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Bone CT Evaluation of Nasal Cavity of Acromegalics —Its Morphological and Surgical Implication in Comparison to Non-Acromegalics

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Abstract. *Purpose*: In order to numerically compare the morphological differences of the nasal cavity and nasal sinus between acromegalics and non-acromegalics, bone window CT scans sliced parallel to the transsphenoidal surgical route were performed. *Material and cases*: Acromegalic patients had small or large macroadenomas and were 13 (7 men and 6 women) in number, aged 53.2+/−16.1 years. Non-acromegalic patients had pituitary tumors and were 44 (21 men and 23 women) in number, aged 52.1+/−12.5 years. *Results* The results of acromegalics are described in comparison to non-acromegalics in parentheses. a) The width of the surgical corridor: piriform aperture, 27.6+/−2.7 (25.9+/−2.6) mm; origin of inferior nasal concha, 29.4+/−9.4 (26.6+/−4.0) mm; and origin of middle nasal concha, 29.8+/−3.2 (26.2 mm+/−4.2) mm. b) The depth of the surgical corridor: the upper lip thickness, 18.1+/−2.7 (13.3+/−1.4) mm; the distances between piriform aperture and sphenoid wall, 52.9+/−4.6 (49+/−4.2) mm; sphenoid wall and sellar floor, 17.3+/−4.1 (18.7+/−4.1) mm; and sellar floor to dorsum sellae, 17.6+/−3.4 (15.6+/−4.0) mm. c) Marked carotid prominence: 7/13=53.4% (8/44=18.25%). d) Sinusitis: 8/13=61.5% (12/44=27.3%). *Discussion & conclusion* The data presented above show that morphological differences in bony nasal cavity and soft tissue may be responsible for a deeper and narrower surgical field for acromegalics. Acromegalics had a marked carotid prominence more frequently, which needs special attention to avoid carotid injury, when enlarging the surgical field. Knowing these morphological differences will provide useful information for peri-and intra-operative care.

Key words: Acromegaly, Transsphenoidal surgery, CT scan, Nasal cavity

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Purpose

Hypersecretion of GH induces a systemic effect including bone metabolism and morphological change of the facial bone and skull base as well [1]. Although transsphenoidal surgery is a choice of treatment for GH secreting adenomas, characteristic changes in acromegaly have not been sufficiently evaluated from a neurosurgical viewpoint, in particular, with regard to transsphenoidal surgery [2]. In order to numerically compare the morphological differences of the nasal cavity and sinus between acromegalics and non-acromegalics and to elucidate

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its surgical implication, bone window CT scans sliced parallel to the transsphenoidal surgical route were performed.

Materials and cases

Acromegalic patients had small or large macroadenomas and were 13 (7 men and 6 women) in number, aged 53.2+/−16.1 years, ranging from 13 to 75 years. Non-acromegalic patients had pituitary tumors and were 44 (21 men and 23 women) in number, aged 52.1+/−12.5 years, ranging from 18 to 76 years. They include pituitary adenomas, Rathke's cleft cyst and craniopharyngioma. In addition to conventional neuroimaging studies such as skull and facial X rays, CT scans and MRI, a 3 to 5 mm- thick high resolution CT scan (Somatom Plus, Siemens) with a bone window image was performed to observe bony structures and soft tissue. It was assumed that, on inserting speculum blades toward the sella, we could provide a proper and comfortable operative field in slices parallel to the imaginary line connecting the inferior margin of the piriform aperture and the bottom of the sellar floor, which is parallel to the transsphenoidal surgical route (Fig. 1). By using this method the following radiometric study was performed (Fig. 2). a) The width of the surgical corridor: piriform aperture in maximum width (1), origin of inferior nasal concha (2) and origin of middle nasal concha (3). b) The depth of the surgical corridor: the upper lip thickness, (4) (Fig. 3); the distances between piriform aperture and sphenoid wall, (5); sphenoid wall and sellar floor, (6); and sellar floor to dorsum sellae, (7). c) Extent of carotid prominence. d) Presence or absence of sinusitis.

