Hepatocellular carcinoma with ring calcification mimicking hydatid disease: a case report

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Abstract

Background: Ring calcification in hepatocellular carcinoma is extremely rare. Untreated hepatocellular carcinoma occasionally includes calcified lesions. Here, we report a case of ring-calcified hepatocellular carcinoma.

Case presentation: A 60-year-old man with a hepatic tumor was referred to Tokyo Women’s Medical University Hospital. He had a history of chronic hepatitis C. Computed tomography showed a liver tumor 20 mm in diameter in segment 6 of the Couinaud classification, with ring calcification. Based on this uncommon imaging presentation and the patient’s past exposure to the definitive hosts of Echinococcus multilocularis, he was preoperatively diagnosed with echinococcosis. Partial hepatectomy was performed as a radical treatment for echinococcosis. A final diagnosis of hepatocellular carcinoma was confirmed based on pathological findings. The patient was discharged uneventfully.

Conclusion: The presentation of an extremely rare hepatocellular carcinoma with ring calcification may be disguised as hydatid disease.

Keywords: HCC, Calcification, Ring calcification, Rim calcification, CT findings, Echinococcosis, Hydatid disease

Background

Calcification of untreated hepatocellular carcinoma (HCC) has been reported in 3.3–25.0% of HCC cases [1–4]. Calcification of untreated HCC is less common than fibrolamellar carcinoma [4–6], metastatic liver tumor, or hemangiomia [6, 7]. The patterns of calcification may characterize specific hepatic lesions [6, 8]. Multiple, ill-defined patterns are associated with metastatic liver tumors. A solitary, stellate, central-located pattern is associated with fibrolamellar carcinoma. The turtle back pattern is unique to schistosomiasis. A peripheral rim pattern, which resembles ring calcification, is often seen in echinococcosis [6, 8, 9].

Case presentation

A 60-year-old man with asymptomatic chronic hepatitis C was referred for a hepatic tumor that was detected on screening abdominal ultrasonography. Laboratory data showed that serum levels of alpha-fetoprotein and protein induced by vitamin K absence-II were not elevated; indocyanine green had a 27% retention rate at 15 min, the Child-Pugh score was 5, and liver damage was “A.”

Computed tomography (CT) revealed a 20-mm well-defined tumor with calcification in segment 6 of the Couinaud classification of the liver. Calcifications were distributed, especially on the edge of the tumor. Ring calcification was observed in the tumor (Fig. 1a). Dynamic CT showed a typical HCC pattern, which was enhanced in the early phase and washed out in the delayed phase in the center of the tumor (Fig. 1b, c).
The environmental factor should be described since echinococcosis was suspected due to the presence of ring calcification in the liver. Although biochemical analysis of the echinococcus antibody was negative, the patient's unusual past engagement in red fox hunting in the Hokkaido area led to an association with echinococcosis. Based on this unusual environment factor and the characteristic ring calcification, a preoperative diagnosis of echinococcosis was made. To treat, partial liver resection of segment 6 was performed.

The resected specimen presented as a solid white tumor with a thick capsule containing rim calcification.

Fig. 1 Dynamic CT. a A calcified tumor was seen in segment 6 of the liver in the plain CT. b CT in the arterial phase showing partial early enhancement of the tumor (indicated by white arrows). c CT in the delayed phase showing a washed-out pattern in the tumor.

Fig. 2 Macroscopic image of the tumor. a A solid tumor was seen on the surface of the liver. b A cross section of the tumor revealed the thick capsule. c Another cross section of the tumor after formalin-fixation showed hemorrhage and necrosis inside the tumor.
and necrotic tissue macroscopically (Fig. 2a–c). Histological findings confirmed that necrotic and hemorrhagic tissues were observed in most parts of the tumor. A few viable cancer cells with moderate differentiation were also detected (Fig. 3a–d). The tumor capsule had a thick fibrosis along with rim calcification (Fig. 3b). The patient was discharged uneventfully from our hospital on postoperative day 10 and has survived for 9 years without recurrence.

