High-resolution metrizamide CT cisternography in sellar and suprasellar abnormalities

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Metrizamide computerized tomographic cisternography was performed with a small dose and low concentration of intrathecal metrizamide using a newer generation of computerized tomography scanner for the evaluation of sellar and suprasellar abnormalities. The examination was performed with thin sections in axial, direct coronal, and (when feasible) direct sagittal projections in a high-resolution technique. The relationship of the lesions with carotid arteries, optic chiasms, and hypothalamic structures was accurately defined.

Key Words: computerized tomography, metrizamide CT cisternography, sellar lesion, suprasellar lesion, optic chiasm, diaphragma sellae, infundibulum

The advantages of computerized tomography (CT) and metrizamide CT cisternography (MCTC) over cerebral angiography and pneumoencephalography for the evaluation of the sellar and parasellar region have already been demonstrated. Accurate delineation of supra- and parasellar extension of the lesions is difficult due to partial volume effect and variability in the character of enhancement in a conventional contrast CT scan. This problem is especially troublesome when the lesions are hypodense or isodense in nature. Metrizamide CT cisternography offers an excellent alternative for further evaluation of these lesions. With the availability of the newer generation of CT scanner, low-dose metrizamide cisternography will offer high-resolution images delineating excellent normal and pathological anatomy. The incidence of headache, nausea, vomiting, and visual disturbances is directly related to the amount of metrizamide used. Morbidity is low when a small dose of metrizamide is used. We have performed MCTC in 22 patients, predominantly for tumor, empty sella syndrome, and endocrine abnormalities. The results are summarized and selected case reports presented.

A third-generation CT scanner* was used in this series. The patient was placed in a prone position on a tilting fluoroscopic table. A lumbar intrathecal injection of 3.5 to 5 cc of metrizamide at a concentration of 170 to 190 mg iodine/ml was given via a No. 22 spinal needle. After removal of the spinal needle, the patient's head was tilted in a -60° (Trendelenburg) position for 1 minute. The table was then returned to a -15° position, and the patient was taken to the CT room and examined in axial projections while his torso was kept elevated at 20° to 30°. After appropriate axial sections were obtained, if the patient was cooperative, prone coronal, and direct sagittal sections were attempted using a slightly modified technique described by Osborn and Anderson. Scanning was performed with 4-mm collimation, and 1-mm overlapping of the images. The programs were set at × 3 magnification for image reconstruction. Approximately six to eight sections were needed for axial, four to eight sections for coronal, and four to six sections for lateral projections. A total of 16 to 24 images were obtained, depending on the patient and size of the lesion. All images were recorded on a clear-base single-emulsion film in the reverse mode at 512 or 1024 window and 150 to 200 level. The enhanced subarachnoid space was easily differentiated from the adjacent bone structures in the reverse mode. Images were then examined for deformity and obliteration or enlargement of subarachnoid spaces in the sellar, parasellar, and suprasellar regions. Figures 1 and 2 demonstrate the normal anatomy of the diaphragma

*Siemens Somatom SD manufactured by Siemens Corp., 186 Wood Avenue South, Iselin, New Jersey.
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**FIG. 1.** Normal anatomy of the sellar and parasellar region on metrizamide computerized tomographic cisternography. *Upper Left:* Axial section through the midsella (arrow) showing no concentration of metrizamide within the sella turcica. *Upper Center:* On a section through the diaphragma sellae, the infundibulum is seen as a central defect (arrow). *Upper Right:* Suprasellar cistern showing a transverse impression (arrows) anterior to the infundibulum that represents the optic chiasm. *Lower Left:* Cut just above the previous section demonstrates the A1 and M1 segments of the carotid arteries (arrows). *Lower Right:* Direct sagittal section reveals the optic recess of the third ventricle (arrow).

