

## EXPERIMENTAL METHODS FOR CLINICAL PRACTICE

# Effects of Pentoxifyllin Drugs and UV Photohemotherapy on Blood Viscosity

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Translated from *Byulleten' Eksperimental'noi Biologii i Meditsiny*, Vol. 126, No. 11, pp. 579-580, November, 1998  
Original article submitted July 18, 1997

In patients with chronic arterial insufficiency of the legs pentoxifyllin drugs not change blood viscosity. By contrast, photohemotherapy with blue light decreased and normalized blood viscosity in 64% patients.

**Key Words:** *pentoxifyllin; blue light; phototherapy; blood rheology*

Circulation is determined by cardiac function, vascular status, and blood rheology. High blood viscosity (BV) causes a decrease or complete blocking of regional bloodflow, increase in vascular resistance and blood stagnation in the veins, decrease in venous flow, and drop in cardiac output. High BV has an etiopathogenetic role in myocardial infarction, stroke, venous and arterial thrombosis, and chronic arterial insufficiency of the limbs. In 15-20% patients with intermittent claudication, the symptoms are caused by high BV, but not occlusion of the major arteries [4]. High BV is associated with atherosclerosis obliterans of the leg arteries [2,5,6]. Pentoxifyllin (PP) drugs Trental (Hoechst), Agapurin (Slovakofarma), and Ralofect (AWD) have been used for decreasing BV. Pentoxifyllin is considered as the most effective drug among them.

Similar effects of photohemotherapy with ultraviolet rays [3] and a He-Ne laser [1] have been recently reported. We used electromagnetic irradiation in the blue-light range (wavelength is patented). In the present study we compared the effectiveness of drug therapy with that of photohemotherapy in patients with high BV.

## MATERIALS AND METHODS

Viscosimetric studies were carried out in 2 groups of patients. Group 1 consisted of 31 patient (4 women) aged 50-70 years with atherosclerosis obliterans of the leg arteries, stage II according to Fontain. These patients were treated for one month with Trental ( $n=10$ ), Agapurin ( $n=10$ ), and Ralofect ( $n=11$ ) in a daily dose of 400 mg.

Group 2 consisted on 28 patients (8 women) with the same disease at the same stage treated by photohemotherapy (6 sessions during 2 weeks). Blood (200 ml) was collected from the ulnar vein into a sterile flask with Glucigar. Reinfusion was carried out at a rate of 60 drops/min from the flask. Blood was irradiated while passing through a transparent plastic hose of a disposable transfusion system placed into a special device for blood irradiation with blue light. The intensity of exposure was  $0.16 \text{ mW/cm}^2$ .

Viscosimetric studies were carried out using a Lowshear-30 device at a shift rate of  $128 \text{ sec}^{-1}$ .

## RESULTS

In group 1 patients, the mean BV before treatment was  $5.29 \pm 0.11 \text{ sP}$ , which is statistically higher than the norm ( $4.50 \pm 0.3 \text{ sP}$ ). After the end of PP course, BV remained virtually the same:  $5.27 \pm 0.12 \text{ sP}$ . In

**TABLE 1.** Changes in BV (sP) in Patients with Atherosclerosis Obliterans of the Leg Arteries after Therapy with PP Drugs and Photohemotherapy ( $M \pm m$ )

Group 1				Group 2			
patient No.	before	after	% of initial value	patient No.	before	after	% of initial value
1.	5.48	5.08	92.7	1.	5.18	4.11*	79.4
2.	5.10	5.14	100.8	2.	5.28	4.61*	87.3
3.	5.35	5.27	98.5	3. (f)	4.78	4.01*	83.9
4.	6.48	6.02	92.9	4.	5.45	4.52*	82.9
5.	5.48	5.55	101.3	5.	5.63	5.11	90.7
6.	6.48	5.42	83.6	6. (f)	5.08	5.03	99.1
7.	6.13	6.91	112.7	7. (f)	4.96	4.23*	85.4
8.	5.18	5.48	105.8	8.	5.40	4.54*	84.1
9. (f)	5.40	5.27	97.6	9.	5.85	5.09	87.0
10.	5.18	5.27	101.7	10.	5.87	4.79*	81.6
11.	5.48	5.21	95.1	11. (f)	5.05	4.49*	88.8
12.	5.45	5.70	104.6	12.	6.84	5.72	83.6
13.	5.13	5.01	97.7	13.	6.79	5.96	86.1
14.	5.57	5.53	99.3	14.	5.78	4.23*	73.2
15.	5.83	5.37	92.1				
16.	6.59	6.50	98.6				
17.	5.83	5.53	101.8				
18.	5.43	6.83	119.8				
19.	5.70	6.83	119.8				
Mean...	5.64±0.11	5.62±0.13	100.14±1.79	Mean...	5.57±0.17	4.74±0.15**	85.22±1.56**

Note. f: female patients; \*the result is within the normal range; \*\* $p < 0.05$  vs. initial value.

17 patients (54.8%) BV slightly decreased and in 14 (45.2%) increased.

In group 2 patients, the mean initial BV was  $5.04 \pm 0.13$  sP, i.e., it was lower than in group 1 because there were more women in the group, and this parameter is generally lower in women than in men. After photohemotherapy, BV decreased to  $4.55 \pm 0.11$  sP ( $p < 0.05$ ). It decreased in 24 (85.7%) patients and slightly increased in 4 patients.

The groups were comparable by the initial BV values (Table 1). Blood viscosity did not significantly decrease in group 1: in 11 patients it negligibly decreased and increased in 8 patients. It did not normalize in any of the patients.

In group 2 BV significantly decreased; it normalized in 9 (64%) patients.

Thus, photohemotherapy with blue light more effectively than PP corrects BV disorders. The clinical efficacy of photohemotherapy is higher and the effect is clearly seen after long ineffective therapy with PP drugs.

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