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Case Report

Pinealectomy in rat: an illustrative case

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ABSTRACT

The pineal body is known to be a vital component in the regulation of seasonal reproduction. The pineal complex may consist of two parts in rats, i.e. the small deep pineal and the large superficial pineal. As commonly used techniques of pinealectomy remove the superficial pineal only, we illustrated the surgical technique for pinealectomy on our rat specimen in this report. © **IJAV. 2009; 2: 43–44.**

Key words [rat] [pineal] [pinealectomy] [dissection] [anatomy]

Introduction

Pinealectomy was described by Hoffman and Reiter in 1965 [1]. In many techniques described for pinealectomy, all recognize the problem of brisk and often fatal hemorrhage from surrounding dural sinuses. It is known that the pineal's sympathetic innervation from the superior cervical ganglia is vital for its function. Ideal technique for pineal removal should: hold bleeding to a minimum; require only short duration of surgery; present a clear view of the pineal gland at the operation site, facilitating its extirpation and decreasing the probability of accidental damage to adjacent neural structures; and provide the researcher an opportunity to perform perfect parallel sham operations, making sure that its innervation is not disrupted [2]. In this report, pinealectomy was illustrated on rat specimens.

Case Report

The technique of pinealectomy

The rats were anesthetized via intraperitoneal injection of thiopental sodium. The dosage used was 50 mg/kg body weight. After shaving the dorsum of the head, animals were held in position by using the index and thumb of the left hand over the jaws; care was given to allow the animals to breathe freely. A midline incision was made in the scalp between the ears and the eyes, and the edges were retracted laterally after clearing the underlying connective tissue. The sagittal and lambdoid sutures were then exposed by scraping away the periosteum to the temporal bone attachments of the temporalis muscles. Transverse sinus (TS) and superior sagittal sinus (SSS) can be seen through the bone (Figure 1).

A square-shaped bone flap encompassing parts of both parietal and occipital bones was designed, and the bone was actually cut on 3 sides using an electric saw. The posterior boundary of the square was left intact; thus by applying mild pressure the bone flap could be raised in front and held posteriorly. Great care must be focused on removing the bone piece to avoid hemorrhage from the underlying sinuses. On the anterior boundary of the square, the saw usually traumatizes the straight sinus with some bleeding. This could easily be controlled by gentle pressure. The flap was then raised very carefully without injuring the dura, and the confluence of sinuses (CS) was exposed over the triangular space at the junction of the parietal and occipital lobes (Figure 2).

The dura was cut with a sharp needle in an arc-shaped line in the area of the confluence of the superior sagittal and transverse sinuses. The dura was raised with forceps. The SSS was double ligated with 6/0 gauge surgical suture introduced under the SSS with a curved atraumatic needle, and resected (Figure 3). The resected portion should be minimal and markedly rostral to the CS facilitating reestablishment of adequate venous drainage following surgery. By reflecting the caudal portion of the ligated SSS posteriorly, the gland was seen beneath the CS (Figure 3). The gland was approached from an anterior aspect and removed with a pair of fine curved

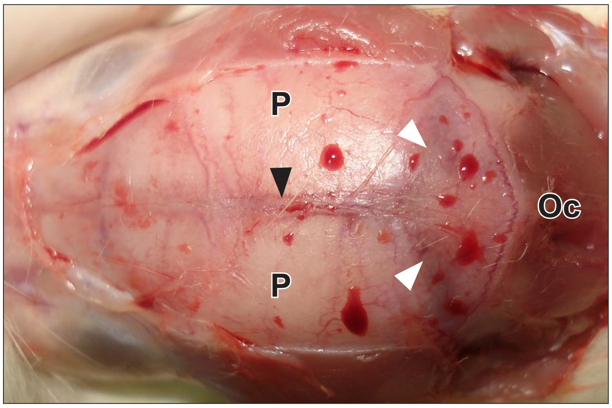

Figure 1. The periosteum is reflected laterally, exposing the parietal and occipital bones. At this stage the superior sagittal sinus and the transverse sinuses are visible underneath the bones. *(**P:** parietal bones; **Oc:** occipital bone; **black arrowhead:** superior sagittal sinus; **white arrowheads:** transverse sinuses)*

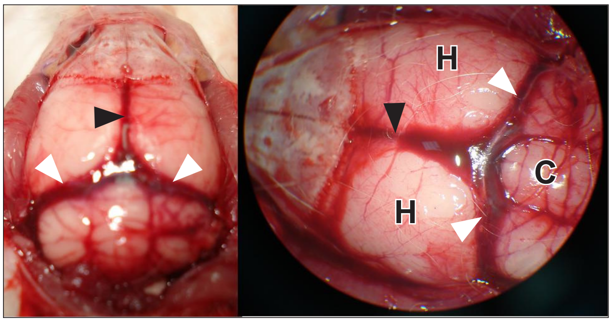

Figure 2. The operative field after the bone flap has been raised. At this stage, the superior sagittal sinus and the transverse sinuses are visible. *(**Black arrowhead:** superior sagittal sinus; **white arrowheads:** transverse sinuses; **H:** cerebral hemispheres; **C:** cerebellum)*

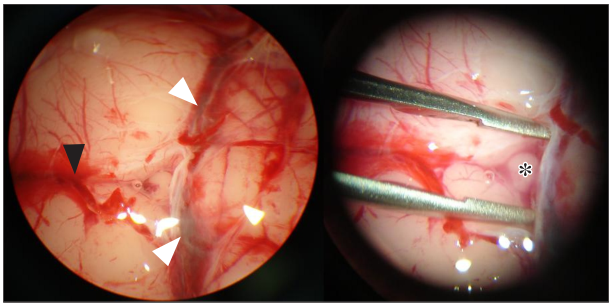

Figure 3. At this stage, the superior sagittal sinus and the transverse sinuses are double ligated and resected, and the pineal gland is brought into view. Pineal gland can easily be removed by using a fine forceps. *(**Black arrowhead:** superior sagittal sinus; **white arrowheads:** transverse sinuses; **asterisk:** pineal gland)*

watchmakers' forceps by grasping the base of the body. Any bleeding was controlled with cotton wool pledgets. The procedure was completed by returning the reflected SSS to its original position. The bone flap was replaced and the wound closed using 4/0 chromic atraumatic catgut. The skin incision was closed with a continuous stitch.

Discussion

The pineal gland is a tiny (1–2 mm) round, rather translucent organ, situated on top of the brain at the confluence of the superior sagittal and transverse sinuses, between the cerebral hemispheres and the cerebellum [3].

The pineal gland represents a complex, rather than a single organ in adult rats. Regularly one can distinguish pineal tissue in the intercommissural region as a deep pineal, a superficial pineal, which represents the major part of the pineal complex, and nearly always a parenchymal stalk of variable length [4].

The involvement of the pineal gland in the modulation of circadian rhythms and sleep regulation has been relatively well known for long time. Moreover, many experimental studies have linked the pineal gland to reproductive physiology, cardiovascular, neurologic and immunological regulation. It has been recently suggested that the pineal gland and its main hormone melatonin may also have a role in energy homeostasis because of its modulatory effects on weight and appetite-regulatory hormones such as leptin and ghrelin [5].

Pinealectomy is known to remove the nocturnal elevation of serum melatonin level and decrease melatonin concentrations. It has been suggested that reduction of circulating melatonin by pinealectomy increases oxidative stress in a number of tissues, including the brain [6].

Several anatomical structures such as SSS, CS, TS should be taken into consideration during pinealectomy. Pinealectomy should be confirmed by the histological evaluation of the gland for each animal.

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