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Note on the results of circumsection of the motor cortex.

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The observations recorded were done in collaboration with Dr R. S. Woodworth. Their object was to test in the monkey the results obtained by Marique and by Exner and Paneth in the dog, but incidentally one experiment has been made in the cat and one in the dog. In one monkey and one cat a complete extirpation of a motor area was made for the sake of comparing the symptoms in the "circumsected" cases.

In two successive experiments on one monkey a cut was made through the pia mater and the most superficial part of the cortex alone, the cut circumsecting the arm area and avoiding large vessels. These experiments both gave no noticeable result.

In four other experiments on monkeys the cut around the arm area was deep enough not only to penetrate the grey matter, but to pass some distance into the white matter. In all four there was considerable hæmorrhage both superficial and deep. In three out of the four there was motor paralysis of the opposite arm, and in two of these cases there was also paresis of the leg: in one no paralysis was noticeable. In none was there any appreciable persistent sensory paralysis (tactile), but one showed homonymous hemianopsia persisting 14 days; when the animal was killed. The motor paralysis was in all cases less marked than with extirpation of the area.

In three of the four cases the circumsected area was exposed just prior to the killing of the animal, and explored with the faradic current; the time after the operation being from a fortnight to three weeks. In all, movements of the paralysed arm were obtained, but it required a stronger stimulus to elicit them than was the case with those of the normal side. The circumsected area had for the most part a pale or yellowish appearance, but in one which was examined in sections prepared by the Nissl method, the giant pyramidal cells were not smaller nor less numerous than those of the surrounding motor region, and showed an increased amount of tigroid or chromatic substance.

In all which have been examined by the Marchi method there is extensive degeneration down the pyramidal tract.

In one monkey the whole motor area was isolated from the pre-frontal, temporal, and parietal lobes by sections made well beyond its limits, and extending deeply into the cerebral substance. In this animal no paralytic symptoms were noticeable.

In the dog experimented on, a cut 5—7 mm. deep was made well around the sigmoid gyrus. The result of this was to produce paralysis for voluntary motion (inability to hold a bone, awkwardness in walking), and blunted sensibility on the opposite side, and also at first homonymous hemianopsia which, however, had disappeared by the 5th day. The animal was killed one month after the operation: the circumsected area gave no result on stimulation.

In the cat no attempt was made at circumsection, but a cut was made behind the motor area so as to sever it superficially from the posterior part of the brain. The operation was immediately followed by some paresis, both motor and sensory, of the opposite limbs; but after 3 or 4 days this had passed off. The animal was killed 22 days after the operation. Stimulation of the area in question produced movements of the opposite limb. The spinal cord showed degeneration in the pyramidal tract.

The result of these experiments and observations is to indicate that, although a circumscribed area may retain some degree of electrical irritability, there is so much disturbance produced in its anatomical elements, as the result of interference with its vascular supply¹, that it is unnecessary to assume with Marique², that the paresis which results from the operation is due to severance of superficial association fibres. It is besides probable that many, if not most of the association fibres, have a deep course in the white matter, and are not injured by such incisions as have been employed in these and similar experiments.

¹ Cf. Exner and Paneth. *Pflüger's Archiv*, XLIV. p. 544. 1889.

² *Recherch. expér., etc.* Bruxelles, 1885. See *Brain*, VIII. p. 536. 1885.

