The Form of Erythrocytes and Laser Doppler Flowmetry of Skin with ACNE and Use of Medication FarGALS in its Comprehensive Treatment

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Abstract

Using the express method of a thick smear and morphometry, the state of erythrocytes obtained from the acne and finger region has been studied. Using laser Doppler flowmetry, the state of microcirculation of the skin of the finger and the acne location area has been studied.

It has been found out that comprehensive treatment with the use of FarGALS promotes the reduction in blood of pathological forms of erythrocytes and the restoration of microcirculation parameters.

Keywords: *Erythrocyte, blood, acne, pathological, microcirculation.*

Introduction

Dermatoses and infectious skin lesions are accompanied not only by significant structural changes, but also by pronounced abnormalities in the ratio of discocytes - normal erythrocytes and their pathological forms. These abnormalities are noted both in peripheral blood obtained from the finger, and, especially, in blood obtained from areas of pathologically altered skin [2].

Shifts in the ratio of discocytes and pathological[3] forms of erythrocytes cause pronounced microcirculation abnormalities[6].

However, studies of changes in the shape of erythrocytes and microcirculation with acne[7], which is one of the most common skin pathologies, especially in adolescents and young adults [4]. have not been conducted.

The medication FarGALS is registered by the Pharmaceutical Committee of the Ministry of Health of the Republic of Uzbekistan and is approved for clinical use.

It is included in the pharmacotherapeutic group - “antiseptic and wound healing agent”, has a pronounced antioxidant effect, has the property to enhance metabolism in tissues, increases oxygen consumption by them, accelerates the regeneration of damaged tissues, promotes neovasculogenesis [1]. These properties of FarGALS make in possible to suggest that it has a positive effect on erythrocyte membranes, normalization of the ratio of discocytes and their pathological forms, and contribute to the activation of microcirculation.

In this regard, the purpose of this study is defined: to study the effect of FarGALS with its complex use in the treatment of acne on erythrocytes and the state of microcirculation.

Materials and Research Method

Before and after the course of treatment, all patients’ blood obtained from the finger and acne area has been studied. Blood for light microscopy has been studied with the use of the express method of a thick smear (EMTS) - Patent Office of Uzbekistan - “Method for the Determination of RBC Forms” No. MKI 6 A 61 B 10/00, Program “Express Diagnosis of RBC Forms” No. ED-5-05.

For this, 2 drops of blood have been fixed for 3-4 minutes in 1 ml of a 2.5% solution of glutaraldehyde. Then a drop of fixed blood has been placed on a glass slide. A cover glass has been horizontally lowered onto it. A layer formed underneath is a “thick smear” - suitable for studying using a light microscope equipped with a digital camera.

Erythrocyte form ratio has been calculated at a magnification of 10x40 with a sample of at least 1000 erythrocytes for each stage and series of studies. Erythrocyte studies have been performed using Biolam-I2 and Axioscop 40 - ZEISS microscopes. Light-optical micrographs have been obtained on an Axioscop 40 - ZEISS microscope coupled to a digital camera with a data storage in a computer using the Microsoft-Windows XP-Professional application programs.

Laser Doppler flowmetry has been performed using LAKK-01 devices with a single-channel analyzer (LAZMA, Russia) coupled to a Pentium-Sh personal computer and ALT - Vostok LDF-01 device developed by domestic manufacturers ("Naf" company). A comparative assessment of the data obtained using LAKK-01 and ALT - Vostok LDF-01 has been carried out. These studies have shown the full authenticity of the devices.

LDF has been used to assess microcirculation of the skin of the finger (control) and of the face of 8 patients with normal skin (control) and in patients aged 14-24 with acne on the face. The standard conditions for registering LDF have been observed [2].

Conventional treatment included standard therapy. FarGALS has been used as a local application.

Results of the Research and Discussion

With acne, the proportion of pathological forms of erythrocytes is slightly less than half of all red blood cells (pic. 1 tab. 1).

Morphometry of blood erythrocytes obtained from the gums and from the finger (in presence of acne) has shown that pathological forms dominate among erythrocytes. This is especially pronounced in blood obtained from the area of acne.

The conventional treatment of this pathology leads to a significant reduction in the pathological forms of erythrocytes, both in the blood from the acne area and in the peripheral blood obtained from the finger (pic. 1 tab. 1).

