

Dynamic Computerized Tomography of Pelvic Masses

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Abstract : *The performance of consecutive, 4.8 sec computed tomographic (CT) scans, after the intravenous administration of a bolus of amidotrizoate, was found to be useful in evaluating the vascular anatomy and organ perfusion in benign and malignant pelvic masses. It appears to have significant advantages over conventional intravenous contrast enhancement CT scan in selected cases. (Thai J Obstet Gynaecol 1991;3:115-119.)*

Key words : computerized tomography, pelvic mass

X-ray computed tomography (CT) is an easy, safe and valuable diagnostic method for tumours in the pelvic cavity because it is a relatively noninvasive procedure^(1,2). However, the use of a low concentration drip infusion of iodinated intravenous contrast medium in routine CT, which is delayed for several minutes after intravenous contrast medium administration, may obscure subtle areas of abnormality in the CT of the body⁽¹⁾. Dynamic CT, which is performed by obtaining rapid sequential CT scans following a bolus injection of intravascular contrast medium, has been shown to be useful in the analysis of pathological lesions, such as cerebral⁽³⁾, hepatic, biliary or renal lesions^(4,5). However, dynamic CT has seldom been utilized in gynaecologic diseases. We have evaluated patients with benign and malignant pelvic

masses with dynamic CT, and found it to have some advantages.

Materials and Methods

A GE/Yokogawa 9000 CT/T scanner was utilized in performing the dynamic scanning series. In patients who were evaluated by dynamic CT scanning, the level for the dynamic CT was selected from conventional CT scans obtained through the general area of anatomic interest prior to the administration of intravascular contrast medium. After selection of the appropriate level, a dynamic CT scan was performed.

An 18-gauge Teflon needle was inserted into an antecubital vein, and 40 ml of contrast material (60% meglumine and sodium amidotrizoate) was injected at a flow rate of 8 ml per second. The scanning was begun 8

sec after the initiation of the bolus injection; i.e. a sequence of 6 exposures, each 4.8 sec in duration, with an interscan interval of 1.5 sec, followed by 3 exposures, each 4.8 sec in duration, interscan interval of 15 sec.

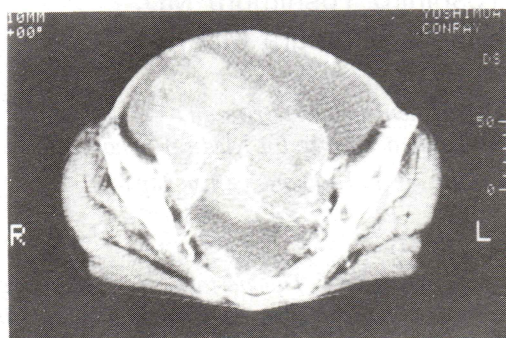
Analysis of the dynamic CT scans obtained during the intravascular passage of the contrast bolus provides a nearly real-time analysis of the pharmacokinetics of the contrast medium as it passes through the tissue included within the scan slice. For patients evaluated with this modality illustrate the potential value of this methodology.

Cases Report

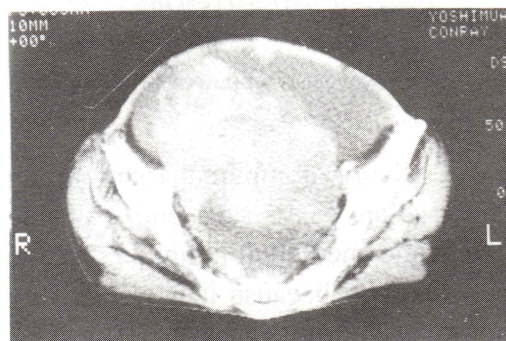
Case 1

A 75-year-old woman had a primary ovarian tumour (serous cystadenocarcinoma, Stage T3NxMO) that had been partially resected 2 years earlier. The patient was given 4 courses of double chemotherapy with cis-diamminedichloroplatinum (CDDP) and adriamycin. She had recently developed symptoms of abdominal distension, and her serum CA 125 level was elevated (14500 U/ml). A CT scan was done to evaluate the possibility of a recurrent ovarian cancer. Dynamic CT revealed ascites and a mass in the lower abdomen which was highly vascularized and had prominent solid and cystic components, which were highly suggestive of recurrent ovarian cancer (Fig. 1).