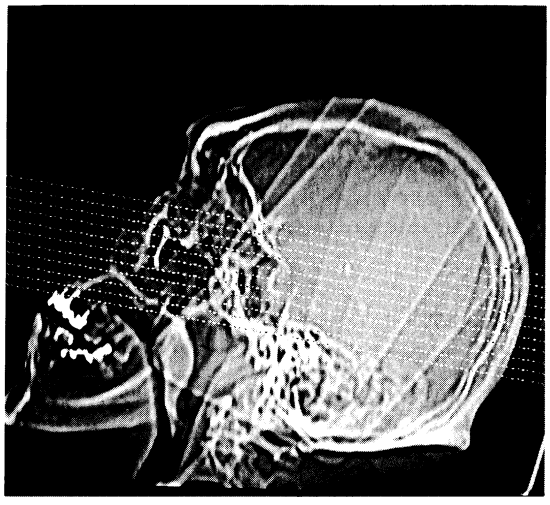

Fig. 1. The dotted line shows the slicing plane in CT scan. Three to 5 mm-thick high resolution CT scan (Somatom Plus, Siemens) with a bone window image was performed to observe bony structures and soft tissue. It was assumed that, on inserting speculum blades toward the sella, we could provide a proper and comfortable operative field in slices parallel to the imaginary line connecting the inferior margin of the piriform aperture and the bottom of the sellar floor, which was parallel to the transsphenoidal surgical route.

Results

The results of acromegalics are described in order in comparison to non-acromegalics in parentheses.

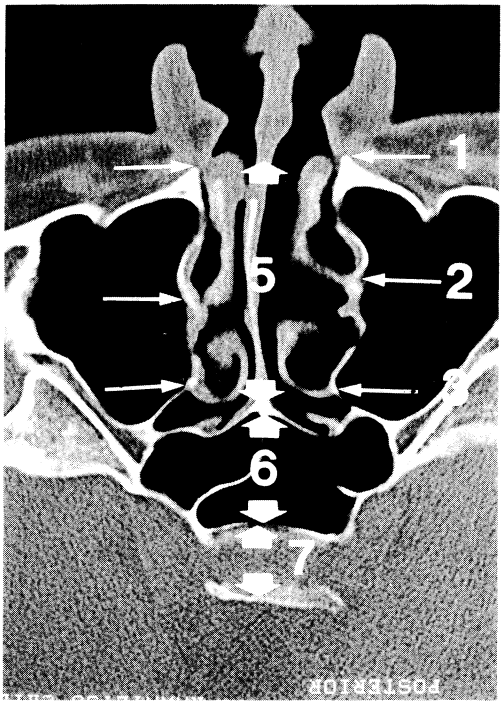

Fig. 2. Locations of radiometric studies. a) The width of the surgical corridor: (1) piriform aperture in maximum width, (2) origin of inferior nasal concha (3) origin of middle nasal concha. b) The depth of the surgical corridor: (4) the upper lip thickness (Fig. 3), (5) the distances between piriform aperture and sphenoid wall, (6) sphenoid wall and sellar floor (7) sellar floor to dorsum sellae.