**FIG. 2.** Normal metrizamide computerized tomographic cisternography, coronal sections, through the sellar and parasellar regions show the chiasmatic, infundibular, and vascular anatomy.
Illustrative Cases

Case 1

This 46-year-old woman presented with a history of a bitemporal visual field defect for 6 months, with occasional headaches. No endocrine abnormality was present. The patient's skull film showed a mildly enlarged sella turcica. Conventional CT showed no enhancing lesion in the sellar or suprasellar region. The contents of the sella turcica appeared to be of the density of cerebrospinal fluid (CSF), suggesting an empty sella syndrome. An MCTC showed concentration of metrizamide within the sella, indicating an empty sella (Fig. 3 upper left). A section through the diaphragma sellae showed unusually long prechiasmatic optic nerves (Fig. 3 upper right). This was again seen in the direct coronal sections, with concentration of metrizamide in the sella just below the prechiasmatic and chiasmatic optic tract (Fig. 3 lower). Surgical exploration revealed that the sella turcica was moderately enlarged and contained CSF. A few fibrous strands were seen in the sella. The prechiasmatic optic tract appeared to be unusually long.

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Fig. 3. Case 1. Metrizamide computerized tomographic cisternography of the sellar and parasellar region. Upper Left: Axial section through the center of the sella turcica showing a concentration of metrizamide within the sella, which represents an empty sella. The pituitary gland could not be located. Upper Right: Section through the suprasellar region showing unusually long prechiasmatic nerves (arrows). Lower Left: Direct coronal section demonstrating both optic nerves (arrows), and a metrizamide-filled sella turcica. Lower Right: Section through the optic chiasm (arrows) demonstrating a slight depression.
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Fig. 4. Case 2. Metrizamide computerized tomographic cisternography scans. Left: Axial section through the sella turcica showing a small pituitary gland located posteroinferiorly (arrow) with concentration of metrizamide within the sella representing an intrasellar cisternal herniation. Right: Direct sagittal section showing an infantile type of sella turcica with intrasellar cisternal herniation. A small pituitary gland is clearly seen in the posteroinferior part of the sella turcica (arrow).

The pituitary gland could not be located. The sella was packed, and the patient’s visual field returned to normal within 1 month of surgery.

Case 2

This 14-year-old boy had noticed a bitemporal field defect for 3 months. There was no endocrine abnormality. Plain skull film showed an infantile type of sella turcica which was of normal size. Conventional CT showed CSF in the sella, suggesting the empty sella syndrome. No enhancing lesion was seen within the sella turcica or in the suprasellar region. An MCTC showed metrizamide within the sella, outlining a small pituitary gland which was located posteroinferiorly, and was best seen in the axial and direct sagittal projections (Fig. 4). There has been no change in the patient’s visual field in the last 9 months.

Case 3

This 25-year-old woman presented with symptoms of galactorrhea for 6 months. The patient’s prolactin level was 120 units. Conventional CT showed an enhancing 4-mm sellar lesion with slight suprasellar extension. Plain skull film showed a normal-sized sella. Visual field examination was normal. The patient was placed on bromocriptine medication. Within 1 month, she returned with a bitemporal visual field defect. Repeat conventional CT indicated no change in the size of the lesion. An MCTC showed a well demarcated sellar lesion slightly elevating the optic chiasm (Fig. 5). An adenoma, 4 mm in size, was removed from the upper anterior quadrant of the pituitary gland. The patient’s visual field returned to normal after surgery.

Case 4

This 15-year-old boy presented with a 2-month history of headache and bitemporal visual field defect, slightly more marked on the right. Plain skull film showed a moderately enlarged sella turcica. Conventional CT showed an isodense nonenhancing pituitary lesion, with the upper part not clearly delineated. No endocrine abnormality was found. Visual field studies showed a bitemporal field cut which was slightly more marked on the right. An MCTC was performed: the axial section showed a large sellar mass with suprasellar extension (Fig. 6 upper); the coronal section showed suprasellar extension slightly more to the left (Fig. 6 lower left); and the direct sagittal section delineated the suprasellar and anteroposterior extension fairly well (Fig. 6 lower right). The optic chiasm was seen to be displaced forward. The cisternographic findings were well correlated at surgery. A large chromophobe adenoma was removed. The patient’s visual field returned to normal following surgery.

Case 5

This 58-year-old woman had noticed a gradual loss of vision in both eyes for the last 8 months. There was occasional mild headache. Skull film showed a normal-sized sella with slight hyperostosis of the planum sphenoidale. Conventional CT in the axial projection showed a slightly enhancing density in the suprasellar.
region. An MCTC was performed in the axial, coronal, and direct sagittal projections. The axial section showed distortion of the diaphragma sellae which was displaced posteriorly (Fig. 7 upper left). A large suprasellar mass was seen in the axial, coronal, and direct sagittal projections (Fig. 7 upper right and lower). The vascular structures, such as the A1 segments of the internal carotid arteries, were displaced upward. The subarachnoid space was blocked anteriorly. A diagnosis of chiasmatic groove meningioma was confirmed at surgery. The patient's visual field returned almost to normal within 1 month of surgery.

