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Case Report | OMICS International

Balloon-Occluded Transarterial Chemoembolization for Peritoneal Metastasis of Hepatocellular Carcinoma

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Abstract

We report unusual 2 cases treated with Balloon-occluded transarterial chemoembolization (B-TACE) for peritoneal hepatocellular carcinoma (HCC) metastasis. An 87-year-old female with hepatitis-C related cirrhosis underwent radiofrequency ablation (RFA) repeatedly. Computed tomography showed a 30 mm diameter tumor seeding adjacent to the ascending colon. Digital subtraction angiography (DSA) of the gastroduodenal artery showed a tumor stain fed by an omental arterial branch distributing from the greater curvature of the stomach. Since ultra-selective cannulation was difficult, a micro-balloon catheter was selected and advanced to the right gastroepiploic artery on the central side of the omental artery, and B-TACE was performed at this point. A 78-year-old male with hepatitis-C related cirrhosis underwent RFA and TACE repeatedly, but multiple HCC developed and a 45 mm diameter metastatic tumor adjacent to the descending colon was observed. DSA of the inferior mesenteric artery showed a tumor stain fed by the several peripheral branches of the left colic artery. Since one of this several branches was noted the normal mesenteric blood vessel by selective angiography, the position of the tip of the micro-balloon catheter was finely adjusted by balloon inflation to prevent inflow of the contrast medium into the normal blood vessel, and then B-TACE was performed.

Keywords Hepatocellular carcinoma; Peritoneal metastasis; Balloon-occluded transarterial chemoembolization

Abbreviations TACE: Transarterial chemoembolization; HCC: Hepatocellular carcinoma; B-TACE: Balloon-occluded transarterial chemoembolization; LE: Lipiodol emulsion; RFA: Radiofrequency ablation; CT: Computed tomography; IC: Informed consent; DSA: Digital subtraction angiography; GDA: Gastroduodenal artery; IMA: Inferior mesenteric artery; CTCAE: Common Terminology Criteria for Adverse Events; PEIT: Percutaneous ethanol injection therapy; QOL: Quality of life; c-TACE: Conventional transarterial chemoembolization;

Introduction

Transarterial chemoembolization (TACE) was developed in the late 1970s to early 1980s as a treatment approach for unresectable hepatocellular carcinoma (HCC) and became widely used in Japan [1, 2].

With the development of angiography and advances in devices, i.e., micro catheters, TACE has become applied selectively to cancer-bearing segments, sub segments, and sub-subsegments, and favorable treatment outcomes have been occasionally reported [3-6].

To improve the local control effect of TACE, balloon-occluded TACE (B-TACE) has recently been developed using a micro-balloon catheter suitable 4-Fr guiding catheter [7], which our hospital has adopted since the end of 2012.

B-TACE is a treatment method that utilizes changes in intrahepatic hemodynamics induced by balloon occlusion, through which an anticancer drug mixed with Lipiodol (Lipiodol emulsion: LE) is accumulated efficiently to enhance local control [7].

We performed B-TACE for 2 HCC patients with peritoneal metastasis, and achieved safe and favorable treatment outcomes. Herein, we report these cases with a review of the literature.

Case presentation

Case 1

Radiofrequency ablation (RFA) was performed repeatedly for HCC in an 87-year-old female with hepatitis-C related cirrhosis (Child-Pugh classification A).

On follow-up dynamic computed tomography (CT), a 25 mm diameter tumorous lesion that was assumed to be tumor seeding after RFA, was detected in the abdominal cavity (Figure 1). Since the liver function was favorable, sorafenib® (Nexavar; Bayer Healthcare pharmaceuticals; Leverkusen, Germany) was considered, but the patient rejected it because of adverse reactions.

She also declined to undergo surgical resection, and the lesion was in contact with the ascending colon, for which RFA is inapplicable. Thus, TACE was selected after obtaining informed consent (IC).

