

Some observations on vaso-motor reflexes / by Swale Vincent and A.T. Cameron.

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**Some Observations on Vaso-
Motor Reflexes**

by

SWALE VINCENT and A. T. CAMERON

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Some Observations on Vaso-motor Reflexes.

By SWALE VINCENT and A. T. CAMERON.

(From the Physiological Laboratory, University of Manitoba,
Winnipeg.)

(Read May 27, 1914.)

The present investigation was suggested by the conflicting results obtained by our senior class of students in trying to obtain the results described in the majority of text-books on stimulation of the central end of an afferent nerve, and by what seemed to us an inexplicable contradiction frequently met with, between the effect of stimulating the cut central end of a sensory nerve, and the effect of stimulating the terminals of such a nerve, as for example, in the skin.

Insufficient attention has been paid by previous investigators to the specific pharmacodynamic effect of the anaesthetic employed. It seems to have been assumed by most workers that a standard condition of the animal should be aimed at, in which disturbing influences due to reflex muscular spasms and reflex respiratory movements were as far as possible eliminated. Such an object is undoubtedly desirable from many standpoints, but has in our opinion the supreme disadvantage that the specific action of the anaesthetics concerned is disregarded. In experiments with dogs the majority of observers seem to have employed ether as an initial anaesthetic followed by morphia, and frequently curare. We have found no detailed account of what happens in the record of the vaso-motor reflexes if the animal be simply anaesthetised with ether. We have considered that this problem should not be shirked, especially as such a condition is one very frequently met with in surgical procedure upon the human subject.

The problem of the vaso-motor reflexes is of course intimately connected with that of shock, but with the latter subject itself we do not propose to deal.

From a large number of experiments on dogs, cats, and rabbits we are led to the following conclusions:

When an animal is deeply under the influence of ether, it is frequently impossible to obtain any vaso-motor reflexes whatever. When anaesthesia is fairly complete the effect of stimulating the central end of the cut sciatic nerve is sometimes a distinct rise. As the effect of the anaesthetic begins to pass off, the rise is followed by a more or less

pronounced fall. Respiratory movements are markedly increased, and the extent of the fall appears to be largely proportional to the violence of the respiratory activity. During the actual stimulation there is either a very slight rise, or a more marked rise, or the pressure remains about constant, while the fall usually begins at the moment of cessation of the stimulation. There is thus a clear indication of the action of two opposing influences, a reflex vaso-constriction, producing a rise, and violent respiration, producing a fall.

A similar fall of pressure is brought about by performing rapid artificial respiration by compression on the thorax, and can be induced in the human subject by rapid and deep voluntary respiration.

The effects so far described (except the last) apply to animals anaesthetised with ether, and the same are generally true if chloroform, chloral hydrate, or urethane are employed. When the animal is under the influence of morphia, electrical stimulation of the central end of the sciatic produces a rise of pressure, while mechanical stimulation of the skin produces a fall, but there is every reason to believe that this is after all a quantitative, and not a qualitative difference. It is difficult to apply a mechanical stimulation to the skin which can be considered as the equivalent of a rapidly interrupted electrical stimulation upon the sciatic.

When the animal is fully under the influence of curare, stimulating the central end of a cut nerve trunk invariably causes a rise of blood pressure. This effect seems to be due, largely at any rate, to the cessation of respiratory movements.

The more widely the thorax is opened, the more does the fall of blood pressure obtained by stimulation of nerve tend to become replaced by a rise (animal under ether). The lowering of blood pressure when the central end of the sciatic nerve has been stimulated, as also when rapid artificial respiration has been performed by compression of the thorax, and further also when rapid and deep voluntary respiration is performed upon human beings, is probably due to direct mechanical influence upon the heart's action, or interference with the return of blood to the heart, or both.

The result of a weak stimulation is usually a fall of blood pressure, while a pressor effect follows as a rule a stronger stimulus (confirmatory of Knoll and of Hunt). The difference however we have not observed when the thorax is opened.

Cooling the nerve tends to produce vaso-dilator effects (confirmatory of Howell, Budgett, and Leonard, and of Reid Hunt). This also we have been unable to observe in an animal with the thorax opened.

Stimulation of the skin, kneading of muscle, and manipulation

of the intestines, all cause a fall of blood pressure, under certain conditions, and a rise under other conditions. These conditions we believe are the same as for the corresponding results with the sciatic nerve, though it is not always so easy to demonstrate this.

The vaso-motor reflex from the intestine is abolished by full doses of nicotine, is reduced by section of the great splanchnic nerve on both sides, and is abolished by extirpation of the semilunar ganglion.

Our evidence in favour of the existence of vaso-dilator fibres in afferent nerve trunks consists of results from certain animals in which, no matter what the condition, with thorax opened, and curare administered, stimulation of such nerve trunks resulted in a fall of blood pressure, and secondly from the observations made during experiments on the kneading of muscle, in which marked double-fall effects were produced, easily traceable to separate causes: a vaso-dilatation and a respiratory effect.

Whether a rise or fall of blood pressure will result from stimulation of an afferent nerve (terminals or cut central end) depends on the relative effects of the three primary causal factors (a) reflex vaso-dilation; (b) reflex vaso-constriction, and (c) frequency and depth of respiration, and the relative predominance of one or more of these factors is determined by (i) the strength of stimulus, (ii), the temperature of the nerve, (iii) the anaesthetic, (iv) the degree of anaesthesia, and (v) the idiosyncrasy of the animal.

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