Computed Tomography in the Urinary Tract, Adrenals, and Pelvis

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Computed tomography until recently has principally been of value in imaging anatomy. The diagnosis of pathology has been limited to lesions that alter gross structure. With new advances, however, diagnosis of functional abnormalities may become possible, in addition to an improvement in the resolution of anatomic lesions.

Currently, CT is of great value in identifying pelvic lesions and assessing their importance. Of great value is the staging of urinary bladder carcinoma. By injecting air into the bladder, the tumor is clearly outlined. The degree of involvement of the bladder wall is readily determined on the standard CT scan. If the tumor extends past the bladder wall into the perivesicular fat, total excision is not possible and radio- and chemotherapy is more appropriate than surgery.

A new technical advance called dynamic scanning allows one to evaluate blood flow. This is performed by injecting a contrast bolus in a peripheral vein and obtaining slices rapidly at one location. The scans take 5 s, with an interscan delay of 1, so that five scans are taken in 30 s, or ten a minute. This allows one to see the contrast bolus as it washes in and out of the scan plane.

One straightforward application is the identification of suspicious masses. In one patient with lymphoma, multiple bilateral pelvic masses consistent with enlarged lymph nodes were seen. With the addition of a contrast bolus, they were seen to opacify and wash out rapidly. Their identification as the iliac vessels then became obvious.

Potentially an important use of dynamic scanning is the evaluation of blood flow to the kidney. This would aid in the diagnosis of renovascular hypertension and renal infarcts. Preliminary research has been carried out at Duke University (North Carolina, USA). In these canine studies part of the kidney was infarcted by embolization of the segmental artery. Rapid sequential scans of the area were then taken and evaluated by the computer. By plotting the change in opacity due to contrast from scan to scan, a measurement of blood flow in each part of the kidney section is obtained. Clear differences are apparent when the center of the infarct is compared with the periphery.

Further clinical evaluation in human patients is, of course, necessary. However, these results suggest that dynamic scanning may define decreased blood flow in a patient with unilateral stenosis and may even identify segmental compromise of renal blood flow. This would allow angiography to be more directive, and may eliminate it entirely in those cases where no flow abnormality is identified.

Finally, new reprocessing of computer data allows improvement in image resolution to better than 0.75 mm. This is particularly valuable in diagnosis of small adrenal gland lesions as well as in assessment of the extent of malignancy.

References

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