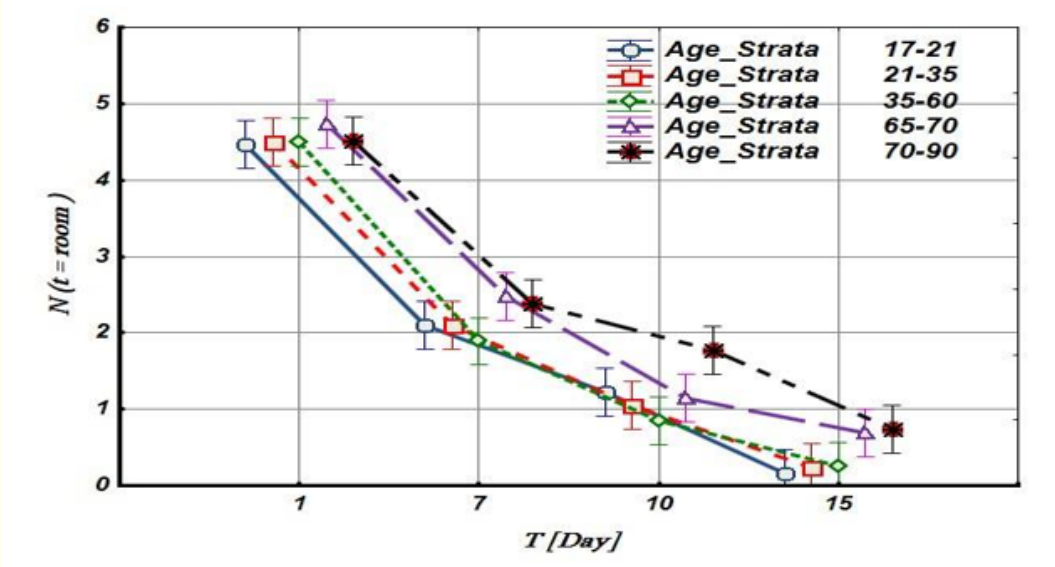

Diagram 2 : *Show, that hemolysis of erythrocytes was particularly rapid in the blood of young volunteers. Even older erythrocytes appeared to be more stable.*

Curve reflecting the viability (tolerance) of peripheral blood erythrocytes at storage at 5^0C.

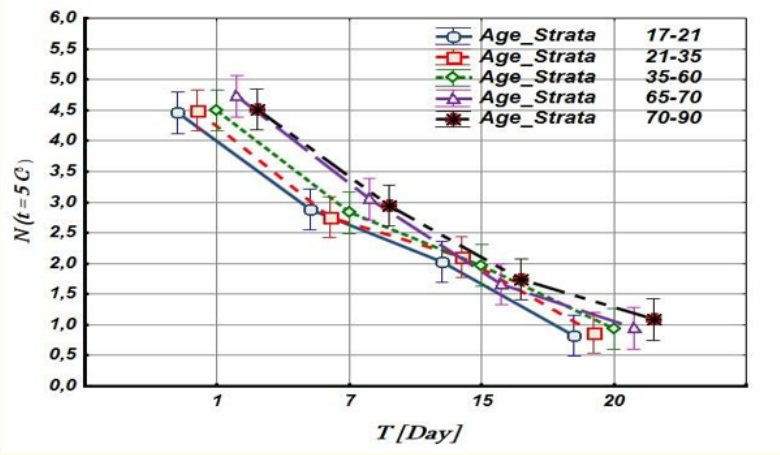

Diagram 3 : *On the 10th day of observation under storage conditions at 50C, the number of erythrocytes in different age groups ranged from 2.0 - 2.3 × 106 er. Mm3, and on the 20th day of observation their number was 0.8 - 1.2 × 106 er. Mm3 (no significant age difference was detected).*

Changes in the number of erythrocytes in the blood of practically healthy people of different ages during storage at -17^{0}C.

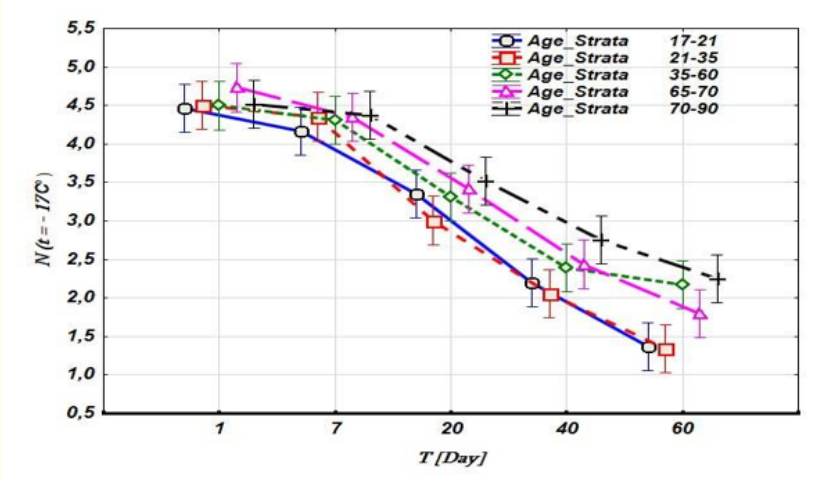

Diagram 4 : *On the 10th day of observation under storage conditions at 170C, the number of erythrocytes in different age groups ranged from 3.3 - 4.0 × 106 er. Within 3 mm, on day 20 of observation 3.3 - 3.5 × 106 er. Mm3, on the 40th day of observation - 2.0 - 2.8 × 106 er. Mm3, and on the 60th day of observation the range of fluctuations increased to 1.8 - 2.3 × 106 er. Mm3. It should be noted that the resistance (and therefore their number) of erythrocytes in all conditions and terms of storage was found to be particularly high in the elderly.*

The results of the study show that the erythrocytes of young volunteers are characterized by much lower resistance compared to the erythrocytes of the elderly. The rate of deformity, on the contrary, decreases significantly with age.

This can be caused by changes in membrane lipid-protein composition in erythrocytes of older people. This opinion is supported by the fact that the deformation of young erythrocytes is in positive correlation with the average diameter of erythrocytes (=0,9443, =0,0001) [1-6].

Conclusion

It has also been shown that the lifespan of red blood cells increases with increasing age of the body. Therefore, a decrease in its deformation indicates that this function is difficult to perform and it is undergoing apoptosis.

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