

## Multimodal treatment of hepatocellular carcinoma

Yoshiyuki Shimamura<sup>1</sup>, Yoshihumi Takenaka<sup>1</sup>, Masanori Ishii<sup>1</sup>, Yasuo Shima<sup>2</sup>, Hiroki Taniguchi<sup>1</sup>, Youzou Kitai<sup>1</sup>, Hidejiro Watanabe<sup>1</sup>, Shigeru Sugai<sup>2</sup>, Akira Takashi<sup>2</sup>, Tomoki Kitaya<sup>1</sup>, Tomoji Matsuyama<sup>1</sup>, and Hiroshi Hasegawa<sup>3</sup>

<sup>1</sup>Department of Surgery, National Matsudo Hospital

<sup>2</sup>Department of Internal Medicine, National Matsudo Hospital

<sup>3</sup>Department of Surgery, National Cancer Center Hospital

**Summary.** Our multimodal treatment of hepatocellular carcinoma (HCC) has brought about a significant improvement of the survival rate. It consists of a combination of hepatectomy and transcatheter arterial embolization using lipiodol (L-TAE). In order to facilitate L-TAE, we have developed a special catheter with notches. A group of patients with HCC (124 cases), excluding cases with absolutely non-curative resections and operative deaths, were treated between December 1980 and November 1986. Each case was treated for more than 1 year after hepatectomy. The patients were divided into two groups: A, patients with a single tumor not larger than 5 cm, and B, cases with larger tumors or more than one lesion. Some patients in each group were treated with L-TAE after hepatectomy. In group A, there was no significant difference in survival between treated and non-treated cases. In group B, L-TAE gave a significantly better survival than no postoperative treatment.

### Introduction

Hepatocellular carcinoma (HCC) is often combined with liver cirrhosis and the tumors are often multiple, even when small in size. The main methods for treatment are hepatectomy [1], transcatheter arterial embolization (TAE) [8], and percutaneous ethanol injection. However, each method has its shortcomings. For example, after hepatectomy tumor recurrences are common since the resections have to be limited to preserve liver functions. To compensate for this limitation, we have used a combination of hepatectomy and transcatheter arterial embolization by lipiodol (L-TAE). The results of this treatment have been promising [5].

### Patients, materials and methods

Since December 1980, we have treated 124 HCC patients with the multimodal therapy after exclusion of absolutely non-curative resections and operative deaths. The observation period for each case exceeds 1 year after hepatectomy (Fig. 1). As shown in Fig. 2, the patients were divided into two groups. Group A comprised patients with a single tu-

- excluded (absolute non-curative  
operative death)
- following up more than 1yr after hepatectomy
- Dec. 1980~Nov. 1986

Fig. 1. Hepatocellular carcinoma (124 cases)

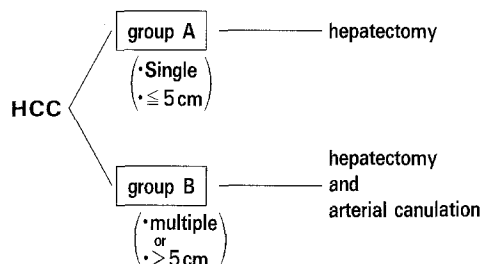


Fig. 2. Surgical treatment of hepatocellular carcinoma (HCC)

### hepatectomy and cannulation

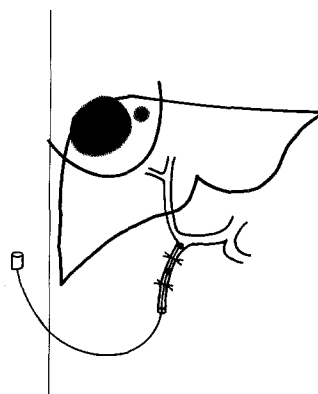


Fig. 3. Hepatectomy and cannulation

mor, 5 cm in diameter or smaller. Group B consisted of cases with multiple tumors of any size or tumors larger than 5 cm. After hepatectomy, some cases in both groups had the relevant liver artery/ies cannulated at the same

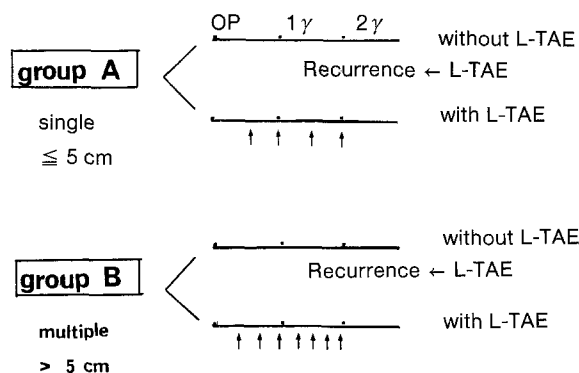


Fig. 4. Our study of patients after hepatectomy. L-TAE, transcatheter arterial embolization using lipiodol