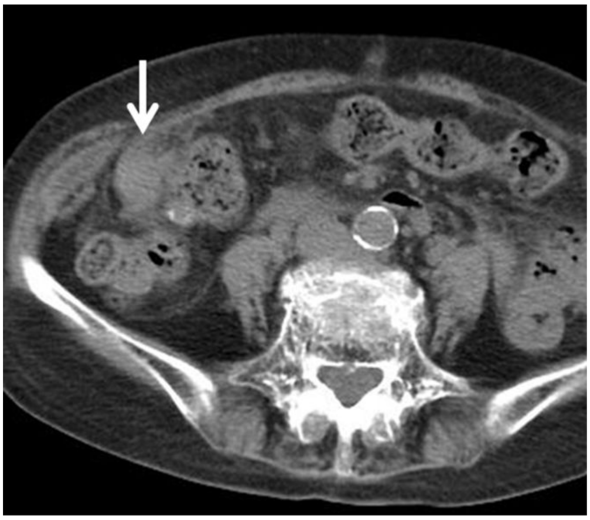

Figure 1: Abdominal computed tomography (CT); Unenhanced computed tomography (CT) imaging shows a peritoneal metastasis of hepatocellular carcinoma (HCC) measuring 25 mm in diameter adjacent to the ascending colon (white arrow).

Abdominal angiography was performed via the right femoral artery, using a 4-Fr sheath (Medikit, Tokyo, Japan) and a 4-Fr shepherd hook-guiding catheter (Terumo, Tokyo, Japan). Digital subtraction angiography (DSA) of the gastroduodenal artery (GDA) showed a tumor stain fed by an omental arterial branch distributing from the greater curvature of the stomach (Figure 2 (A)).

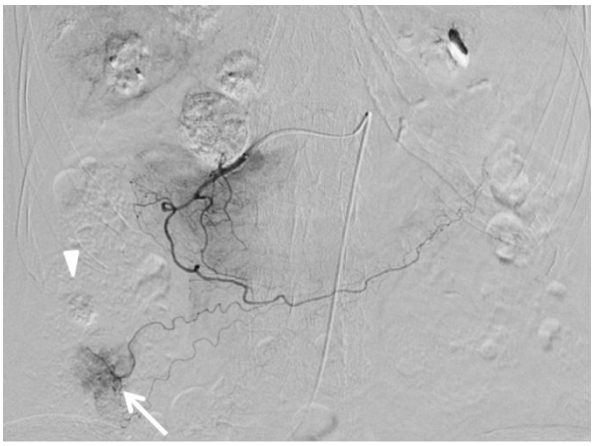

Figure 2A: Abdominal angiography; (A) Digital subtraction angiography (DSA) of the gastroduodenal artery shows a tumor stain (white arrow) fed by an omental arterial branch distributing from the greater curvature of the stomach. Accumulation of Lipiodol emulsion (LE) by previous treatment is showed in the cranial side of the tumor stain (white arrow head).

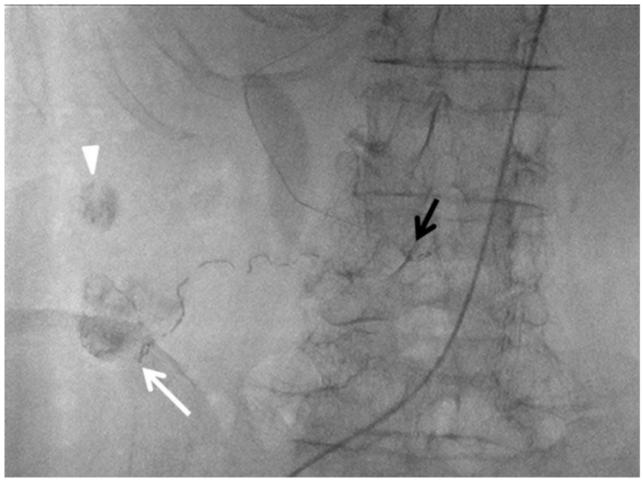

Figure 2B: Abdominal angiography; (B) The micro-balloon catheter is placed in the right gastroepiploic artery on the proximal side of the omental artery. Balloon-occluded transarterial chemoembolization (B-TACE) is performed at this point with inflation of balloon (black arrow). Accumulation of LE is showed in the target tumor (white arrow). Accumulation of LE by previous treatment is showed in the cranial side of the target tumor (white arrow head).

Since ultraselective cannulation was difficult, a micro-balloon catheter (LOGOS®; PIOLAX, Tokyo, Japan) was selected and advanced to the right gastroepiploic artery on the central side of the omental artery, and B-TACE with miriplatin® (Dainippon Sumitomo, Osaka, Japan) and 1 mm-Gelpart® (Nippon Kayaku, Tokyo, Japan) was performed at this point (Figure 2 (B)).

Figure 3: Abdominal CT; Unenhanced CT imaging shows dense accumulation of LE in the peritoneal HCC metastasis the day after B-TACE (white arrow).

On unenhanced CT the day after treatment, dense accumulation of LE was noted in this region with no influence on the nearby intestine (Figure 3). On unenhanced CT 6 months after treatment, dense accumulation of LE was noted in the treated region and no recurrence was noted.

