
Indices of fermentativ activity of periphery blood during the treatment of purulent wounds of children by low-intensive radiation of infrared laser

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Abstract

The application of the modulated infrared laser of the wavelength of 10.6μm at the complex treatment purulent wound is described. By the conduction of the citochemical studying of the complex dehydronasis in neutrofilis of periphery blood the protective effect of the low-intensive CO₂ laser is revealed on example of normalization citochemical indices in neutrofilis periphery blood: in a experimental group – by 5-7 days, in a control group – by 10-14 days.

Keywords: infrared laser, purulent wound, succinatdehydrogenas, lactatdehydrogenas

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Introduction

The problem of prophylactic and treatment of purulent wounds, in spite of appearing of a lot of new medicines and suggesting methodical approaches, is an actual topic in modern surgery and need a economical wastes [1-3]. From one side the prescription of new antibiotics and hormonal medicines are not insured from the relapses and depend on organism sensibilization. From the other side the direct treatment of the wound area, without full examination of the condition of organism and it homeostasis is resulted in prolongation of the process of reparati-on [2,4]. Last year the number of new methodical approaches of using the laser radiation (LR) on the treatment of purulent wound were reported [5-9]. The lasers application in a clinical practice leads to the improving of the effect of treatment of purulent wounds and to advance their complications [10,11].

Present investigation was based on the antimicrobe effect of modulated low-intensive radiation of the infrared laser (IL) with the wavelength of 10.6μm. New optical method proposed by us permit to suppress the surface bacterium flora, improve microcirculation, increase cellular biopotential and make the process of reparation more intensive [6,10,12,13]. Now one of the priority in a local etiotropic complex therapy of purulent wound is given to laser therapy, which unlike the traditional methods do not possess toxic, allergic, mutagenic, teratogenic, resistant and secondary effect. The investigation of influence of LR on the inflammation process have been showed that in a source of inflammation the increasing of the process of oxidation–reconstruction, rising of the oxygen absorption and decreasing the proliferation in a connective tissue normalizing vessel penetration is observed

[14,15]. More over, the antimicrobe activity of the infrared LR is combined with the absence of direct contact with pathological object, that prevents an additional mechanical trauma, the risk of infection, chemical aggression, microbial dissemination [15,16]. The experiments that were conducted on the animals with the application of the infrared laser radiation show high therapeutically effect and this is confirmed by other methods of investigation.

Experimental investigation shows that the have laser radiation infrared range have the permits immunokorrective qualities, what permits to recommend it like a optical method for local using [11, 16].

The aim of our experiment is to study the citochemical indices of neutrofills of periphery blood of the patients with purulent-inflammation diseases of "soft" tissue by the application of the low-intensive (10-100 mW) infrared laser radiation.

Experimental

The investigations were conducted on 52 patients in a surgical department RCCH AR of the Crimea with purulent wounds, which were devised onto 2 groups. First group – 22 persons, were treated traditionally. The surgical treatment of purulent wound (cutting and extracting the purulent source of infection) leads to the appearing of a surgical "bath" of the wound. This manipulation consists of irrigation the wound by the superficial-active substance with the solution of antiseptic. Medical effect of the treatment in I phase of the wound process is based on a antimicrobe, dehydrotational, uninflammational and analgetic effect. With this used aim we used 3% solution of H_2O_2 , 10% solution of NaCl, 25% solution of $MgSO_4$, 5% solution of acidi Borici, ferments – tripsin, hemotripsin and others. Combinative using of antiseptics and ferments are composed with the using of antiseptically ointment. Ointments – "Irucsol", "Levomicol", "Levomycetin" and "Diocsidinova" - possess all the properties that

were described above. In the II phase of the wound process the local treatment is directed to stimulate the reparation and to elimination of the secondary infection (ointments "Algofin", "Solcoseryl") [2]. The III phase of treatment do not differ from the treatment in the II phase of the wound process.

The second group included 30 persons, that were treated by the laser therapy. On the base of the citochemical investigation we revealed the activity of complexes of hydrogenas: succinatdehydrogenas (SDG) and lactatdehydrogenas (LDG) by known methods [17,18]. For the quantity marking the ferment in neutrofills periphery blood in every case we calculated the citochemical index (CCI) by the Astaldi and Verga formula (1958). The results were processed by the method of variable statistic of indices where the first changing of the object and individual changing where accounted. For the revealing of the phases of processes we used the method of the real periodicity, which is based on the calculation of changing complex parameters showing the condition of the object.