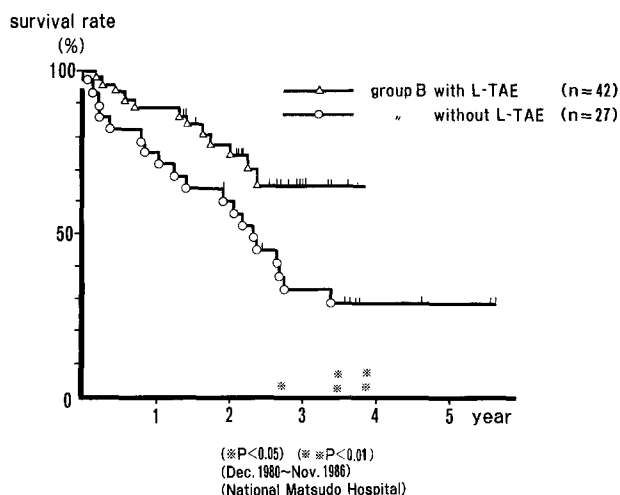


Fig. 5. Comparison of survival curves for group B with/without transcatheter arterial embolization using lipiodol (L-TAE) after hepatectomy (Kaplan-Meier)

operative session with a special catheter. This beaded catheter is easy to insert and to fix securely, making repeated embolizations safer with less risk of dislodging. As shown in Fig. 3, the catheter remained in place for 1 year or longer. Its external end was first fixed to the skin but in recent cases it has been buried subcutaneously to avoid infections, stress fractures of the catheter, and inconvenience. The embolized and non-embolized patients within the groups were compared using the Kaplan-Meier method for calculation of survival rates (Fig. 4).

The embolization procedure [6] L-TAE first uses injection of a mixture of doxorubicin, 20–40 mg, with 10 ml lipiodol Ultra Fluid, 5 ml 60% meglumine diatrizoate (urografin), and 100 mg aminoglycoside antibiotic dibekacin sulfate. This mixture is shaken vigorously for 10 min. This is immediately followed by injection of 1-mm<sup>3</sup> gelling cubes in urografin. The procedure is monitored by fluoroscopy.

## Results

The survival rates of embolized and non-embolized patients are described in Fig. 5. Open circles denote group B,

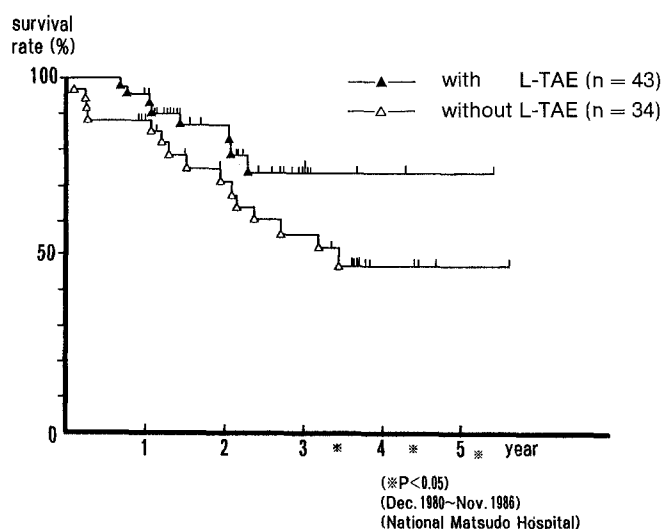


Fig. 6. Comparison of survival curves for hepatocellular carcinoma patients without portal vein involvement with/without transcatheter arterial embolization (L-TAE) after hepatectomy

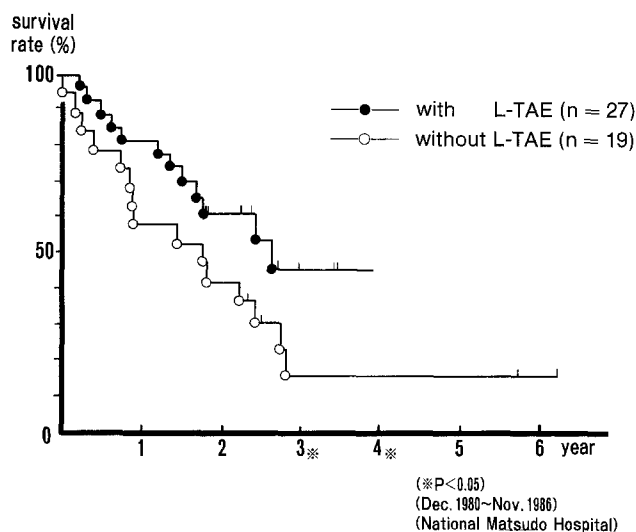


Fig. 7. Comparison of survival curves for hepatocellular carcinoma patients with portal vein involvement with/without transcatheter arterial embolization (L-TAE) after hepatectomy (Kaplan-Meier)

non-embolized cases, and open triangles denote embolized patients in this group. A comparison shows a statistically significant advantage for the embolized cases. Group A did not show the same difference and is not detailed here.

The data were further analyzed by consideration of portal vein involvement by tumor (vp factor) because this is one of the most important prognostic factors in resected HCC (Figs. 6, 7). As seen, L-TAE after resection improved the survival rates of both vp-positive and vp-negative subgroups.

## Discussion

The most effective treatment of HCC is resection, and it is important to have sufficient margins to avoid recurrence. However, in most cases, the resection has to be limited be-

cause of existing liver dysfunction. Consequently the recurrence rate after hepatectomy is relatively high with a poor survival rate. To improve the situation, we have postoperatively used L-TAE, which is another efficient form of treatment of HCC. It produces tumor necrosis [5–7] with acceptable side-effects. This has led to favorable survival rates, confirming the efficacy of this combined therapy.

Another advantage of L-TAE is that it is the most effective method of detecting small HCCs [2, 6, 8] and therefore useful in the early detection of tumor recurrence.

A recent study suggested the use of L-TAE for recurrent HCC [3]. However, as this study showed, it can be used successfully for surgical adjuvant purposes with acceptable side-effects.

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