Discussion

Table 1 summarizes the MCTC findings in 22 patients who were evaluated for sellar and suprasellar lesions. Examples of normal anatomy were taken from patients who underwent MCTC for lesions elsewhere. Normal axial, coronal, and direct sagittal sections through the sellar and suprasellar region are shown in Figs. 1 and 2. When the sella was within normal size with a competent diaphragm, no concentration of metrizamide was seen within the sella. The diaphragma sellae was well delineated, including the prechiasmatic optic tract. The optic chiasm was seen as a transverse bar-like defect on the axial and coronal projections. The infundibulum appeared just posterior to it as a rounded defect, with the postchiasmatic optic tract lying anterolaterally. The relationship of the vertical segment of the internal carotid artery and the A1 segment was seen well in the axial and coronal projections. The optic recess of the third ventricle was clearly visualized in the direct sagittal section. The prechiasmatic portions of the optic nerves were not identified on the coronal sections, except in one patient (Case 1). This patient presented with bilateral visual field defects. Her MCTC demonstrated a so-called "empty sella." When the diaphragma sellae was incompetent, the sella showed a concentration of metrizamide representing an empty sella (Figs. 3 and 4). Among the nine patients who had empty sella, five presented with galactorrhea and elevated serum prolactin, two with abnormal visual fields, and two with amenorrhea. A small pituitary gland could be located posteroinferiorly in all but two patients. The sella turcica in all but two patients, both of whom had "empty sella," showed mild enlargement in lateral skull radiographs. Among the 11 patients with elevated serum prolactin levels, six demonstrated the presence of a small adenoma. Three of these tumors were removed.

![Fig. 5. Case 3. Metrizamide computerized tomographic cisternography scans. Left: Axial section showing a filling defect in the suprasellar region (arrows). Right: Coronal section showing slight elevation of the optic chiasm with suprasellar extension of the neoplasm (arrows).](image-url)
Fig. 6. Case 4. Metrizamide computerized tomographic cisternography scans. **Upper Left:** Axial section through the midsella showing the sella turcica (arrow) asymmetrically enlarged by the intrasellar mass. **Upper Right:** Section through the suprasellar region showing a rounded defect in the suprasellar cistern caused by the suprasellar extension of the neoplasm. **Lower Left:** Coronal section showing the asymmetrical suprasellar extension of the neoplasm (arrow). **Lower Right:** Direct sagittal section showing anteroposterior and superior extension of the chromophobe adenoma.

surgically, and three were treated with bromocriptine. In the remaining five patients, the only abnormality was an empty sella. The prolactin-secreting adenomas measured between 4 and 6 mm in diameter, and were well delineated by MCTC. The nonenhancing chromophobe adenomas were best evaluated by MCTC for their supr- and parasellar extension. Also, one meningioma was diagnosed preoperatively by its attachment at the chiasmatic groove. The anterolateral extension of the lesions was best seen on the axial and lateral projections, whereas superior and lateral extensions were best appreciated on the coronal projections. The bone outline of the sella turcica was well delineated, eliminating the necessity of polytomography in most of the patients. Except for mild transient headache experienced by three patients, no adverse reactions were seen.

**Summary**

High-resolution metrizamide CT cisternography (MCTC) using a newer generation CT scanner in axial, direct coronal, and (when feasible) direct sagittal views provided minute and accurate delineation of sellar, parasellar, and suprasellar anatomy. The relationship of lesions with the optic chiasm, hypo-
Fig. 7. Case 5. Metrizamide computerized tomographic cisternography scans. **Upper**: Axial sections through the suprasellar region showing a large filling defect caused by a suprasellar mass (arrows). **Lower Left**: Direct coronal section showing superior extension of the mass by elevation of the A1 segments of the carotid arteries (arrows). There was also bilateral parasellar extension present. **Lower Right**: Direct sagittal section outlining the anteroposterior and superior extension of the mass (arrows). The sella turcica is normal in size.

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References

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