Results and discussion

Using the low-intensive modulated infrared laser radiation at the irradiation of the surface of purulent wound show the decreasing of the terms of wound epitalisation and process of inflammation.

Analyzing the citochemical indices of ferments in the neutrofills of the blood of the patients with a purulent wound reveals the changing of this activity to the level of the control group, and in the experimental group the activity of (SDG) decreased to 20,8% ($P_1 < 0,05$), and (LDG) activity increased to 25,5% ($P_1 < 0,05$). After 3-5 days we observed the progressive decreasing of SDG-activity both in control as well as in the experimental group to 29,1% ($P_1 < 0,01$) and 28,6% ($P_1 < 0,01$) (Table 1,2). By this time the activity increase to 39,8% ($P_1 < 0,001$) in experimental group.

Table 1. Citochemical indexes of succinatdehydrogenas (SDG) and lactatdehydrogenas (LDG) in neutrofls of periphery blood patients with superficial purulent wounds

Searching indexes	Conventiona l indexes	Control (healthy)	Control (investigation)	Term of observation (24 h)				
				3	5	7	10	14
SDG	M+	1,82	1,44	1,36	1,29	1,18	1,39	1,63
	m	0,07	0,08	0,06	0,08	0,09	0,06	0,08
	P ₁		<0,05	<0,05	<0,01	<0,001	<0,05	>0,05
	P ₂			>0,05	>0,05	<0,05	>0,05	>0,05
LDG	M+	2,16	2,71	2,88	3,02	3,14	2,78	2,44
	m	0,09	0,11	0,12	0,09	0,11	0,08	0,09
	P ₁		<0,05	<0,01	<0,001	<0,001	<0,05	>0,05
	P ₂			>0,05	>0,05	<0,05	>0,05	>0,05
P ₁ – Reliable to control (health)								
P ₂ – Reliable to control (investigation)								

Table 2. Citochemical indices of succinatdehydrogenas (SDG) and lactatdehydrogenas (LDG) in neutrofls of periphery blood patients with superficial purulent wounds with using complex treatment by laser radiation.

Searching indexes	Conventiona l indices	Control (healthy)	Control (investigation)	Term of observation (24 h)				
				3	5	7	10	14
SDG	M+	1,82	1,44	1,34	1,30	1,49	1,57	1,74
	m	0,07	0,08	0,06	0,09	0,08	0,07	0,06
	P ₁		<0,05	<0,05	<0,01	<0,05	>0,05	>0,05
	P ₂			>0,05	>0,05	>0,05	>0,05	<0,05
LDG	M+	2,16	2,71	2,85	2,98	2,62	2,35	2,22
	m	0,09	0,11	0,12	0,10	0,09	0,11	0,12
	P ₁		<0,05	<0,01	<0,01	<0,05	>0,05	>0,05
	P ₂			>0,05	>0,05	>0,05	>0,05	<0,05
P ₁ – Reliable to control (health)								
P ₂ – Reliable to control (investigation)								

In the experimental group after 7 days of the treatment we observed the sufficient changing of citochemical indices in neutrofls of periphery blood and the tendentions to reconstruction the indices. In the control group by this time the activity of ferments begin to change very progressively (activity of SDG was lower than 35,2% ($P_1 < 0,001$), LDG – activity higher than 45,4% ($P_1 < 0,001$)). The fracture term for citochemical indices for control group was 10-14 days, and we observed the tendentious to reconstruction the indices than (activity of SDG was lower than 10,4%, and in

experimental group – 4,4% ($P_1 < 0,05$)). Analogically tendentious both in the control as well as in the experimental group, we reveal citochemical indices of LDG.

Conclusions

1.Citochemical investigation of complex dehydrogenates of neutrofls of periphery blood can reveal the conformities in changing activity of these ferments in dynamic of superficial purulent wound.

2.Processes of hypocsia, on the level of a human being are the changing in the wound.

3. Expressing protective effect of laser radiation (normalization citochemical indexes in neutrofiles of periphery blood in experimental group only on 10-14 days).

4. All the fact that we have got may be a diagnostical mark in treatment of superficial purulent wound and could be the index of effective method in treatment.

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