ADRENALIN SECRETION AFTER SUPRAPLEURAL NOVOCAIN BLOCK OF THE SYMPATHETIC NERVES

Z. A. Khalutova

From the Department of Physiology (Chairman – Active Member Acad. Sci. USSR E. N. Pavlovskii) of the N. E. Bauman Kazan Veterinary Institute

(Received October 21, 1956. Presented by Active Member Acad. Med. Sci. USSR V. N. Chernigovskii)

Assistant professor of the Kazan Veterinary Institute, V. V. Mosin, developed a method of suprapleural novocain block of the abdominal nerves with the associated sympathetic trunks in horses, large-horned cattle, sheep, pigs, dogs, dark brown foxes, cats, rabbits and other animals. Bilateral, suprapleural novocain block of the abdominal nerves and the bordering sympathetic trunks is of considerable therapeutic value in such diseases of the abdominal cavity as peritonitis, gastroenteritis, metritis, cystitis, nephritis, etc.

Experiments in our laboratory have demonstrated marked changes in the activities of the stomach, pancreas and other organs that result from the influence of the novocain block using the method of V. V. Mosin. In part, A. I. Poliakov demonstrated a lowering of the blood sugar which occurs after the block and lasts for over 10 hours and even up to several days.

It seemed important to clarify the mechanism of the hypoglycemia which develops after the block of the abdominal nerves and the sympathetic trunks. This would enable us to understand the reason for the favorable influence of the block under pathological situations. On the supposition that the development of the hypoglycemia is connected with a diminished secretion of adrenalin, we decided to determine the normal amount of adrenalin in the blood and then the amount present after a bilateral novocain block.

Blood adrenalin was determined by the method of luminescent analysis with the S. V. Senkevich modification developed in the laboratory of the Kazan Medical Institute.

In order to develop fluorescence of adrenalin or its derivatives, the blood plasma was subjected to the rays of a mercury quartz arc. The intensity of the luminescence was measured with a photometer.

The experiments were done on dogs. The blood was drawn from the femoral artery with a syringe rinsed in a 2% solution of acid sodium citrate. The site of blood withdrawal was flushed with alcohol. In each dog for the first 5-6 days the normal content of adrenalin was dete mined and then, at various intervals after the V. V. Mosin block, the adrenalin content was determined again. The block was performed using a 0.25% solution of novocain and injecting 20 cc of this solution on each side.

EXPERIMENTAL RESULTS

The normal blood adrenalin is shown in Table 1.

The data as presented demonstrate that luminescent analysis will always demonstrate the presence of adrenalin or its derivatives (in the blood). Normally the quantity of adrenalin in the blood fluctuates only within rather narrow limits. Sex and weight of the animals do not seem to affect the adrenalin blood levels.

After the normal values were determined for the blood plasma of all the dogs, a V. V. Mosin block was instituted and then, at various intervals, the blood adrenalin levels were again determined. The results of these tests are presented in Table 2. In succeeding days all the dogs showed a return of the adrenalin levels to normal.

TABLE 1

Alterations in the Amount of Adrenalin Present in the Blood of Dogs Under Normal Conditions

Date of the determinations	Adrenalin content in γ/cc in the dogs
Dog No. 1, Tresor, male, weight 8 kg	
21/VI	1.4
22/VI	1.9
Dog No. 2, Volchok, male, weight 8 kg	
20/VI	1.25
23/VI	1.5
Dog No. 3, Damka, female, weight 12 kg	
21/VI	1.2
22/VI	1.5
22/VI	1.1
Dog No. 4, Zhuchka, female, weight 9 kg	
22/VI	1.13
23/VI	1.1
Dog No. 5, Dzhilda, female, weight 13 kg	
12/VII	1.45
13/VII	1.1
14/VII	1.4
15/VII	1.2
16/VII	1.2
Dog No. 6, Orlik, male, weight 13 kg	
13/VII	1.45
14/VII	1.6
15/VII	1.8
Dog No. 7, Belka, female, weight 10 kg	
30/VII	1.3
31/VII	0.95
14/VIII	1.4
Dog No. 8, Sultan, male, weight 16 kg	
14/VIII	1.3
15/VIII	1.47

The adduced data show that within 2-3 hours after the block in the animals of the abdominal nerves and the associated sympathetic trunks, adrenalin and its products capable of fluorescing in the blood disappear. The fluorescing substances do not reappear until as late as 12 to 13 days after the block. The same results are obtained after a secondary block which was performed on dogs No. 5 and 6. In dog No. 5 fluorescent substances reappeared after the 12th day following the secondary block while in dog No. 6 they reappeared on the 13th day.

