

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: <http://Elsevier.com/locate/radcr>

Case Report

The advantage of iron-containing fiducial markers placed with a thin needle for radiotherapy of liver cancer in terms of visualization on MRI: an initial experience of Gold Anchor

Osamu Tanaka MD^{a,*}, Yoichi Nishigaki MD^b, Hideki Hayashi MD^b, Takayoshi Iida MD^a, Takamasa Yokoyama RT^a, Eiji Takenaka RT^a, Eiichi Yama RT^a, Eiichi Tomita MD^b

^a Department of Radiation Oncology, Gifu Municipal Hospital, 7-1 Kashima-cho, Gifu City, Gifu 500-8513, Japan

^b Department of Hepatology, Gifu Municipal Hospital, Gifu City, Gifu, Japan

ARTICLE INFO

Article history:

Received 25 December 2016

Received in revised form

5 February 2017

Accepted 6 March 2017

Available online 12 April 2017

Keywords:

Liver tumor

Radiotherapy

Image-guided MRI

Fiducial marker

Gold Anchor

ABSTRACT

Radiotherapy for liver malignancy is increasing due to advances in radiotherapy technique. Visualization of the tumor as well as fiducial markers is essential. To see if improved visibility exists on computed tomography (CT) and magnetic resonance imaging (MRI), we evaluated an iron-containing fiducial marker. A patient with hepatocellular carcinoma and a patient with cholangiocarcinoma were enrolled. Pain caused by placement of marker and the best MRI sequence for visualization of both the fiducial marker as well as the liver tumor on MRI was evaluated. CT was obtained in 2.5-mm thickness, and MRIs were obtained in eight sequences (ie, T2-weighted image). 22G preloaded needles were used for marker placement in both patients; this caused little pain during placement under local anesthesia with xylocaine. No complication occurred in either patient. Both markers and tumors were well visualized by the same MRI sequence. The iron-containing fiducial marker is safe and useful for detecting fiducial markers in the liver and for registration using CT and MRI.

© 2017 the Authors. Published by Elsevier Inc. under copyright license from the University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Introduction

There are various treatment methods for liver tumors; these include radio frequency ablation, transperipheral arterial chemical embolization (TACE), systemic chemotherapy, and radiotherapy [1]. Radiotherapy, particularly stereotactic ablative body radiotherapy (SABR), is commonly used for treating tumors located far from the body surface (i.e., deep tumors in the caudate lobe and

portal vein thromboses sometimes located near the diaphragm [2]). TACE or embolization using lipiodol are used for hyper vascular tumor such as hepatocellular carcinoma (HCC) to reduce the nutrient supply, from artery blood flow. That makes it difficult to treat the tumors by local chemotherapy. Some reports have stated that three-dimensional (3D) conformal radiotherapy can be successfully applied even if the portal vein is invaded by the tumor after SABR [3].

Competing Interests: The authors have declared that no competing interests exist.

* Corresponding author.

E-mail address: c.blured@gmail.com (O. Tanaka).

<http://dx.doi.org/10.1016/j.radcr.2017.03.014>

1930-0433/© 2017 the Authors. Published by Elsevier Inc. under copyright license from the University of Washington. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

In recent years, with the advancement of radiotherapy, improvement of treatment planning has become necessary before precise irradiation. It is sometimes difficult to track a tumor in the liver during radiotherapy. Therefore, fiducial markers are used to locate a tumor in the liver. Magnetic resonance imaging (MRI) is superior to computed tomography (CT) to delineate a liver tumor, which has led to the development of CT to MRI registration [4,5]. The outline of a tumor is delineated using MRI, and CT to MRI registration is guided by fiducial markers [6–8].

In general, detection of small fiducial markers in the liver is difficult by MRI. Use of a larger metal device can improve marker detection. However, a larger needle is required to place larger markers. The use of a larger needle increases the risks of bleeding, pain, discomfort, and tumor seeding.

Ferromagnetic metals are highly susceptible to MRI. The metals include iron, cobalt, nickel, and so on. Gold Anchor (GA) fiducial markers contain 0.5% pure iron in pure gold (Naslund Medical AB, Huddinge, Sweden), which voids the signal on MRI. A pilot study by Marsico et al. reported the usability of GA fiducial markers in the liver. However, the visibility on MRI was not addressed. To our knowledge, no study has reported the usefulness of a marker composed of 0.5% iron for detecting HCC or intrahepatic cholangiocellular carcinoma (CCC). We evaluated the pain, discomfort, bleeding, and safety during echo-guided insertion using 22G needle. Three weeks after, we investigated the GA fiducial markers in MRI for detection of HCC and CCC.

