THE ANTI-SHOCK ACTIVITY OF LARGE DOSES OF CYANOCOBALAMIN

(UDC 617-001.36-085.3:577.164.16+615.3:577.164.16-092.259)

I. S. Badyuzin

The S. M. Kirov Order of Lenin Army Medical Academy, Leningrad
Scientific Director—Active Member Academy of Medical Sciences, USSR, Prof. I. R. Petrov
(Presented by Active Member of the Academy of Medical Sciences, USSR, I. R. Petrov)
Translated from Byulleten' Éksperimental'noi Biologii i Meditsiny, Vol. 60, No. 11,
pp. 62-64, November, 1965
Original article submitted June 2, 1964

N. V. Lazarev and S. M. Vishnyakov [2] employed cyanocobalamin (Vitamin B_{12}) successfully for electric shock prophylaxis in the cat. This vitamin is incorporated into the anti-shock fluid employed in the clinic by M. S. Lisitsin [3]. Cyanocobalamin has been used in the complex therapy of "the crush syndrome" [1] and hemorrhagic collapse [4].

The objective in the present work was to assess the therapeutic properties of cyanocobalamin when employing it as the sole treatment in conditions of severe traumatic shock.

METHODS

Traumatic shock was produced in 22 non-narcotized dogs, after a small amount of the blood was removed (1% of the body weight), by crushing the soft femoral tissue. Therapy was instituted 2 h after the appearance of III degree shock. Results from experiments in which therapy was begun later are not included in the present report.

RESULTS

Severe trauma in animals produced disorganization of the fundamental processes of nervous activity, hypothermia, severe disorder of circulation, respiration and other functions. All 5 control animals (experimental series I) that received no therapy died in 3-4 h after the trauma was inflicted. The animals in experimental series II were given Petrov's saline transfusion fluid intravenously in dosage of 15-18 ml/kg; this temporarily gave a favorable result, increased the arterial pressure, and prolonged life. However, 7 out of 8 animals died during the course of the first day. The animals in experimental series III, 15 min after transfusion with Petrov's solution, were given 60 μg/kg of cyanocobalamin intravenously (see table and figure). The vitamin injection produced a long and steady therapeutic effect: 7 of 9 dogs recovered, but when only the blood-extending solution was given 1 of 8 recovered ($P < 0.01$).

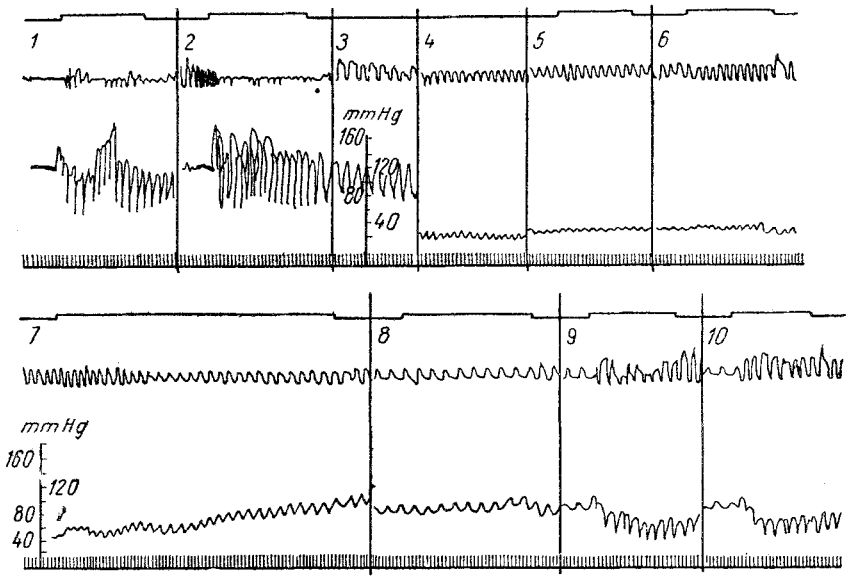
While the administration of Petrov's solution, with most animals, resulted in a slowing of the heartbeat in connection with increased arterial pressure, the injection of vitamin B_{12} permitted retaining an increased frequency of the pulse during shock. A study of the electrocardiogram in 5 subjects in the principal series (III) of experiments demonstrated that during the course of the first hour after therapy the disturbed bioelectric activity of the heart muscle failed to make a complete recovery.

On the basis of hypotheses contained in the literature relative to the restorative activity of cyanocobalamin [2], we had anticipated an increase in the pressor reflexes and evidence of a superficial phase of parabiosis after administration of the vitamin. However, in 4 of the animals the pressor reflexes on stimulating the mixed nerve were distorted (see figure) but in the remaining 5 they were not substantially enhanced.

The behavior of the animals immediately after the operation was unique. Despite severe trauma of an extremity, they were able to move independently, they exhibited liveliness in orienting reactions, and drank small quantities of water. However, in certain dogs the conditions were more serious, as evidenced by "circus" movements and refusal of water.

Changes in Arterial Pressure Following Treatment, and the Final Outcome of the Experiments (M±m)

Exptl. series	Therapeutic means		Arterial pressure (in mm)						No. of animals	
	Petrov's solution (in ml/kg)	Cyanocobalamin (μg/kg)	2 h following trauma	after therapy					total	recovered
				1 min	15 min	30 min	45 min	60 min		
II	18,5	—	46 ± 4	84±4	79±5	80±4	80±6	72±5	8	1
III	16,7	60	48 ± 2	87±5	89±5	88±4	83±3	84±4	9	7



The pressor reflexes with weak (1, 5, 9) and strong (2, 6, 10) stimulation of the femoral nerve (respectively 19 and 17 cm on the scale of the Dubois-Reymond induction apparatus at a current source of 6 v, 50 cps). 1, 2) Initial period; 3) after the bloodletting; 4) immediately after trauma; 5, 6) 2 h after trauma; 7) after administering Petrov's solution; 8) after administering vitamin B_{12}; 9, 10) an hour after therapy. Designation of the curves (top to bottom). 1) Marker showing stimulation; 2) respiration; 3) arterial pressure; 4) time markings (1 sec). Outcome of the experiment—the animal recovered.

The results obtained indicate that the use of vitamin B_{12} is advantageous not only for shock prophylaxis [2] but also for its complex therapy.

LITERATURE CITED

1. V. A. Kovalenko, The Pathogenesis of functional disorders during prolonged compression of tissues and the action of penetrating radiation, and therapy following prolonged tissue compression [in Russian], Diss. kand. Leningrad (1957).
2. N. V. Lazarev and S. M. Vishnyakov, Vestn. khir., 11 (1957), p. 19.
3. V. G. Mitrofanov, The pathogenesis of traumatic shock and its complication with radiation sickness [in Russian], Diss. dokt., Leningrad (1959).
4. J. Howard and M. deBakey, Surgery, 30 (1951), p. 161.