Thus, the novocain block of the absominal nerves interrupts impulses going to the suprarenals and their medullary substance thus producing profound alterations in the formation of adrenalin, the effects outlasting by far the actual action of the novocain itself. V. V. Mosin is of the opinion that his procedure produces anesthesia of the abdominal organs for only 2 to 5 hours. Apparently, then, the conductivity of the abdominal nerves is

interrupted for only a short time. However, the effects of the block persist much longer. According to the unpublished observations in our laboratory of Berestov, Lisov and Kostin, the block disturbs the actions of the stomach and pancreas for from 2 to 13 days.

It is evident that the adrenalin-forming function of the chromaffin tissues is also upset for a long time.

TABLE 2

Alterations in the Amount of Adrenalin Present in the Blood of Dogs Following Bilateral Novocain Block

Time interval	adrenalin content in the dogs expressed in γ/cc							
	№ 1	№ 2	№ 3	№ 4	№ 5	№ 6	№ 7	№ 8
block performed	6/24	6/24	6/25	6/25	6/16	6/16	6/5	6/15
After 3 hours. . . .	0	0	0	0	0	0		
" 4 "	—	—	—	—	0	0	0	0
" 48 " . . .	—	—	—	—	0	0	0	
" 3 days . . .	0	0	0	0	0	0		0
" 4 " . . .	—	—	—	—	0			
" 5 " . . .	—	—	—	—	0	0		0
" 6 " . . .	—	—	—	—	0	0		
" 7 " . . .	—	—	—	—	0		0	
" 8 " . . .	—	—	—	—	0	0		
" 9 " . . .	—	—	—	—	—	—	—	0
" 10 " . . .	—	—	—	—	0	0		0
" 11 " . . .	—	—	—	—	0	1.09	0	0
" 12 " . . .	—	—	—	—	0	1.0	0	0.95
" 13 " . . .	—	—	—	—	1,04	1.4	1.6	1.3

However, we cannot be certain that the disappearance of fluorescing substances from the blood must mean that the novocain block stops the formation of adrenalin. It may be supposed that under the influence of cessation of afferent impulses to the chromaffin tissues the chemistry of adrenalin formation becomes so altered that fluorescent substances no longer become the end product of adrenalin metabolism.

The problem needs further investigation. We believe that we have established the fact that fluorescent substances disappear from the blood as a result of novocain block of the abdominal nerves and the sympathetic nerves by the V. V. Mosin method and that this fact must be taken into consideration when the mechanism of the action of this block is examined further and practical therapeutic conclusions are being drawn.

Thus, the suprapleural novocain block of the abdominal nerves and associated sympathetic trunks by the V. V. Mosin method produces a disappearance from the blood of the fluorescing products of adrenalin metabolism. The action of the block persists for 12 to 14 days at the end of which time these fluorescing substances reappear in the blood. This effect of the novocain block must be associated with the cessation of impulses going over the abdominal nerves to the suprarenals.

SUMMARY

Experiments were performed on dogs to reveal the mechanism of hypoglycemia which takes place in novocain block of the abdominal nerves and sympathetic trunks. The method of luminiscent analysis was used.

It was established that a stable disappearance of the products of adrenalin disintegration takes place in the blood and plasma even 2-3 hours following suprapleural novocain block of the abdominal nerves and the sympathetic trunks by Mosin's method. The function of adrenalin production is reestablished on the 12th-13th day after the block.

LITERATURE CITED

[1] V. V. Mosin, Novocain Block of the Abdominal Nerves – A Method for Producing a Protective Effect Upon the Nervous System in the Presence of Peritonitis and Inflammation of Abdominal Organs,* Dissertation, Kazan, 1951.

[2] S. V. Senkevich, A Method of Luminescent Analysis of Blood Adrenalin and Tissue Sympathin,* Dissertation, Kazan, 1953.

* In Russian.