

## Postoperative Anosmia After Removal of Pituitary Gland Adenomas Using the Pterional Approach

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### Summary

There have been several studies on anosmia following operations on anterior circulation aneurysms, but no similar study has yet been reported on pituitary gland adenomas which required the transcranial approach.

In this study, 38 cases with pituitary gland adenomas, for whom the pterional approach was employed, were observed retrospectively from the point of view of postoperative olfactory nerve function.

In the postoperative period only one case complained of impaired sense of smell on the operated side. Eight cases objectively showed olfactory nerve disfunctions. The olfactory nerve function could be preserved at a relatively high rate of 79 per cent. This high rate, we think, resulted from the microtechnique employed as well as the relatively cautious frontal retraction which was less than 1,5 cm.

*Keywords:* Pterional approach; pituitary gland adenomas; postoperative anosmia.

### Introduction

The pterional approach is commonly employed in the surgery of aneurysms and lesions around the sella especially for lesions behind the clivus<sup>7, 8</sup>. It consists of drilling of the sphenoid ridge to the landmark of the orbitomenigeal artery. After the dura is opened, the Sylvian fissure is split either from the medial to the lateral aspect or vice versa. Sylvian dissection allows retraction of the frontal lobe with less distortion of the brain. A brain retractor is placed on a wet cotton strip on the inferior surface of the frontal lobe. The retractor is often placed across the olfactory nerve causing strain on the nerve as well as the olfactory striae leading to the frontal and temporal lobes<sup>7</sup>.

The frontotemporal approach which has been widely used for the surgery of aneurysms, pituitary lesions and epilepsy is described elsewhere as the Dandy approach. In these approaches anosmia appears to be an important risk<sup>2, 6</sup>. As far as we know no quantitative

assessment has yet been published on olfactory nerve lesions following the removal of pituitary adenomas using the pterional approach.

This study presents a retrospective analysis of 38 personal cases of olfactory nerve damage following surgery on pituitary adenomas by the pterional approach.

### Material and Methods

This study covers 38 cases with pituitary gland adenomas who were operated on by the pterional approach between the years 1984–1990 at the Neurosurgical Department of the Medical School of Atatürk University, Erzurum, Türkiye.

None of our cases had pre-operative radiotherapy. The cases with impaired sense of smell preoperatively and those who did not come back for follow-up examination were not included in this study. Also a 62 year-old female patient was excluded from the study, because she died in the early postoperative period of a heart attack. Of the 38 cases 22 were female and 16 were male who ranged between 24 and 56 years of age.

In the operations, neuroleptic (Fentanyl plus Droperidol) anaesthesia was applied and the anaesthetist did not take an active part in the positioning of the head. Mannitol was usually administered in a 20 per cent solution in doses of 0.25 to 0.75 gr. per kg of body weight. Mannitol was started at the beginning of the operative procedure and was administered at a rate so that the infusion would be completed at about the time the dura was opened.

Always a right pterional craniotomy was used. The bone flap was initiated with a frontal burr-hole just behind the zygomatic process of the frontal bone and below the anterior end of the superior temporal line. A second hole was placed in the frontal bone 3–4 cm superior to the first and 1–2 cm above the orbital rim. A third hole was opened in the parietal bone along the linea temporalis, 3 cm posterior to the second. The final corner of the bone flap is marked by a fourth burr-hole in the squamous temporal bone, behind the sphenotemporal suture, about 3 cm inferior to the third hole and posterior to the first. After craniotomy Sylvian microdissection techniques described by Yaşargil<sup>8</sup> were employed in all cases without any modification. Under the operating microscope the sphenoid wing

was progressively flattened until a small ridge representing the most lateral aspect of the lesser wing was reached. At that point, a small bridging vessel, the orbito-meningeal artery, could be seen. The rough bony spicules of the postero-lateral orbital roof were smoothed (adjacent to the fronto-sphenoidal suture), with the aid of a high speed diamond drill and gentle frontal lobe retraction was used. After the dural opening and frontal lobe retraction, the basal Sylvian cistern was opened on the frontal side of the Sylvian vein and the M<sub>1</sub> segment of the middle cerebral artery was followed to the internal carotid artery bifurcation. In every case, a self-retracting retractor 7 mm in width was placed on a wet cotton strip on the inferior surfaces of the posterior and medial orbital gyri of the right frontal lobe, and advanced to the olfactory tract, parallel to the roof of the orbit. The retractional aperture was 1 to 1.5 centimeters. To relieve the compression of the retractor on the olfactory nerve and the brain tissue, it was loosened every five minutes for 15 to 30 seconds. The carotid cisterns were opened to release C.S.F. and to gain optimal relaxed brain condition, if they were not invaded by the tumour. This was also very important to protect the olfactory nerve functions post-operatively. The capsule of the tumour was coagulated and incised in the space between the optic nerves in 33 cases, and between the optic nerve and carotid artery in five cases, after microdissection. The suprasellar portion of the tumours was removed completely in 34 cases, and partially in four cases. Two cases had prefixed chiasma and three cases had a postfixed one whereas another three had supero-lateral extension. One of the patients had an unruptured right posterior communicating artery aneurysm associated with the pituitary gland adenoma.

