

THE CEREBRAL HEMODYNAMIC EFFECT OF VINCAMINE

Jean Claude Depresseux
University of Liège, Belgium

The assessment of the cerebral hemodynamic action of the vaso-active drugs remains an intricate problem in man, particularly in the pathological cases ; the interpretation of the results in the latter is complicated by the presence of pre-treatment alterations in the distribution of rCBF and by differences in the vascular reactivity to drugs. The difficulty of setting up well controlled and homogeneous groups prescribes to submit the experimental results to a careful statistical analysis.

The study of the cerebral hemodynamic effect of Vincamine is the occasion to elaborate and to test an experimental program and to draw inferences as to the mechanisms of action of such drugs on the rCBF distribution.

The action of the drug is studied in 16 patients with neurological diseases including cerebral circulatory disorders. The cases are partitioned into three diagnostic subgroups : cerebral infarcts, one week to one month old (6 cases), dementia (6 cases), normal pressure hydrocephalus, surgically derived and clinically stabilised (4 cases).

The rCBF of 20 to 32 regions of one hemisphere are measured in each patient by means of the intracarotid 133 -Xenon method, on the side of the cerebral lesion in the 6 hemiplegic patients and on the left side in the 10 other cases. The radioactivity is detected with a gamma-camera ; count rate loss from saturation of the detector is verified negligible. The values of bicompartmental rCBF are automatically computed (1).

Measurements are made twice in each patient, prior to any treatment and five minutes after the injection of 5 mgr of Vincamine (Pervincamine Dausse) into the internal carotid artery of the cerebral hemisphere concerned. The patient quietly remains in dorsal decubitus, without any premedication, and the stability of the operational conditions is ensured by repeated measurements of the arterial pressure and of the arterial pCO₂ ; cases exhibiting variations of these parameters or abnormal values of pCO₂ were excluded.

The analysis bears on the fast compartmental rCBF ; the effect of the drug on each region is estimated by the paired differences - rCBF after Vincamine minus rCBF before Vincamine -.

A control group is examined in the same conditions, but without any injection of drug : it shows no significant difference between the first and the second measurement (mean difference = 0.2 ml/min.100gr, with a 95% confidence interval of the mean from - 0.5 to 0.9 ml/min.100gr).

The paired differences between the rCBF before and after Vincamine are computed in 395 regions. Reference, relatively ischemic and relatively hyperemic zones are distinguished in each patient by setting on each side of his own mean CBF a range of + and - 15% of this mean value (2).

The analysis of variance of the paired differences of rCBF justifies to maintain the distinction between the so-called reference, ischemic and hyperemic zones and to applicate the t-test of Student. The three diagnostic groups of infarcts, dementia and hydrocephalus show no difference of response to the drug and may therefore be grouped for the analysis. (see table)

The 90 ischemic zones show an enhancement of their rCBF, with a very significant ($p < 0.001$) mean difference of + 26.6 ml/min.100gr and a 95% confidence interval of the mean from + 22 to + 31.2 ml/min.100gr. The individual values undergo no steal phenomenon.

The same comparison with regard to 219 reference zones discloses also a significant ($p < 0.001$) flow increase, but the difference is less : + 10.5 ml/min.100gr, with a 95% confidence interval of the mean from + 8.1 to + 12.8 ml/min.100gr.

The relatively hyperemic zones, 86 in number, show no significant alteration of their rCBF ; the rCBF changes in these zones appear sometimes positive, sometimes negative.

TABLE

		Infarcts	Dementia	Hydrocephalus	Total
Ischemic zones	n	39	27	24	90
	\bar{d}	+22.3	+26.5	+33.8	+26.6
	$s_{\bar{d}}$	2.8	4.6	5.4	2.4
	t				11.20 $p < 0.001$
Hyperemic zones	n	37	34	15	86
	\bar{d}	-3.9	+1.1	-10.7	-3.1
	$s_{\bar{d}}$	2.9	3.0	6.8	2.1
	t				-1.49
Reference zones	n	83	78	58	219
	\bar{d}	+5.1	+14.7	+12.6	+10.5
	$s_{\bar{d}}$	1.3	2.0	3.0	1.2
	t				8.71 $p < 0.001$
Total	n	159	139	97	395

The mean paired differences \bar{d} (rCBF after Vincamine minus rCBF before Vincamine) in ml/min.100gr, in the three diagnostic subgroups ; n is the number of zones, $s_{\bar{d}}$, the standard deviation of the mean difference, t, the Student's t.

In view to elaborate a model permitting to account for the variable comportment of the relatively hyperemic zones, a comparison is made between the mean CBF values after Vincamine, respectively in the hyperemic zones and in the remainder of the hemisphere of each subject. The analysis shows that the mean value of the differences does not diverge significantly from zero ($t = -0.07$, $DF = 14$).

In conclusion, the study reveals that Vincamine has a beneficial hemodynamic effect in the brain ; this action is more intense in the ischemic regions ; it is registered out of any alteration in arterial pressure nor in arterial pCO₂. The action of Vincamine leads to a decrease and an equalisation of the hemodynamic resistances of the cerebral vascular bed.

References

1. Depresseux, J.C., Merchie, G., Champarnaux, J.F. and Haglund, M. Int. J. Biomedical Computing, 7, 241-249 (1976)
2. Kohlmeier, K. Verh. dtsh. Ges. Kreislforsch., 39, 95-101 (1973)