The use of FarGALS in the comprehensive treatment of acne leads to a significant increase in the proportion of discocytes and a decrease in the proportion of pathological forms of erythrocytes. This tendency appears both in the blood from the acne area and in the peripheral blood from the finger.

A characteristic feature of blood from the finger, and especially from the acne area, is a sharp increase in the proportion of erythrocytes with a crest (pic. 1 tab. 1). Comprehensive treatment and, especially, treatment using FarGALS significantly reduces the number of pathological forms of erythrocytes, but their share remains much higher than the control level (pic. 1 table. 1) Laser Doppler flowmetry has shown that acne causes microcirculation abnormalities as in the skin of finger, and especially in the area of localization of acne. AmaxCF/AmaxLF, which reflects the measurements of arterial blood flow, decreases in the acne area by more than 3 times. AmaxHF/AmaxLF, which reflects the measurements of venous blood flow, decreases by more than 2 times. MEI - the microcirculation efficiency index reduces by 2 times.

Medication therapy leads to a tendency to normalize the studied parameters. When using FarGALS, all the studied parameters are close to the control level (tab.2).

Pathological forms of erythrocytes such as stomatocytes, echinocytes and erythrocytes with a crest are found in peripheral blood and are in the norm. However, their total share does not exceed 11-12%. Erythrocyte is the most differentiated cell in the body of mammalian animals and humans and does not have either organelles or nuclei. This determines their sensitivity to various changes in blood parameters in various pathological conditions. The shifts in the ratio of discocytes (normal red blood cells in the form of a biconcave disc and their pathological forms) are determined, first of all, by changes in the properties of their plasma membrane [2]. An increase in the proportion of pathological forms of erythrocytes leads to the abnormality of microcirculation, since discocytes have the ability to change their shape when passing through narrow capillaries with its subsequent restoration[2].

The shifts we have found in the ratio of discocytes and pathological forms of erythrocytes regarding the presence of acne are especially pronounced in the blood obtained from the skin of the acne location area. This is accompanied by shifts in all studied microcirculation parameters. Changes in blood from the finger accompanied by impaired microcirculation parameters confirm the systemic nature of microcirculation disorders in acne, where erythrocytes play a leading role.

FarGALS contributes to the restoration of the ratio of discocytes and pathological forms of erythrocytes and improves microcirculation of the skin.

Conclusions

1. With acne, there is an abnormality of the ratio of discocytes and pathological forms of erythrocytes in blood obtained from the finger and especially from the area where acne is located.
2. FarGALS contributes to the restoration of the ratio of discocytes and pathological forms of erythrocytes in blood obtained from the finger and from the area where acne is located.
3. The use of FarGALS in the comprehensive therapy of acne, along with a reduction in the proportion of pathological forms of erythrocytes, leads to an improvement in microcirculation.

Table 1: The ratio of discocytes and pathological forms of erythrocytes regarding the presence of acne and after treatment with FarGALS

Erythrocytes form	Control 1gr.	Blood from finger before treatment 2 gr.	Blood from acne area before treatment 2 gr.	Blood from acne area, treatment without FarGALS,.	Blood from finger, treatment with FarGALS,
Discocytes	89±1,7%.	65± 1,4%*	54± 1,6%*	70± 1,6%**	81±1,2%**
Echinocytes	4±0,6%.	6± 1%*	7± 1%*	5± 1%**	4±0,2%**
Stomatocytes	3±0,04%.	14 ±0,2%*	19 ±0,9%*	12 ±0,2%**	6±0,1%*
Eryth. with crest	3± 0,01%	13±0,3%*	18±0,4%*	12±0,2%**	7±0,2%**
Irreversible forms	1±0,07 %	2±0,2%*	2±0,2%*	1±0,2%**	2±0,1%**

* Statistically significant (P <0.05) compared with control 1

The devices used make it possible to obtain over 20 parameters characterizing the state of microcirculation. An indicator of microcirculation - MI, characterizes the total microvascular blood flow. It can be represented by the following expression: MI (t) = M + .δMI (t). "M" reflects the level of perfusion (in relative units) and its value is the total reflection of the average speed of movement of erythrocytes.

