

Surgical Removal of the Pineal Gland in 3-5-Day-Old Chicks¹ (36382)

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The role of the pineal gland in light-mediated physiological responses is being extensively investigated by several laboratories. Although reports in the literature cite the effects of pinealectomy on various physiological parameters in chicks, no rapid, reliable procedures have been published for this surgical technique. Recently, Binkley, Kluth and Menaker (1) briefly discussed a procedure, which required about 1 hr to complete, in older birds. This report presents a fast, easily repeatable surgical technique for pinealectomy of young chicks.

Materials and Methods. *A. General.* One-day-old broiler cross male chicks were obtained from a commercial hatchery. They were housed in electrically heated battery brooders and standard management procedures were followed. Feed and water were supplied *ad libitum* throughout the pre- and postoperative phases of the experiment.

The surgery was performed under a Bausch and Lomb binocular dissecting microscope. Conventional aseptic procedures were followed. Benzalkonium chlorohydrate (Zephiran) was used to swab the operating area and to cleanse the instruments.

Three anesthetics were used in the study. They were: (1) pentobarbital sodium (Nembutal) administered intramuscularly (im) at the dose of 35 mg/kg of body weight; (2) a chloral hydrate-pentobarbital sodium-magnesium sulfate preparation (Equi-Thesin) administered (im) at the dose of 2.5 mg/kg of body weight; (3) ether administered by placing the chicks in a 2000 ml covered container with ether-soaked cotton. Central nervous system stimulants, pentyltetrazol (Metrazol) and 3,3-methylethylglutarimide (Mikedimide), were used and evaluated to a limited extent. They were not used with ether and

only sporadically with other anesthetics.

B. Surgical procedure. The chicks were anesthetized with one of the agents to achieve the proper plane of anesthesia. An area extending caudally from the orbits to the distal end of the parietal bone and laterally to the edge of the skull was clipped free of down. The skin was then swabbed with gauze soaked in Zephiran.

Approximately a 1.5 cm midline incision was made through the skin beginning at a point midway down the frontal bones and continuing to the posterior edge of the parietal bones. A small skull incision (about 0.3 cm) was made with a scalpel slightly lateral to the midpoint of the fissure between the frontal bones. Next, the skull was cut in the shape of a J using fine microdissecting scissors (Fig. 1). The J-cut starts at the midpoint, proceeds laterally 0.5 cm, and then caudally to the fissure between the frontal and parietal bones. The same procedure was followed on each side of the skull. The flaps of soft skull were then removed, exposing the dura mater of the brain.

A 0.5 cm incision was made in the dura lateral to, but parallel with, the midline. Finally, a cut was made at right angles to this incision through the dura to ligate the small vein in the midline. This is necessary to gain access to the pineal gland. The tips of fine forceps were inserted beneath the dura and pushed caudally to the pineal gland (about 0.6 cm). The forcep points were closed to grasp the pineal gland and its stalk which were then removed. This tissue was then examined visually to determine if the entire pineal had been taken out.

Bleeding was controlled by inserting a tiny piece of Gelfoam under the posterior edge of the incision. The dura was then replaced and the skin was closed using three inter-

¹ Vt. Agr. Exp. Sta. J. Article 267.

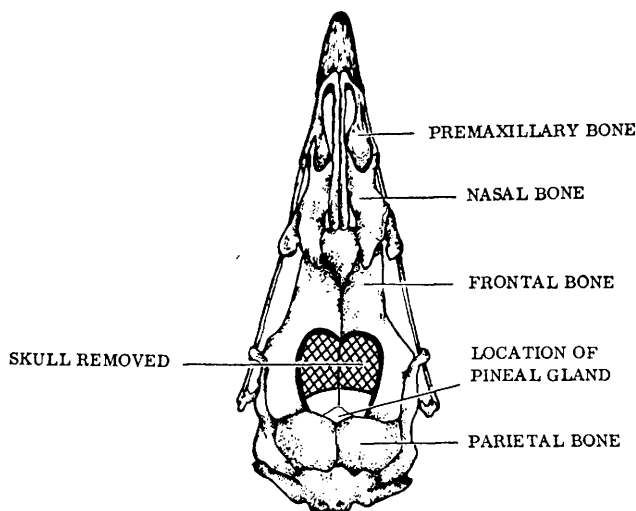


FIG. 1. Dorsal aspect of chicken skull showing location of incisions.

rupted sutures made with 000 nylon suture and fine, curved needles. Dequalinium chloride powder (Decton) was applied along the incision. A heat lamp was used to maintain a temperature of about 35–37° in the operating area.

C. Postoperative care. Following surgery the chicks were moved to walled chambers under heat lamps to provide a warm (35–37°), draft-free recovery area. Approximately 2 hr after the operation the chicks were returned to the battery brooders where food and water were supplied *ad libitum*. The nylon stitches were not removed from the head.

Results and discussion. Very satisfactory results were obtained with this pinealectomy procedure. Chicks at 3 to 5 days of age were selected because their skulls are soft and easily cut with microdissecting scissors. Consequently, expensive, specialized instruments are not required for the procedure. The entire operation required less than 5 min/chick once the technique was perfected.

The young chick proved highly variable in its response to Nembutal and Equi-Thesin. Nembutal was injected intramuscularly at 35 mg/1000 g of body weight. Equi-Thesin was injected intramuscularly at 2.5 ml/1000 g of body weight. Both of these anesthetics were extremely difficult to work with. The induction period, recovery period, and rate of mor-

tality varied considerably between chicks. These drugs were considered unsatisfactory for this procedure under our laboratory conditions. Central nervous system stimulants, Metrazol and Mikedimide, were used in some instances with problem chicks. These stimulants were injected in an attempt to prevent death in chicks that did not recover from deep anesthesia. This procedure was also unsatisfactory on a routine basis. A suitable response was not obtained. If they responded at all, convulsions and death resulted within a few minutes.

Ether was the most suitable anesthetic agent for this rapid surgical procedure. With it anesthesia was easily induced and the recovery period was minimal. Also, little problem was experienced with mucous blockage of the respiratory tract because of the short duration of the surgery.

Mortality, during the first 2 hr postoperative, was about 5% when ether was used. The primary cause was overdose during surgery, but hemorrhage accounted for a small percentage of the mortality. Subsequently mortality up to 6 weeks of age was low and at about the same rate as observed with control chicks.

Summary. A quick, reliable procedure for the surgical removal of the pineal gland from 3 to 5-day-old chicks is presented. This procedure for pinealectomy was satisfactory

as judged by low mortality and high success of the operation as verified at autopsy. The entire procedure requires approximately 5 min/chick. Nembutal, Equi-Thesin, and ether were evaluated as anesthetic agents for use in pinealectomy. Ether was the most suitable drug because of its ease of administra-

tion, rapid induction, short recovery period, and low mortality experienced with its use.

1. Binkley, S., Kluth, E., and Menaker, M., *Science* 174, 311 (1971).

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