Case 2

RFA and TACE were performed repeatedly for HCC in a 78-year-old male with hepatitis C-related cirrhosis (Child-Pugh classification A), but multiple HCC developed and a metastatic tumor measuring 45 mm in diameter was observed in the abdominal cavity, for which sorafenib® treatment was performed. A local necrotic component was present in the peritoneal metastasis following sorafenib® treatment, showing a partial treatment effect, but a viable lesion was detected on the dorsal side of the lesion (Figure 4). This patient also declined to undergo surgical resection, and RFA was inapplicable because the tumour was adjacent to the descending colon. Thus, TACE was selected after obtaining IC.

Figure 4: Abdominal CT; Dynamic CT imaging shows a peritoneal HCC metastasis measuring 45 mm in diameter with enhancement lesion on the dorsal side in the arterial phase (white arrow). This tumor is adjacent to the descending colon.

Abdominal angiography was performed via the right femoral arterial approach, using a 4-Fr sheath and 4-Fr shepherd hook-guiding catheter. DSA of the inferior mesenteric artery (IMA) showed a tumor stain fed by the several peripheral branches of the left colic artery, suggesting that 2 blood vessels were mainly involved. When angiography of these 2 blood vessels was performed by selective cannulation into each vessel, one was found to be the normal mesenteric blood vessel. A tumor stain was detected through 4 peripheral branches of the other vessel (Figure 5 (A)), confirming that these were the tumor blood vessels. The position of the tip of the micro-balloon catheter (LOGOS®) was finely adjusted by balloon inflation to prevent inflow of the contrast medium into the normal mesenteric blood vessel, and then B-TACE with LE of farmorubicin® (Pfizer, Tokyo, Japan) and 1 mm-Gelpart® was performed (Figure 5 (B)).

Figure 5A: Abdominal angiography; (A) DSA of the inferior mesenteric artery shows a tumor stain (black arrow head) fed by the four peripheral branches of the left colic artery (white arrows). The distal side of the feeding artery is showed a normal mesenteric artery (black arrow).

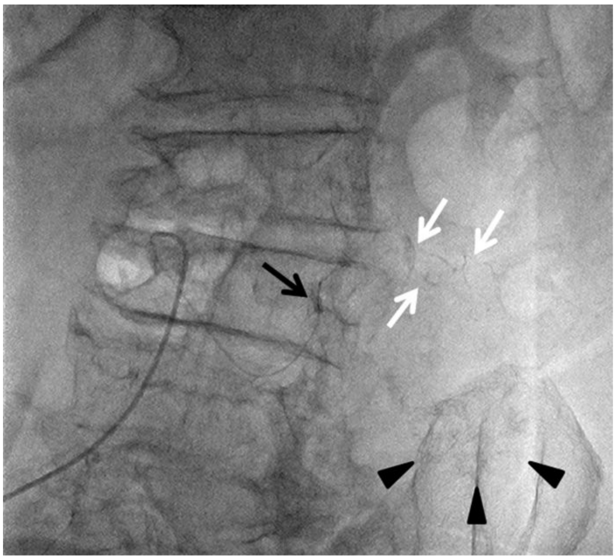

Figure 5B: Abdominal angiography; (B) B-TACE is performed at this point with inflation of balloon (black arrow).The flowing of LE to several narrow feeding arteries is showed (white arrows). Accumulation of LE is showed in the target tumor (black arrow heads).

Dense accumulation of LE in the treated region was noted on unenhanced CT the day after treatment (Figure 6). Dense accumulation of LE in the treated region remained on unenhanced CT at about 7 months after treatment, indicating a persistent treatment effect.

Figure 6: Abdominal CT; Unenhanced CT imaging shows dense accumulation of LE in the viable lesion of the peritoneal HCC metastasis the day after B-TACE (white arrows).

The course after B-TACE was favorable in both patients, and there was no sign of Common Terminology Criteria for Adverse Events (CTCAE) ver.4.0 grade-3 or more severe adverse events.

Discussion

While peritoneal HCC metastasis is relatively rare [8-10], tumor seeding associated with treatment procedures, i.e., percutaneous liver tumor biopsy, percutaneous ethanol injection therapy (PEIT), and RFA has increased recently [11-13].