Discussion
To our knowledge, ring calcification in hepatocellular carcinoma is rare. There are no more than five previous case reports in the English literature [10–13]. We present the sixth case of primary HCC with ring calcification and review previously published reports with the aim of consolidating the findings relating to its clinical and pathological features (Table 1). Five out of six reported cases were from Japan and derived from infection by the hepatitis C virus. Most of the tumors were no larger than 40 mm in diameter, and ring calcification of the tumors was easily recognized on CT. Surgery was performed in four of the six cases, and survival after surgery presented satisfactory results. Usually, making a correct preoperative diagnosis based on dynamic CT findings, history of viral infection, and patient information is not difficult. Preoperative biopsy should be performed carefully because dissemination after needle biopsy was reported in cases of HCC and echinococcosis [10, 14]. For small HCCs, radio frequency ablation could have been carried out, but radio frequency ablation is unlikely to be the best therapy because of the physical difficulty in targeting an eggshell-like lesion. Thus, radical resection seems to be the best therapy for both ring-calciﬁed HCC and hydatid disease.

Hydatid disease, or echinococcosis, is a zoonosis that is caused mainly by *Echinococcus granulosus* and *Echinococcus multilocularis*. To make a correct diagnosis of echinococcosis, a patient’s social history is an important factor. For example, red foxes, the definitive hosts of *E. multilocularis*, inhabit the northern island of Japan, and more than 95% of echinococcosis patients in Japan are from the Hokkaido area [15]. Serum antibody tests and image ﬁndings are also helpful for diagnosis. The sensitivity and speciﬁcity of serum antibody tests were reported as 61–97.1% and 61.7–100%, respectively, [16–20]. CT can conﬁrm a hepatic mass and the form of calcification, ring calcification; rim calcification is a characteristic ﬁnding of echinococcosis [6, 8, 9]. Magnetic resonance imaging helps distinguish cystic components and solid components; the typical ﬁndings of alveolar echinococcosis are multiple small round cysts and solid components with slight enhancement after contrast material injection [21]. In the

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**Fig. 3** Microscopic findings of the tumor. **a** A cross-section of the tumor. Upper-case alphabets with windows correspond to microscopic images labeled with lower-case alphabets. **b** Image around the capsule showing hemorrhagic area along with rim calcification inside the fibrous capsule (×10 hematoxylin and eosin stain; white arrows indicate calcifications). **c** Image around another area of the capsule showing viable cancer cells beneath the capsule (×10 hematoxylin and eosin stain). **d** Image around the tumor septum showing calcification and viable cancer cells (×10 hematoxylin and eosin stain; white arrows indicate calcifications).
**Table 1 Summary of reported ring-calcified HCC**

| Case | Year  | Nationality | Age | Sex | Liver condition | Viral infection | Size (mm) | Location | CT pattern | Histology | Treatment | Survival |
|------|-------|-------------|-----|-----|-----------------|----------------|-----------|----------|------------|-----------|-----------|----------|
| 1    | 1994  | Greek       | 56  | M   | LC              | HBV            | NA        | S8       | Early      | NA        | Chemotherapy | NA       |
| 2    | 1999  | Japanese    | 72  | F   | CH              | HCV            | 30        | S8       | Delayed    | Moderately differentiated HCC | Partial hepatectomy | NA       |
| 3    | 1999  | Japanese    | 77  | F   | LC              | HCV            | 30        | S8       | Early      | Not obtained | None      | NA       |
| 4    | 2008  | Japanese    | 67  | F   | CH              | HCV            | 37        | S4       | Early      | Moderately differentiated HCC | Left lobectomy | 3 years |
| 5    | 2013  | Japanese    | 68  | F   | CH              | HCV            | 10        | S4       | No         | Poorly and moderately differentiated HCC | Left medial sectionectomy | 30 months |
| 6    | 2020  | Japanese    | 60  | M   | LC              | HCV            | 19        | S6       | Early      | Moderately differentiated HCC | Partial hepatectomy | 9 years |

CT computed tomography, M male, F female, LC liver cirrhosis, CH chronic hepatitis, HBV hepatitis B virus, HCV hepatitis C virus, NA not available, HCC hepatocellular carcinoma

**Conclusion**

We report an extremely rare ring-calcified HCC case that mimicked hydatid disease. This case serves as a good reminder of the variety of imaging presentations of HCC.

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