



Title	CT Detected Radiation Damage of the Liver and Pancreas
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## CT Detected Radiation Damage of the Liver and Pancreas

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## 上腹部放射線治療後の肝・膵の変化 CT scan による観察

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### Introduction

Based on the CT investigation of 8 patients who received 50 Gy to the upper abdomen, some apparent and serial changes of the liver and pancreas were detected in an irradiated area. As to the liver, a sharply and linearly demarcated low density was observed in the treatment volume immediately after the completion of radiotherapy. Marked atrophic change of the irradiated portion of the liver and pancreas was apparent 18 months after radiotherapy.

### Materials and Methods

Six patients with bile duct carcinoma were examined by CT within one month after radiotherapy. Two patients with para-aortic lymph node metastasis of uterine cervical cancer were examined both before and after radiotherapy. All patients received 50 Gy in 25 fractions over 5 week by two opposed coaxial equally weighted 10 MV X-rays. Contrast medium (65% Angiografin, 100 ml) was administered during scanning as rapid drip infusion.

### Result

All 6 patients with bile duct cancer examined within one month after radiotherapy, demonstrated sharply low density area in the liver corresponding to the treatment volume. The mean attenuation value of the irradi-

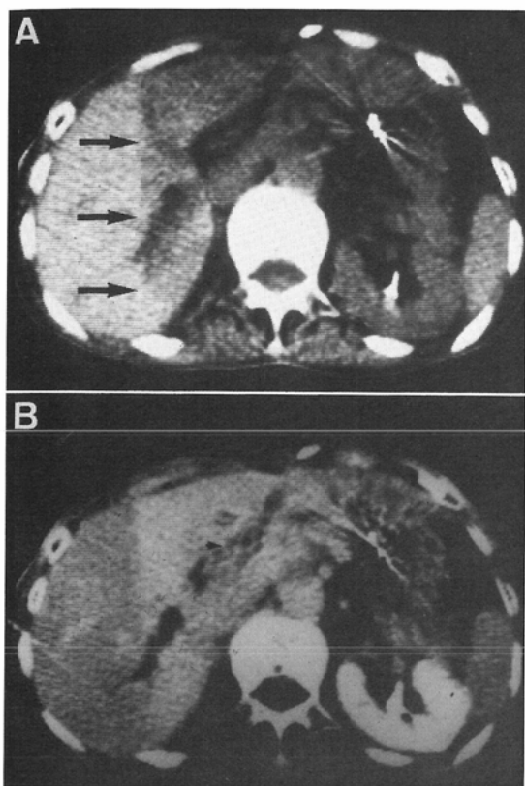


Fig. 1 CT scans of the liver 28 days after external irradiation to the bile duct cancer.

- A: Scan without contrast enhancement. Sharply and linearly demarcated low density (arrows) corresponding to the treatment volume is defined.
- B: Scan with contrast enhancement. Irradiated area is markedly enhanced by the intravenous administration of contrast material.

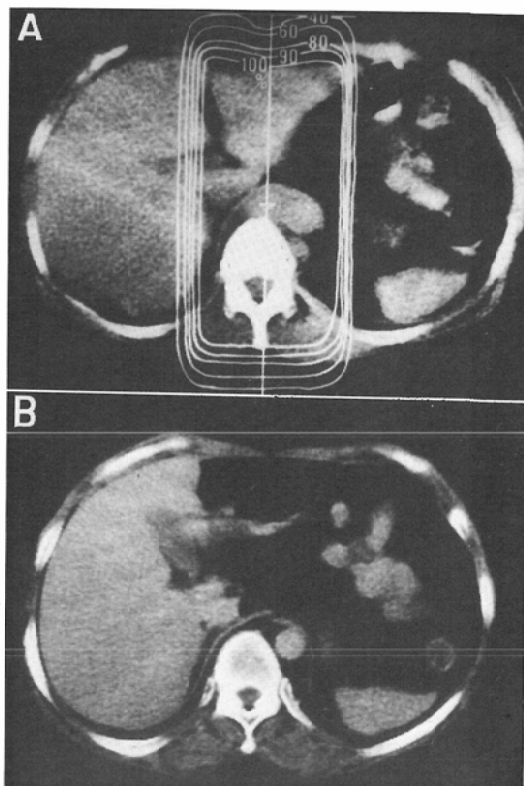


Fig. 2 CT scans of patient with retrocrural lymph node metastasis from uterine cervical cancer.