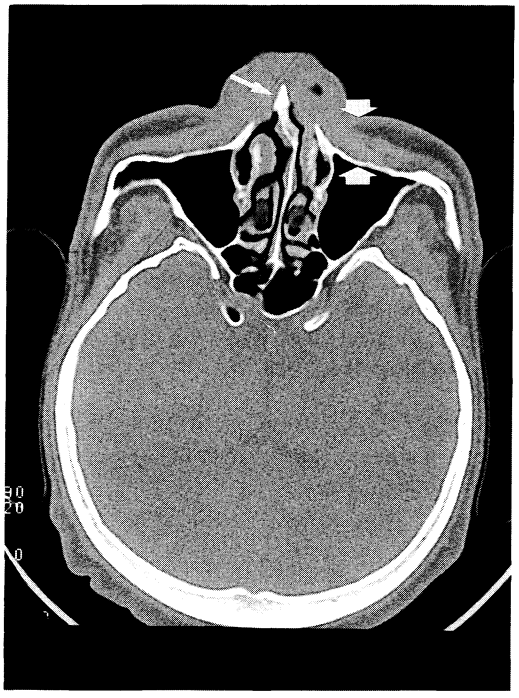

Fig. 3. Upper lip thickness was measured between skin and bony surfaces (arrows) at the slice of anterior nasal spine (arrow).

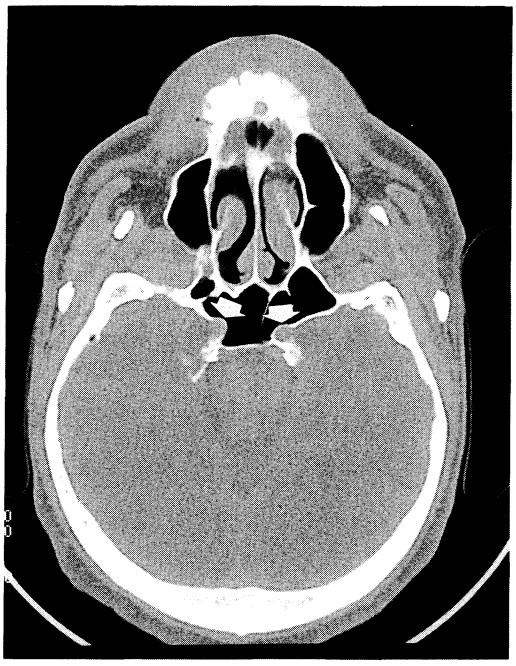

Fig. 4. A representative case showing the marked carotid prominence (arrows).

a) The width of the surgical corridor: piriform aperture, 27.6+/−2.7 (25.9+/−2.6) mm, in maximum width (P=0.053) (1); origin of inferior nasal concha, 29.4+/−9.4 (26.6+/−4.0) mm (P=0.15) (2); and origin of middle nasal concha, 29.8+/−3.2 (26.2+/−4.2) mm (*P=0.019*) (3). b) The depth of the surgical corridor: the upper lip thickness, 18.1+/−2.7 (13.3+/−1.4) mm (*P=0.00*) (4); the distances between piriform aperture and sphenoid wall, 52.9+/−4.6 (49+/−4.2) mm (*P=0.015*) (5); sphenoid wall and sellar floor, 17.3+/−4.1 (18.7+/−4.1) mm (P=0.339) (6); and sellar floor to dorsum sellae, 17.6+/−3.4 (15.6+/−4.0) mm (P=0.094) (7). c) (Fig. 4) Marked carotid prominence: 7/13=53.4% (8/44=18.25%). 4) Sinusitis: 8/13=61.5% (12/44=27.3%).

Discussion

The operative corridor of acromegalics was cylindrical, approximating 27 mm to 30 mm in width, and 53 mm to the sphenoid wall and 70 mm to the sellar floor in depth. The width and length of the bony nasal cavity were different, 2 to 4 mm and 4 mm, respectively, in patients with and without acromegaly. The upper lip was 5 mm thicker in acromegalics. The morphological differences in bony nasal cavity and soft tissue may be responsible for a deeper and narrower surgical field for acromegalics [2, 3, 4]. In order to obtain a comfortable surgical field, specula with longer blades, bony removal of piriform aperture and a lip protector may be in need [3, 4].

Acromegalics had a marked carotid prominence more frequently, which needs special attention to avoid carotid injury, when enlarging the surgical field. This is associated with a well developed sphenoid sinus and thinned bony structure of the sphenoid sinus [5].

Conclusion

Knowlegde of these morphological differences will provide useful information for peri-and intra-operative care.

References

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