Peritoneal metastasis is considered to be an extrahepatic metastasis. According to the management of HCC in Japan based on the consensus clinical practice guidelines proposed by the Japan Society of Hepatology (JSH; 2010 updated version) [14], when an extrahepatic metastasis is present, sorafenib® treatment is indicated when the liver function is Child-Pugh classification A, but palliative care is indicated for Child-Pugh classification C or B. Since peritoneal metastasis is not a prognostic factor, with no influence on the survival time, active treatment may be meaningless. However, its treatment is generally considered to reduce the risk of complications, i.e., ileus and hydronephrosis, and improve patients' quality of life (QOL) [15]. Thus, it may be treated when liver function is relatively favorable and the intrahepatic lesion is controllable to some extent. As the number of long-term surviving HCC patients increases in the future, cases of Child-Pugh classification B with peritoneal metastasis that are not indicated for sorafenib® treatment, cases with peritoneal metastasis that are not responsive to sorafenib®, elderly patients who are not indicated for surgery, and cases who do not want surgical resection with peritoneal metastasis will increase. Thus, it is important to investigate multidisciplinary treatment approaches for HCC, including these cases.

There are various treatment methods for peritoneal HCC metastasis. Surgical resection has mainly been reported, and chemotherapy, TACE, PEIT, and RFA have occasionally been reported [15, 16]. However, to our knowledge, there have been no reports of cases treated with B-TACE. The 2 patients declined to undergo surgical resection, and the lesions were located near the intestine, for which PEIT and RFA were inapplicable. Moreover, patient 1 did not want to undergo sorafenib® treatment even though the liver function was favorable: Child-Pugh classification A, and the patient in case 2 only partially responded to sorafenib®. Thus, after obtaining IC, we performed B-TACE for peritoneal HCC metastasis in these patients, and achieved safe and favorable treatment outcomes.

B-TACE was developed to increase the local control effect of conventional TACE (c-TACE). It is considered that anticancer drug injection-induced reflux is prevented by utilizing balloon occlusion-induced changes in intrahepatic hemodynamics, and injection into an anastomosed branch enables high-density chemoembolization compared with c-TACE [7]. Peritoneal metastasis is frequently present in regions near the intestine, i.e., the omentum and paracolic gutter, as noted in these patients, and the artery feeding the tumor is likely to be distributed within the intestine. Therefore, to prevent serious complications, i.e., intestinal perforation and necrosis, it is necessary to inject anticancer drugs only into the artery feeding the tumor. Considering that changes in hemodynamics, which are characteristic of B-TACE, can be utilized, we performed B-TACE for peritoneal HCC metastasis in 2 patients.

In general, arteries feeding HCC are visualized as being thicker than the blood vessels that are distributed throughout the liver parenchyma on abdominal angiography, and anticancer drugs may flow readily in these thicker vessels. In addition, balloon-occluded blood vessels reduce the peripheral hepatic arterial blood pressure, which may promote flow of viscous LE in the thick tumor blood vessel, but not in normal blood vessels in the liver parenchyma, i.e., B-TACE improves anticancer drug accumulation in tumors while limiting anticancer drug flow into non-tumorous, normal regions. In Case 1, a tumor stain fed by a narrow branch of the omental artery was indicated on DSA of the GDA. Since direct cannulation with a micro catheter was difficult, a micro-balloon catheter was advanced to the right gastroepiploic artery on the proximal side of the omental artery and B-TACE was performed. The anticancer drug did not flow into other regions without flowing backward to the right gastroepiploic artery, and injection into the tumor blood vessel alone was confirmed. In Case 2, the tumor stain fed by several peripheral branches of the left colic artery branching from the IMA, and B-TACE was performed safely by fine adjustment of the position of the micro-balloon catheter tip.

While the application of B-TACE to peritoneal HCC metastasis may be significant for HCC treatment in the future, but the risk of LE and Gelpart® inflow into normal blood vessels feeding the intestine remains a problem. Embolization of blood vessels feeding the intestine can cause serious complications, i.e., intestinal necrosis and perforation, which could threaten the life of patients with underlying hepatic cirrhosis; as with these 2 patients. B-TACE for peritoneal metastasis may be useful when patients are carefully selected and treated carefully, while paying sufficient attention to hemodynamics, after obtaining IC.

Conclusion

Using a micro-balloon catheter for peritoneal HCC metastasis, anticancer drug administration can be limited to the target region, while preventing inflow into non-target regions, i.e., the intestine, even in cases in which several narrow feeding arteries branch out from a single root vessel, or when direct catheter insertion is difficult because of the tortuous direction of the vessels.

It was suggested that B-TACE is a useful treatment option for peritoneal HCC metastasis.

Acknowledgments

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