Modified coronal computerized tomographic cuts for transsphenoidal surgery. Technical note

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Abstract

Computerized tomographic (CT) cuts passing through the anterior nasal spine and the most prominent part of the sellar floor (spino-sellar or SS cuts) were found to be useful in minimizing the chances of anatomical disorientation during the transsphenoidal microsurgical approach as well as in preoperative planning and selection of the length and choice of the instruments to be used. Routine preoperative SS cuts of CT scan are advised.

Keywords: Computerized tomography, pituitary tumors, transnasal approach, transsphenoidal microsurgery

1 Introduction

The transsphenoidal route to the pituitary gland is well established in neurosurgical practice and several approaches to the sphenoid air sinus have been described [2-4, 8]. Conventional coronal CT scan cuts of the sella (Figure 1) lead from nasopharynx to the sella and are far removed from the line of operative approaches. They, therefore, provide little guidance to the surgeon regarding the actual distances, anatomical anomalies, and landmarks enroute to the sella. Spinosellar (SS) cuts (Figure 1 and 2), being in line with the axis of the surgical approach and direction of instrument introduction and manipulation, provide schematic illustration of normal and anomalous anatomical structures encountered during the surgical approach from the upper lip in line with floor of the sphenoid sinus and the sella-turcica (Figures 1, 2 and 3).

2 Anatomical considerations

Size and shape of nasal septum, cavities, and sphenoid sinus vary in different individuals and morphological anomalies, and variations are common in this region. Surgical-anatomical literature for transnasal-transsphenoidal approach [7, 13] gives minimum, maximum, and average distances between the anterior nasal spine and front wall of sphenoid sinus and sellar floor in adults and children. These measurements, measured in SS cuts for each individual patient (Figures 3a, b and c), define the length of the path within the nasal cavity and sphenoid sinus through which instruments must pass to reach the sellar floor, and are important when selecting instruments for transsphenoidal surgery. Speculum of ideal length should have its tip placed just anterior to sphenoid sinus. In reaching the floor of the sella turcica the depth of sphenoid sinus in the axis of surgical approach is added to the length of the speculum. Thus, after traversing these two distances, the dissecting instruments must then enter the sella turcica and be able to reach an additional distance if a suprasellar tumor is present. These distances are variable and may be greater in acromegaly. Exact measurements of these distances in the axis of the surgical approach can be obtained by SS cuts for any particular patient, preoperatively.

Although the vomer is usually at the midline [7, 13] and serves as a dependable landmark, wide variations of pneumatization and asymmetries of septa within the sphenoid sinus are very common [7, 12, 13]. Preoperative delineation of these anomalies and
3 Methods

For the last ten years in over 100 cases, SS cuts have been a standard preoperative investigation for transsphenoidal approach to pituitary tumors. The patient is placed on the scanner table with comfortable head extension. Bony landmarks, namely, anterior nasal spine and the most prominent part of the sellar floor are chosen on the scout-view image (Figure 2), and proper gantry tilt prescribed to obtain the SS slices (Figure 3a, b, and c). These bony landmarks allow exact repositioning of the patient if a subsequent examination required. Distances from the anterior nasal spine to the front wall of the sphenoid sinus and sellar floor as well as the depth of sphenoid sinus and height of suprasellar tumor extension in the axis of surgical approach are measured (Figures 1, 2, and 3). Obstructive lesions of nasal cavities and septum, paranasal sinuses, as well as extent of aeration of sphenoid sinus were well shown and noted. The bony nasal septum (vomer) usually, but not always, indicates the mid-sagittal plane. Thus, in five of our cases the center of the sella floor was shifted laterally by several millimeters from the plane of the bony nasal septum (Figure 4). Overlooking these minor septal deviations can lead to misplacement of the bony window in the sella floor and difficulties in search for the microadenoma. These difficulties can be largely overcome by preoperative evaluation of the SS cuts. Knowledge of the exact configuration and disposition of sphenoid septa in relation to the sellar floor and carotid arteries in line with the surgical approach was found to be helpful during surgery (Figure 5 a, b). Abnormalities detected on SS slices that lead to modification or postponement of surgical approach included: gross septal deviations which necessitated a bilateral septal approach in 19 patients and the fluid level in the maxillary sinuses and hazy ethmoid cells with polypi seen on SS slices delayed surgery in seven cases. The need for enlargement of the bony nasal aperture in 13 patients correlated with the SS cut findings of a small nasal orifice (Figure 5b). Successful exploration and excision of microadenoma was carried out in two patients after anatomical difficulties had led to abandonment of an initial operation. In both these cases SS cuts of CT scan were repeated to confirm position and facilitate surgical approach.

asymmetric septa in the path of surgical approach provide reliable guides that help locate the site and size of the opening in the sellar floor and avoid carotid injury.