

Effect of No-Spa on the State of Arterioles of the Skeletal Muscle of Rats after Total Irradiation with 1 Gy

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Intraarterial injection of 1, 2, and 3 mg/kg No-spa is shown to cause a dose-independent dilation of arterioles, averaging 27.4% in the control animals. On day 6 postirradiation the dilative responses of arterioles drop to 21.1% ($p < 0.05$), which is due to suppression of the myogenic tone of the microvessels.

Key Words: ionizing radiation; No-spa; arterioles of skeletal muscle; dilation

In our previous studies we have shown that total gamma-irradiation of rats in a dose of 1 Gy causes arterial hypotension, which is detectable only during the 24 h after exposure, suppresses the myogenic activity of arterioles of the skeletal muscle, which is manifested in a pronounced decrease of the frequency of spontaneous vasomotions, and lowers their responsiveness to norepinephrine [3].

In the present study we assessed the dilative capacity of resistive vessels of the skeletal muscle in animals undergoing the same treatment.

MATERIALS AND METHODS

Male Wistar rats weighing 260-340 g were irradiated using a ROKUS-M gamma-therapeutic device. During acute experiments under urethane anesthesia (1 g/kg intravenously), the arterial pressure was recorded in the carotid artery; the diameter of the second- and third-order arterioles (the central artery of the muscle being regarded as the first-order vessel) and the linear blood flow rate were measured by intravital TV-microscopy in the vas-

cular bed of the *extensor digiti maximi* of the left hind paw. The difference from the previously reported techniques [3] was that the control (6 rats) and irradiated (5 rats) animals received regional intraarterial injections of 1, 2, and 3 mg/kg No-spa (Hinoi, Hungary). For this purpose the abdomen was opened and a cannula was inserted in the central direction in the right iliac artery, the tip of the cannula reaching the aorta bifurcation; the caudal artery was ligated at the site of its origin; the abdominal wall was sutured. The ascending doses of the preparation were injected at 20-25-min intervals. The statistical reliability of the differences was determined using Wilcoxon-Mann-Whitney's *U* test [2].

RESULTS

The mean arterial pressure in the carotid artery of the control and irradiated animals was 110 (95-130) and 108 (100-120) mm Hg, respectively. The internal diameter of arterioles in the two groups of animals varied from 10 to 26 μ , and the linear blood flow rate was from 0.5 to 10.5 mm/sec. At rest, the microcirculatory bed of the skeletal muscle of irradiated animals, as observed in the micro-

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scope (obj. 25, oc. 12.5), did not exhibit any differences from the vascular bed in the same zone in the control animals.

In the control animals intraarterial injection of No-spa resulted in dilation of the arterioles in all experiments. The intensity of responses was assessed by dividing the augmented value of the internal arteriole diameter by the initial size of the lumen. For No-spa doses of 1, 2, and 3 mg/kg the mean amplitudes of dilative responses were 31.0 ± 5.3 , 23.0 ± 4.2 , and $33.0 \pm 1.0\%$, respectively. Statistical processing of the results, using either the Student *t* test or Wilcoxon-Mann-Whitney *U* test, failed to reveal differences in the responses to different doses of the preparation. In the experiments of Rogoza [4], when the distending pressure was about 100 mm Hg, the diameter of the rat caudal arteries for the maximum relaxation of their myocytes with No-spa was some 30% of the basal state. In studies of the dilative responses of the femoral, renal, and common carotid artery in cats it was found [1] that the maximum dilation attainable under these conditions is approximately equal for all the vessels examined and constitutes some 25%. Comparison of the data obtained by Balashov [1] and Rogoza [4] with our findings suggests that under the conditions of our experiments No-spa in doses of 1, 2, and 3 mg/kg causes equal (and the maximum attainable) dilative responses. Hereafter, the results of measurements of the dilative responses of arterioles to different doses of the preparation are combined in

one group for both the control experiments and the experiments on irradiated animals.

On day 6 after exposure, the dilative responses were less pronounced in the irradiated than in the control animals. Intraarterial injection of 1-3 mg/kg No-spa increased the diameter of arterioles by 21% (8-50%). These data were obtained in 14 measurements, where the extreme values of the responses observed are given in parentheses. In the overall control group (15 measurements) the dilation of arterioles was 27.4% (15-55%). The differences were statistically reliable according to the Wilcoxon-Mann-Whitney test ($p < 0.05$).

These results are in line with our previous findings [3] and allow for the conclusion that total gamma-irradiation of rats with 1 Gy changes the functional activity of the smooth muscle wall of arterioles of the skeletal muscle and suppresses the myogenic tone of the resistive vessels.

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