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Transcatheter Internal Radiotherapy of Hepatoma using Radioactive Iodized Oil (I-131 Lipiodol)

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放射性リピオドールによる肝細胞癌の経カテーテル的組織内照射法について

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Introduction

We report here the initial promising results of transcatheter internal radiotherapy (TCIR) for hepatoma.

Materials and Methods

Five patients with hepatoma were selected after obtaining the informed consents (Table 1). They had multi-nodular tumors with angiographic evidence of hypervascularity and rich stain. Three of them had no previous therapy for hepatomas. The other two had received the intra-arterial infusion of Cisplatin for the management of hepatoma. This chemotherapy had no therapeutic effect on the tumor in one patient (Pt.3), while rapid decrease in serum AFP was noted. On the other patients (Pt. 4), the central necrosis of the tumor made its appearance before injection of I-131 Lipiodol. The therapeutic doses (7.6-16.0mCi/2.0—3.0 ml) of I-131 Lipiodol prepared by isotopic exchange reaction were slowly infused by Seldinger's technique into the right or left hepatic artery, or more peripheral segmental branch supplying the target tumors, and the thyroidal uptake of I-131 of each patient was blocked by potassium iodide. The therapeutic effects were assessed by serial measurements of serum AFP levels and/or the size of the largest tumor in each patient on the CT images.

Results

Table 1 summarizes the results of this internal radiotherapy. The elevated serum AFP levels decreased definitely in four patients and the tumor regression was observed in all patients. Unfortunately, one patient (Pt. 2) who had severe cirrhosis with ascites, died of hepatorenal failure two months after infusion of I-131 Lipiodol. His pathological specimens showed no cancer cells in the largest tumor (Fig. 1a, b) and the several areas of dissolved cancer cells in the other tumor. No serious complications were encountered on and after

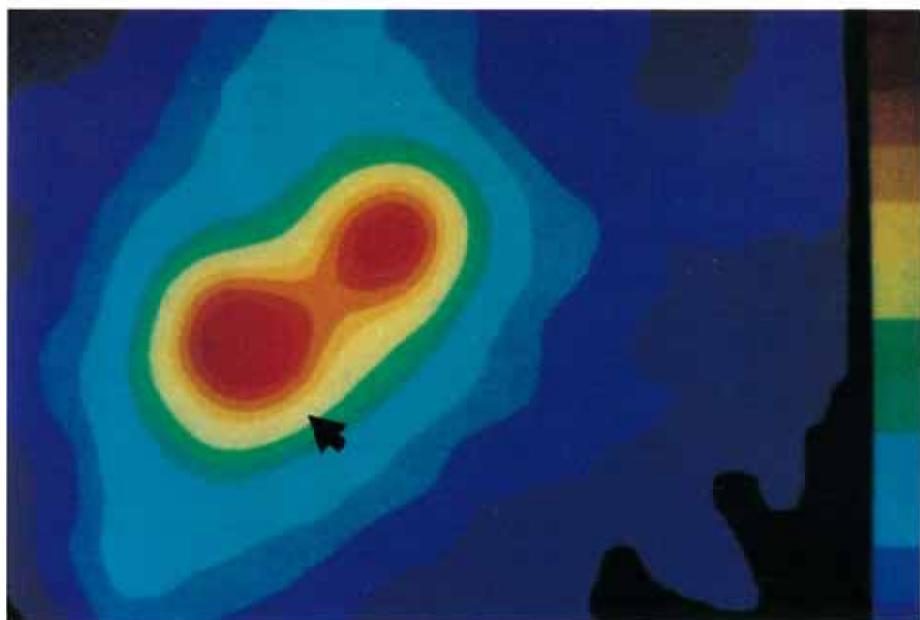


Fig. 1 a) This scintigram of Pt. 2 was obtained 2 days after infusion of I-131 Lipiodol into the right hepatic artery. The selective concentrations of I-131 are clearly demonstrated in the two nodules located in the right lobe of the liver.



b) The postmortem microscopic view (stained with H.E., 10 \times) of the hepatoma patient. Arrow in figure 1-a) indicates same nodule. Two months after infusion of I-131 Lipiodol. This specimen shows intense dissolution of cancer cells, and not any nucleus are found out in this tumor section.

Table 1 Summary of Transcatheter Internal Radiotherapy (TCIR) of Hepatoma

Patient	Localization	Size (cm)	Artery for Infusion	I-131 Dose (mCi)	Iodized Oil Volume (ml)	Serum AFP (ng/ml) Before	Serum AFP (ng/ml) After (day)	Reduction Rates in Tumor Size % (wks)
1.M.K.75M		4.0x3.8	RHA	10.9	2.5	WNL	WNL	64 (25)
2.F.S.77M		4.5x4.0	RHA	7.6	2.3	323	20 (49)	41 (5)
3.S.Y.61F*		6.5x5.0	LHA seg.	16.0	3.0	220	89 (35)	35 (11)
4.N.S.66F*		4.0x3.2	LHA seg.	10.5	2.0	321	31 (28)	78 (9)
5.Y.H.63M		3.0x3.0	RHA seg.	10.0	3.0	324	195 (14)	52 (8)

* Patients received previous chemotherapy.

TCIR. All but one patients are alive and have good clinical courses for 2 to 8 months after the therapy.

Discussion

The present study shows the direct therapeutic effect of TCIR on hepatoma without serious side effects. Our previous study¹⁾ revealed that the effective half life was estimated at 4 days on the average in the tumor, adjacent hepatic portion and probably in the lung. Although the safe radiation doses to the liver and lung with internally administered radionuclides are not known, the tolerance of external irradiation has been estimated at 30 Gy²⁾ in the liver, and 25 Gy in the lung. Based on these results and MIRD dose calculations, tolerant doses might be 70mCi in the liver and 40mCi in the lung respectively. In this study, we selected less than 20mCi which is considered to be safe enough for both organs and to deliver the effective radioactive dose to the target tumors. The hepatoma in this series showed good response to this therapy. We grossly estimated the tumor dose at 40 to 100 Gy, although exact radiation dose calculation is under investigation.

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