- A: Scan before the irradiation. Left lateral segment of the liver is included within the 100% line of dose distribution curve.
- B: Scan 18 months after radiotherapy. Irradiated portion of the liver shows the contractive change.

ated portion was 45 Hounsfield unit, and of the non-irradiated portion 55 Hounsfield units. After contrast enhancement, the corresponding values were 91 and 84 Hounsfield units. The irradiated portion showed higher contrast enhancement value than the non-irradiated portion (Fig. 1).

In three of five patients examined two or more months after radiotherapy, marked contractive change of the irradiated portion of the liver was demonstrated on CT (Fig. 2). Two of these 3 cases had no hepatic disorders.

Pancreatic head received 50 Gy showed marked decrease in size of irradiated portion 18 months after radiotherapy. The non-irradiated portion of pancreas had no change in size.

#### Discussion

Radiotherapy of the upper abdomen has become popular, however few clinical and radiological investigations of hepatic and pancreatic radiation injuries have been done<sup>1)~11)</sup>. Kolvenstvedt et al.<sup>9)</sup> and Jeffrey Jr. et

al.<sup>10)</sup> have reported that the CT finding of radiation-induced hepatic injury is a sharply defined low density area corresponding to the treatment volume. In addition to this findings, our experience indicated that the irradiated portion of the liver is markedly enhanced by the intravenous infusion of contrast material. These CT findings indicate the excessive blood flow or distribution of irradiated portion. Histological studies<sup>4)~6)</sup> suggested that the acute radiation hepatitis is primarily a veno-occlusive disorder. In the series of Jeffrey Jr.<sup>10)</sup>, the low density band resolved 4 to 14 months after radiotherapy. Our 2 cases without hepatic disorders demonstrated contractive change of the irradiated left lateral segment. Lewin et al.<sup>1)</sup> and Reed et al.<sup>4)</sup> showed the marked atrophy of the liver and decreased cellular cytoplasm in remaining hepatocytes in histological studies. On the partial irradiation of the liver, 50 Gy may be enough dosage to give fatal damage to human hepatocytes<sup>1)6)</sup>.

No radiological changed have been described in patients as the result of irradiation of the pancreas. But our experience supports the histological findings of progressive fibrosis in the irradiated pancreas<sup>8)11)</sup>.

When a patient who has received irradiation is examined by CT, changes of attenuation value of the irradiated portion of the liver should be considered<sup>9)10)</sup>. At the time of the radiation therapy planning of the upper abdomen, the contractive change of liver and pancreas should be anticipated.

#### References

- 1) Lewin, K. and Millis, R.R.: Human radiation hepatitis. *Arch Pathol.*, 96: 21—26, 1973
- 2) Johnson, P.M., Grossman, F.M., et al.: Radiation induced hepatic injury. *A.J.R.*, 99: 453—462, 1967
- 3) Lansing, A.M., Davis, W.M. and Braizel, H.E.: Radiation hepatitis. *Arch Surg.*, 96: 878—882, 1968
- 4) Reed, G.B. and Cox, A.J.: The human liver after radiation injury. *Am. J. Pathol.*, 45: 597—611, 1966
- 5) Ogata, K., Hizawa, K., et al.: Hepatic injury following irradiation. *Tokushima J. Exper. Med.*, 93: 240—251, 1963
- 6) Ingold, J.A., Reed, G.B., et al.: Radiation hepatitis. *A.J.R.*, 93: 200—208, 1965
- 7) Spencer, R.P., Kligerman, M.M., et al.: Scan evidence of hepatic "refunction" after tumor irradiation. *J. Nucl. Med.*, 11: 140—141, 1970
- 8) Wallance, S.: Diagnostic roentgenology of radiation change. 101—109, 1979, The Williams & Wilkins Company. Baltimore, U.S.A.
- 9) Kolbenstvedt, A., Kjolseth, I., et al.: Postirradiation changes of the liver demonstrated by computed tomography. *Radiology*, 135: 391, 1980
- 10) Jeffrey Jr., R.B., Moss, A.A., et al.: CT of radiation hepatitis. *A.J.R.*, 135: 445—448, 1980
- 11) Hori, S., Inoue, T., et al.: The role of CT scan for radiotherapy of nodal metastasis from carcinoma of the cervix uteri. *Jap. J. Cancer Clin.*, 27: 687—691, 1981