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Reciprocal Inhibition During One Type of Pupillary Dilatation.

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In this investigation cats and rabbits under light ether anesthesia were used. The cervical sympathetic nerves were isolated on both sides of the neck, and the sciatic nerves were so prepared that their central ends could be stimulated with a tetanizing current. An attempt was made to keep the degree of anesthesia, as well as the intensity of the illumination, constant.

One sciatic nerve was stimulated and a dilatation of both pupils was obtained. The cervical sympathetic on one side of the neck was now sectioned and the central end of the sciatic stimulated with the same strength of current. A *bilateral* pupillary dilatation was again obtained, but the extent of dilatation seen in the eye, which had its cervical sympathetic cut, was less than that seen in the normal eye. In some animals a 1% solution of pilocarpine was instilled into the partially denervated eye. After the drug produced its maximum myosis the sciatic was stimulated as well as the peripheral (head end) of the cervical sympathetic. In the pilocarpinized, partially denervated, eye no effect was obtained from stimulation of the sciatic nerve, while stimulation of the peripheral end of the cervical sympathetic produced a maximum mydriasis.

In other animals the pilocarpine instillation was omitted, and 1% atropine substituted in its stead. In those animals which had received pilocarpine the atropine was later administered. In both sets the results were identical. When the atropine produces its maximum effects by paralyzing the endings of the oculomotor fibres, we can say the pupil is in a position of rest, that is, both sets of nerves are "sectioned", one by drugs and the other anatomically, and the muscles assume their position of rest. Stimulation of the sciatic nerve now produced the usual dilatation of the normal eye, but the pupil of the completely denervated eye remained entirely quiet and unaffected. The size of the normal dilated pupil exceeded that of the opposite one. The remaining cervical sympathetic was now cut and the pupil became smaller than the atropinized one. Stimulation of the sciatic nerve now produced a dilatation on that side, but the size of the dilated pupil did not equal that of the atropinized one.

The dilatation seen in response to sciatic stimulation after section of the cervical sympathetic is interpreted as being due to a diminu-

tion in the tone of the pupillo-constrictor muscle. This is similar to the reciprocal inhibition studied by Sherrington for striated skeletal muscle. There are, however, two striking differences. Sherrington's original study was performed, as alluded to above, on striated skeletal muscle, but we are here dealing with smooth muscle. Secondly, it is to be noted that the reciprocal relaxation is here not complete, while Sherrington found that the relaxation of the antagonistic muscle groups equalled the post mortem lengthening. This was especially true when he used strong stimulating currents. In no case could we produce a complete relaxation of the constrictor fibers, regardless of how strong the stimulating current was. This statement is supported by the fact that the dilatation observed in the sympathectomized eye did not equal that of the denervated atropinized eye, where presumably the constrictor fibres are completely at rest. The possibility of crossed fibres of the cervical sympathetic is ruled out, because when the dilatation after section of the sympathetic was obtained in the second eye, the other sympathetic was already sectioned.

It may also be added that when the normal eye dilates in response to the pain stimulus, the factor concerned with the dilatation is the radial musculature primarily; although the constrictor fibres act as physiological synergists by relaxing, they do not do so completely, and it is necessary for the radial fibres to stretch them to produce a mydriasis.

A typical protocol is appended:

Procedure	Right Eye	Left Eye
Normal	3mm.	3mm.
Stimulate right sciatic	7	7
Cut right cervical sympathetic	3	5
Stimulate sciatic	5	8
Instill 1% pilocarpine in right eye	1	4
Stimulate sciatic	1	8
Stimulate right cervical sympathetic	9	4
Put atropine in right eye	6	4
Stimulate sciatic	6	8
Cut left cervical sympathetic	6	3
Stimulate sciatic	6	4
Instill atropine in left eye	6	6

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