In the control, M indicators are higher than in patients with periodontitis and are respectively 16.6 and 11.5 in the alveolar ridge. The earlobe is 8.5 and 5.7 respectively. In the crest δ is 4, in the earlobe is 2, while the microcirculation efficiency index (MEI), which reflects the ratio of passive and active processes in the microcirculation system, is more than 2 times higher in control compared with that in patients with periodontitis. The latter have shown a more than 1.5 times decrease in the coefficient of variation (CV), which reflects the vasomotor activity of microvessels (tab.1).

A pronounced decrease in the parameter of the amplitude coefficient (arteries/vasomotors) reflecting the relative parameter of the arterial (arteriolar) component of microcirculation has been noted. With periodontitis, the amplitude coefficient of the venous (venular) component (veins/vasomotors) reflecting the venous component of microcirculation has been especially sharply reduced (tab.1).

Conventional treatment leads to a pronounced tendency to normalize the studied parameters.

With a comprehensive treatment using ILBI, the normalization of all the studied microcirculation parameters has been observed (tab. 1).

The study of erythrocytes of the blood from the gums and from the finger has shown that with periodontitis there is a pronounced shift in the ratio of discocytes and pathological forms of erythrocytes. This is especially true for echinocytes and erythrocytes with a crest (tab. 2).

Conventional treatment leads to a pronounced tendency to normalize the ratio of discocytes and pathlogical forms of erythrocytes (tab. 2).

When using ILBI in combination with conventional treatment, there is a restoration of the proportion of discocytes to almost normal levels, especially in the blood from the finger. The content of stomatocytes and erythrocytes with a crest remains quite high (tab. 2).

Table 2: Indicators of laser Doppler flowmetry in periodontitis and its treatment using ILBI

	Control (n=8)		Acne (n=12)		Conventional treatment (n=12)		Conventional treatment + FarGALS (n=10)	
	Finger skin	Face skin	Finger skin	Acne area skin	Finger skin	Acne area skin	Finger skin	Acne area skin
	M±m	M±m	M±m	M±m	M±m	M±m	M±m	M±m
AmaxCF/AmaxB (LF)	0,25±0,1	0,24±0,2	0,2±0,01*	0,08±0,001*	0,22±0,02**	0,16±0,02**	0,23**	0,14**
AmaxHF/AmaxB (LF)	0,4±0,01	0,4±0,01	0,3±0,07*	0,2±0,04*	0,3±0,08**	0,24±0,06	0,38±0.01	0,36±0,01
MEI = $A_{LF}/(A_{CF} + A_{HF})$	2,9±0,1	2,8±0,01	2,5±0,03*	1,5±0,02*	2,6±0,04**	2,1±0,01	2,6±-,02	2,2±0,02
M	16±0,2	14,5±0,3	12,4±0,3*	9,8±0,3*	14±0,2**	12,4±0,2	15,2±0,3	12,9±-4
δ	4,0±0,3	3,8±0,2	2,8±0,1*	1,9±0,03*	3,2±0,1	1,5±0,1	3,6±0,2	3,8±0,1
CV	18,6±0,5	19±05	14,±0,4*	10,0±0,4*	16,±1,0	12±0,5	16,±0,4	14,0±0,3

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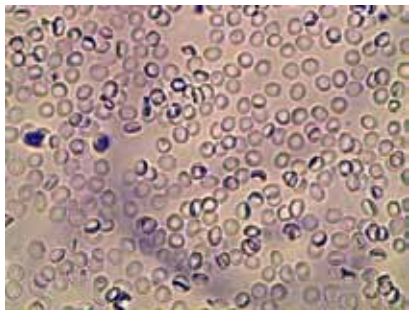

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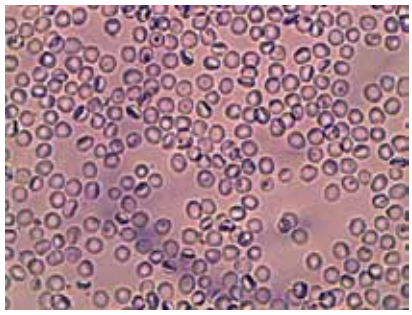

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Blood from the finger. Norm. (control). EMTS 10x40. pic a) Prevalence of pathological forms of erythrocytes in blood: b) from acne area, c) from the finger. EMTS 10x40. Reduction of pathological forms of erythrocytes in blood post conventional treatment d) from acne area, e) from the finger. EMTS 10x40. Significant reduction of pathological forms of erythrocytes in blood: e) from acne area, б) from the finger. Conventional treatment with FarGALS. EMTS 10x40.

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