Case reports

The study protocol was approved by the local institutional review board (approval no. 356), and written informed consent was received from the 2 patients discussed in this report.

Patient 1: HCC

This case involved a patient with a background of hepatic cirrhosis (Child–Pugh class A) caused by chronic hepatitis C infection. The patient underwent repeated radio frequency ablation and TACE for HCC and was finally referred to our Radiotherapy Department for portal vein invasion.

A hepatologist visualized the tumor in the liver by ultrasound. An iron-containing GA fiducial marker (Fig. 1) was placed 2 cm from the HCC using a 22G needle under local anesthesia (Fig. 1). The GA marker had a diameter of 0.28 mm and length of 10 mm (Fig. 2). The hepatologist with 30 years of experience opted for a 22G needle as a 25G needle would have been too flexible and difficult to insert. To prevent intrahepatic bleeding, astriction was performed about 8 minutes. Three weeks after placement, registration on CT and MRI was conducted (Fig. 3). Planning CT and cone-beam CT (CBCT) was shown in Fig. 4.

Patient 2: CCC

The second patient was referred to our Radiation Oncology Department for the treatment of CCC. In this patient, the bile duct was constricted and showed expansion of the intrahepatic bile duct (Fig. 4). Endoscopic retrograde biliary drainage was performed for placement of a 7 Fr, 9-cm tube (Fig. 4; upper right image) (Gadelius Medical K.K, Sapporo, Japan). Jaundice was relieved after endoscopic retrograde biliary drainage. A GA fiducial marker (diameter, 0.28 mm; length, 10 mm) was placed under echo-guided sonography using a 22G needle 2 cm from the tumor, similarly as that in patient 1.

Image acquisition

After marker placement, CT (Optima CT580; GE Medical Systems, Milwaukee, WI) and MRI (Intera 1.5 Nova; Philips

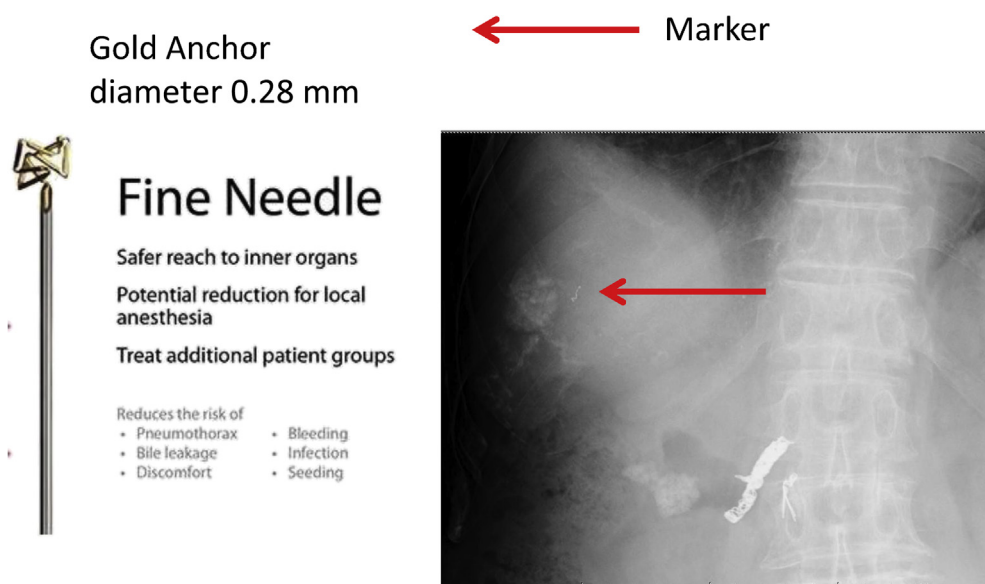


Fig. 1 – Radiograph after insertion. Characteristics of the iron-containing Gold Anchor fiducial marker, which can be placed spherically with a thin 22G or 25G needle. GA contains 0.5% iron and has high visibility on MRI. Visualization is good on simple X-ray images as well. GA, Gold Anchor; MRI, magnetic resonance imaging.

Download English Version:

<https://daneshyari.com/en/article/8825453>

Download Persian Version:

<https://daneshyari.com/article/8825453>

[Daneshyari.com](https://daneshyari.com)