The postoperative olfactory tests were done about 30 days later. The patients who needed radiotherapy started to receive treatment 30 days after the operation.

During the follow-up observations, the patients were examined to see whether they had any impairment in the sense of smell. Every one of the patients was tested using saturated steam of phenylethyl alcohol and Olfactory and Sniff tests. Olfactory and Sniff tests described by Smith<sup>4</sup> as the assessment of butanol threshold were employed. Butanol threshold was assessed with a forced-choice procedure by presenting the patient with an aqueous concentration of butanol in one sniff bottle and water in the other and asking the patient to identify the bottle containing the odorant. The concentration of butanol was increased after each incorrect response until there were five correct responses in a row or until the patient failed to correctly identify the bottle containing 4 per cent butanol. Each nostril was tested separately. The concentration step at which the patient correctly identifies the butanol in five consecutive trials was taken as the detection threshold. This step was used as a function score, which relates the patient's threshold to a normal subject population. The tests were first given on the operated side and then on the other side. They were repeated after 30 minutes.

## Results

During the examination none of the patients had complaints of impairment of sense of smell except one who said he had complete loss of the sense of smell on the operated side. Table 1 shows the results of Olfactometric and Sniff tests.

Objective examinations showed that 3 cases had olfactory disfunctions on the right, one case on the left

Table 1. *The Results of the Examination of Smell in 38 Patients with Pituitary Gland Adenomas in the Early Period*

Localisation	Normal	Reduced	Absent	Total
Ipsilateral	31	1	2	34
Contralateral	33	2	3	38
Bilateral	30	3	1	34
Total nerves tested	94	6	6	106

and 4 cases on both sides. These findings had no relation to the duration of the operations or mannitol treatment or brain oedema. However, of the four patients who had bilateral anosmia during the postoperative period two had a prefixed chiasma.

## Discussion

Different surgical methods have so far been reported on the approaches to parasellar and sellar areas. Two articles have already been published on olfactory nerve function following operations on anterior circulation cerebral aneurysms<sup>2, 6</sup>, however to the best of our knowledge no studies have been published, which deal with the rate of olfactory nerve damage after operation for pituitary adenomas using the pterional approach.

There are some publications on olfactory tract lesions brought about by the bifrontal interhemispheric approach<sup>5, 6</sup>. Eriksen *et al.* carried out a quantitative study on anosmia which developed as a result of the fronto-temporal approach in a group of 25 patients who had anterior cerebral circulation aneurysms. They determined a 89 per cent anosmia incidence on the side where surgical operation was carried out<sup>2</sup>. Pool reported bilateral transection of olfactory nerves by bilateral frontal craniotomy and the interhemispheric approach<sup>3</sup>. Suzuki *et al.* proved that it could be possible to have a 65 per cent bilateral or unilateral protection of the olfactory tract in 110 anterior communicating artery aneurysms which they operated on by the bifrontal approach<sup>6</sup>.

It was reported that the olfactory nerve may be pulled out of the cribriform plate as a result of excessive retraction beyond a certain limit by a retractor which is placed on the frontal lobe during the frontotemporal approach<sup>1, 2</sup>. It was also stated that even mild retractor pressure on cranial nerves may lead to temporary or permanent lesions<sup>1</sup>.

Olfactory nerves may be damaged in the fronto-basal section or at medial temporal lobe levels de-

pending on the employment of retractors. Such damage may lead to irreversible lesions. However, traumatic anosmias may recover even after 5 years<sup>1</sup>. Eriksen *et al.* believed that lesions lasting 35 months or more must be considered as permanent<sup>2</sup>.

We observed olfactory nerve disfunction in 8 cases out of 38 (21%). In other words, it was possible for us to preserve the olfactory function at a rate of 79 per cent. In the operations performed, we placed the retractor only in the frontal sections and the retractional aperture was only 1 to 1.5 centimeters (Yaşargil's technique). We think that keeping this aperture within these limits is the most significant factor affecting postoperative olfactory nerve function.

### Acknowledgements

The authors gratefully thank to Dr. Ruhi Esengün for proof reading.

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