

THE EFFECTS OF HYPOPHYSECTOMY AND HYPOTHALAMECTOMY ON THE INTESTINAL MOTILITY OF Squalus acanthias

Robert B. Hiatt and Anne Moore, College of Physicians & Surgeons, Columbia University, New York, N. Y.

The feasibility of hypophysectomy and selective hypothalamectomy in the dogfish (Squalus acanthias) has been studied using 38 fish ranging from 1500 to 5500 grams. The experimental design was to determine what effects hypophysectomy and hypothalamectomy in chronic preparations would have on intestinal motility. The same methods were used as described in a previous study of the neurophysiology of intestinal motility in primitive vertebrates principally the dogfish (Hiatt et al., Bull. M.D.I.B.L. 6:22-23, 1966). In brief, changes in alimentary motor reactivity to intravenous or intraarterial serotonin, acetylcholine, epinephrine and mechanical stimulation were noted.

Hypophysectomy plus selective or complete hypothalamectomy is a simple procedure in the dogfish. Chronic survival in this series was the rule—there being no operative deaths and only one death in the first post-operative day. The average survival was 9.4 days even though all fish had their alimentary tracts exposed periodically through abdominal incisions for the insertion of recording apparatus following which they were sutured, fed, and returned to the live car. One dogfish lived for four weeks following hypophysectomy and anterior hypothalamectomy. Twenty fish had hypophysectomy only. Nine fish had anterior hypothalamectomy, three had posterior hypothalamectomy and six had total hypothalamectomy added to the hypophysectomy. One fish had anterior hypothalamectomy only.

The operative procedure consists of confining the dogfish on its dorsal surface tilted with head up to 45°. The gills are perfused with sea water via #14 Fr. catheters inserted into the mouth through the spiracles. A plastic sponge fitted cephalad to the catheters in the mouth maintains a dry operative field. A four cm incision is made in the midline of the roof of the mouth beginning at the tooth line. The mucous membrane and perichondrium are reflected exposing a two cm square of cartilage overlying the hypophysis which can be seen through the cartilage in good light approximately three cm caudad to the teeth. The overlying cartilage is removed with a small rongeur exposing the fascial plate to which the ventral tip of the pituitary is attached. The fascial plate is detached at its margins by a scalpel and the attached pituitary is removed with forceps or a simple suction device. With a fine type sucker selective portions of the hypothalamus can then be removed exposing the third ventricle. Gelfoam placed on the resultant defect effectively seals the ventricular defect as proven by autopsy. The cartilagenous defect is filled with Gelfoam and the mucous membrane sutured with continuous silk.

No appreciable difference could be demonstrated in the motor performance of the dogfish stomach as a result of ablative procedures on the pituitary or hypothalamus up to two weeks after the procedure by the methods used. Threshold doses and degree of response to serotonin, acetylcholine, and epinephrine given intraarterially or intravenously were not significantly different nor was there any change in response to mechanical stimulation of pressure receptors in the stomach wall. Confirmatory evidence of lack of pituitary effects in gastrointestinal motility in the dogfish was obtained by demonstrating the failure of Pitressin (Parke-Davis) on three occasions to alter responses to serotonin and epinephrine.