

THE INFLUENCE OF MORPHINE-PENTOTHAL NARCOSIS ON SUGAR UTILIZATION IN THE EXTREMITY OF A DOG UNDER NORMAL CONDITIONS AND AFTER AUTOTRANSPLANTATION

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(Received December 16, 1956. Presented by Acting Member Acad. Med. Sci. USSR S. E. Severin).

The influence of auto and homotransplants of an extremity upon metabolism and the transplanted organ, has up to the present time been little studied. The present work is devoted to a study of the arterio-venous difference in the sugar content of the blood in the femoral vessels of dogs after autotransplantation of the extremity. In our institute these operations were performed by N. P. Petrovsky and A. G. Lapchinsky. We used their material for our studies.

In the upper third of the inner surface of the thigh of a dog a sterile incision was made along the course of the blood vessels, isolating the femoral artery and vein. Blood was taken from these vessels with a needle used for injections, the sugar being determined by the method of Hagedorn-Jensen.

As anesthetics were used during the transplantation operation, it became necessary to exclude the influence of these pain-killing agents upon the sugar assimilation ability of the tissues. The literature indicates (I. I. Fedorov) that during narcosis tissues fail to utilize sugar. As regards pentothal, the literature is silent. As the autotransplants of the dog extremities were done under morphine-pentothal narcosis, we deemed it necessary to observe the influence of this anesthesia upon sugar metabolism and so we used studies on unoperated dogs, the results being shown in Tables 1 and 2.

TABLE 1

Sugar Content in mg% of Femoral Vessel Blood of Dogs after Injecting 2% Solutions of Acidified Morphine.

Date	Dog	Artery	Vein	Arterio-venous difference
Dose 0.2 cc per 1 kg weight				
10/IX 1952	Dezi	286	265	-21
26/XI 1952	Zhuchka	255	238	-17
23/V 1953	Molecule	286	243	-43
10/X 1953	Tresor	213	193	-20
17/X 1952	Dunei	208	177	-23
Average				-25
Dose 0.4-0.5 cc. per 1 kg weight				
17/V 1952	Brother	268	286	+20
13/V 1952	Bear	270	306	+36
27/V 1952	Whiney	154	159	+5

As can be seen from Table 1, the influence of the acidified morphine exerts a varying effect on the arterio-venous difference depending on the dosage: after introducing relatively small doses (0.2 cc 2% solution per 1 kg weight) sugar continues to be utilized by the tissues of the extremity, after larger doses (0.5 cc 2% solution per 1 kg weight) the utilization of sugar ceases and it begins to enter the blood from the tissues.

In Table 2 is given the data relating to the effects of morphine-pentothal narcosis.

TABLE 2

The Sugar Content of the Femoral Vessel Blood of Dogs, kept under Morphine-Pentothal Narcosis (Morphine 0.2 cc 2% sol. per 1 kg Weight, Pentothal Averaging 0.25 cc. 5% sol. per kg weight) expressed in cc %.

Date	Dog	Artery	Vein	Arterio-venous difference
12/XI 1952	Desi	154	154	0
27/VII 1953	Elder	116	107	-9
15/I 1953	Zhuchka 1st	107	100	-7
19/I 1953	Zhuchka 2nd	132	132	0
16/X 1952	Smoke	143	138	-5
Average				-4

TABLE 3

The Sugar Content in mg % of the Blood in the Dog femoral vessels at the End of the Operation of Extremity Transplant, all Conducted Under Morphine-Pentothal Narcosis.

Date	Dog	Artery	Vein	Arterio-venous difference
28/IV 1952	Mars	184	184	0
5/VI 1952	Bright Eyes	152	152	0
10/VII 1952	Grey	151	149	-2
2/VI 1952	Molecule	170	163	-7
13/VI 1952	Beauty	125	141	+16

TABLE 4

The Sugar Content in mg % in the Femoral Vessel Blood of Dogs after Extremity Transplantation.

Date	Dog	day after surgery	Artery	Operated limb		Control limb	
				vein	arterio-venous diff.	vein	arterio-venous diff.
20/IV 1952	Tan	1	182	153	29	174	-8
15/VII 1952	Bright Eyes	15	206	203	-3	-	-
23/X 1952	White	106	205	194	-11	186	-19
20/VI 1953	White	223	162	145	-17	122	-40
8/VII 1952	Grey	163	229	213	-16	203	-26
18/IV 1952	Fox	295	174	158	-16	134	40
23/IX 1952	Silva	560	215	181	-34	189	-26

On the basis of these experiments it can be concluded that it is not possible to study sugar levels in dogs after the introduction of large doses of acidified morphine (in excess of 0.2 cc 2% solution per 1 kg weight), or in dogs under morphine-pentothal narcosis, as this type of anesthesia, similarly to other narcotizing agents, interferes with the utilization of sugar by the tissues from their blood supply.

However, during the course of the transplantation operation, the extremity is fully denervated (there being complete separation from the body of the dog before reattachment). It was not known whether the above described inhibiting action of the morphine-pentothal narcosis upon sugar assimilation occurred also in the tissues of a denervated extremity.

Blood was drawn in the following manner: In the course of the operation the extremity was first severed and, after an interval, reattached. Suturing was commenced with the vessels first; the artery was reanastomosed first, after which the clamp was removed from the artery so that the extremity might receive blood. Blood was permitted to flow from the vein which had not yet been sutured. This venous blood was collected and analyzed for its sugar content.

The obtained results are seen in Table 3.

The results of these experiments show that under morphine-pentothal narcosis the tissues of a fully denervated extremity (first severed and then resutured) fail almost completely to take sugar from incoming blood. For this reason the study of arterio-venous differences under morphine-pentothal narcosis during the transplantation operation is not feasible. As a result there was studied the sugar content in the vessels of the transplanted extremity after various intervals of time elapsing from the operation. It is regrettable that the number of operated dogs was small and that obtaining blood for the analyses was sometimes impossible because of the associated additional trauma. A systematic study after a long time was fully excluded.

The blood was taken from the dogs which were under the influence of a 2% solution of morphine hydrochloride (0.2 cc per kg weight) which had been injected as a preliminary. There were technical obstacles to the withdrawal of blood from the femoral vessels of the transplanted extremity because of the dense overgrowth of scar tissue around the suture sites and around the vessels themselves. The results are given in Table 4.

These results permit the conclusion that the tissues of the transplanted extremity can utilize sugar but, as a rule, to a lesser degree than the normal tissues of the unoperated extremity.

LITERATURE CITED

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* In Russian.