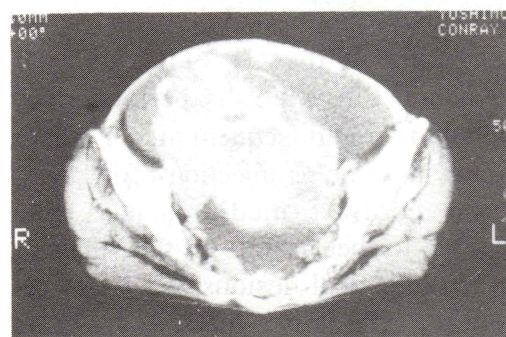
Fig. 1 Case 1. CT image in 75-year-old woman with suspected recurrent ovarian cancer.



(A) Prior to the intravenous injection of the contrast material.



(B) Dynamic 4.8 sec CT scan initiated 21 sec after the beginning of an intravenous bolus injection of contrast material, showing a late arterial phase. The tumour shown in this picture is highly vascularized and has many necrotic areas.



(C) Dynamic 4.8 sec CT scan initiated 73 sec after the beginning of an intravenous bolus injection of contrast material, which is identical with the CT image obtained after conventional drip infusion of iodinated intravenous contrast medium.

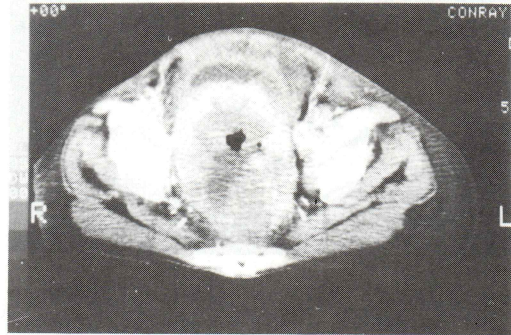
Case 2

A 60-year-old woman had a primary ovarian tumour (serous cystadenocarcinoma, Stage T3NxMO) that had been resected 3 years earlier, and she had been given 4 courses of double chemotherapy with CDDP and adriamycin. She had recently developed symptoms of abdominal distension and an elevated serum CA 125 level (1200 U/ml). Her left kidney had already been autonephrectomized and a right ureteral obstruction, which had been demonstrated by drip infusion pyelography, required nephrostomy. There were no pathological findings in the mucous membrane of the urinary bladder cystoscopically. A CT scan revealed a large necrotic mass, which was clearly distinguished from the surrounding ascites by contrast enhancement with dynamic CT scan. Abnormally high vascularity extending into the right vesical wall was demonstrated. These findings strongly suggested recurrence of her ovarian cancer (Fig. 2).

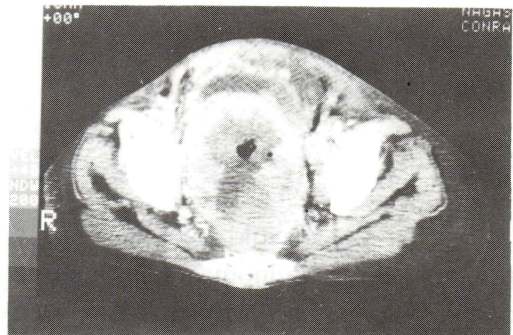
Case 3

A CT scan was obtained in a 45-year-old woman with a 3-year history of a tumour in the lower abdomen. She was in the 5th week of gestation. Since her pregnancy was determined to be terminated by social indication, dynamic CT was performed and an enlarged uterine body with a gestational sac was revealed. Opacification of the left uterine artery was shown,

Fig. 2 Case 2. CT image in 60-year-old woman with suspected recurrent ovarian cancer.



(A) Dynamic 4.8 sec CT scan initiated 8 sec after the beginning of an intravenous bolus injection of the contrast material. Note both femoral arteries are opacified.



(B) Dynamic 4.8 sec CT scan initiated 27 sec after the beginning of an intravenous bolus injection of the contrast material shows a late arterial phase. Note the abnormal vasculature extending into the right vesical wall. The tumour image is clarified by the dynamic CT scan.

and homogeneous tumour arising from the uterine body was enhanced immediately thereafter. No necrotic lesions or disequilibrium in contrast material distribution were observed. The post-operative histologic diagnosis was uterine leiomyoma and decidual change of the endometrium (Fig. 3).

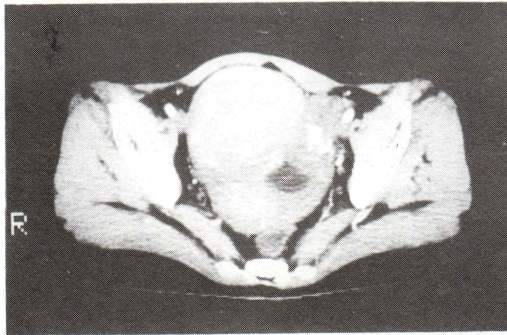


Fig. 3 Dynamic CT scan in 45-year-old woman with myoma uteri and 5th week of gestation. A continuous dynamic 5 sec CT scan initiated 14 sec after the beginning of an intravenous bolus injection of the contrast material is shown.

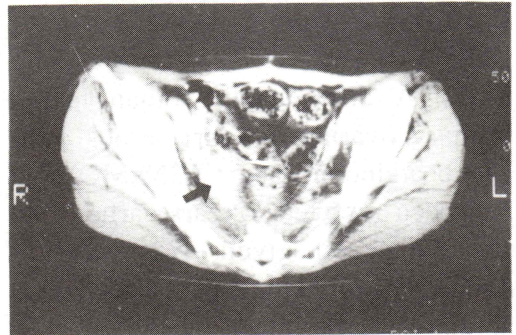


Fig. 4 CT prior to the contrast enhancement features a tumour along the pelvic side wall, suggesting lymphadenopathy. The dynamic CT scan was not effective in contrast enhancement of these nodes.

Case 4

A 40-year-old woman had a primary adenocarcinoma of the uterine cervix (Stage T1bN0M0) that had been treated with radical hysterectomy and postoperative irradiation a year earlier. She had recently developed lumbago and ureteral obstruction was demonstrated by intravenous pyelography. A CT scan was done to evaluate the possibility of a recurrent uterine cancer. Conventional CT scan revealed pelvic adenopathy, however, dynamic CT scan was not effective in contrast enhancement of this enlarged lymph-node (Fig. 4).

Discussion

The case examples presented indicate that valuable information re-

garding blood vessels, perfusion, and amidotrizoate pharmacokinetics can be obtained during dynamic CT. The advantage of this type of analysis is that it can be performed after intravenous contrast medium administration without the utilization of intraarterial catheters. It also appears to be useful in detecting mass lesions and in accurately defining the extent of disease. Bolus contrast medium administration still allows subsequent conventional postcontrast nondynamic CT. This technique is recommended for monitoring the response of gynaecologic malignancies to therapy. The recent introduction of nuclear magnetic resonance imaging seems to improve the imaging of the tumor in the abdomen⁽⁶⁾, however, the cost of the equipment is prohibitive for its generalized use in patients with pelvic masses. Therefore,

rapid scanning of the X-ray CT after bolus contrast medium administration may be the best method for performing these types of studies.

There are limitations in the clinical applications of dynamic CT, including an increased dose of radiation to the patient and the potential complications of administering large amounts of high osmolality iodinated contrast media. Information from consecutive scans may only be obtained at a chosen level with present technology. Conventional CT has been reported to be useful in the diagnosis of pelvic lymphadenopathy⁽⁷⁾, dynamic CT scan is not considered to have any additional advantage in the imaging of lymphadenopathy, which is not considered to be abundant in vasculature. However, dynamic CT in conjunction with bolus intravascular contrast medium administration appears to be an effective diagnostic imaging technique and should probably be employed more frequently in diagnostic CT imaging.

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