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Radiologically identifiable intratumoral portal vein in intrahepatic cholangiomas: a diagnostic pitfall

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Abstract

Background: Although intratumoral patent portal vein (ITPV) is one of the characteristic features of benign hepatic lesions, ITPVs can be demonstrated in malignant tumors. We present the spectrum of MR and CT findings of ITPV identified in intrahepatic cholangiomas with pathological correlations.

Methods: The ultrasound, CT and/or MRI findings of pathologically-confirmed intrahepatic cholangiomas were reviewed and correlated with surgical specimen or autopsy findings.

Results: Intratumoral patent vessels were radiographically-demonstrated in 5 patients with intrahepatic cholangiomas. All intratumoral vessels were secondary or tertiary order portal vein branches. Some wall thickening was identified on pathological examinations.

Conclusion: The radiological demonstration of intratumoral portal vein is not a specific sign of benignity. In the case of a hepatic tumor with a patent portal tract, cholangioma should be considered, as well as benign tumors or lymphoma.

Key words: Liver neoplasm—Cholangioma—Intratumoral portal vein—MR—CT.

Vascular invasion is believed to be one of the characteristics of malignant hepatic tumors [1–3], but intratumoral patent vessels are rarely identified [4–6]. The radiological demonstration of intratumoral vessels can be a diagnostic pitfall in imaging diagnosis. We present five intrahepatic cholangiomas with radiologically identifiable intratumoral vascular structures imaged by ultrasound (US), computed tomography (CT), or magnetic resonance (MR).

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Materials and Methods

The clinical and radiographic findings of the subjects are summarized in Table 1. All tumors were pathologically confirmed: three at surgical resection and two at autopsy. All tumors were relatively large with a mean diameter of 7.9 cm. Complete radiographic–pathologic correlations were proven in all cases. At the request of the radiologist, specimens were thoroughly sectioned to confirm the presence of intratumoral patent vessels.

(US) and (CT) were performed in all cases. Dynamic incremental CT was performed by using a fourth-generation CT scanner following the administration of nonionic contrast medium (iopamidol 300 mgI/ml, 100 ml) at a rate of 2 ml/s by using a power injector. Magnetic resonance imaging (MRI) was performed in three cases by using a 1.5-T unit and a whole body coil. The pulse sequences included T1-weighted and T2-weighted spin echo (SE) and delayed-enhancement T1-weighted SE.

Results

All intratumoral vessels were secondary or tertiary portal vein branches. The intratumoral portal vein (ITPV) consisted of secondary or tertiary order portal vein branches. ITPVs were demonstrated by US as tubular structures contiguous with portal vein branches. ITPV were identifiable by CT as enhancing vascular structures within low-density tumors (Fig. 1). ITPV were demonstrated by MRI as tubular flow voids contiguous with main portal vein branches

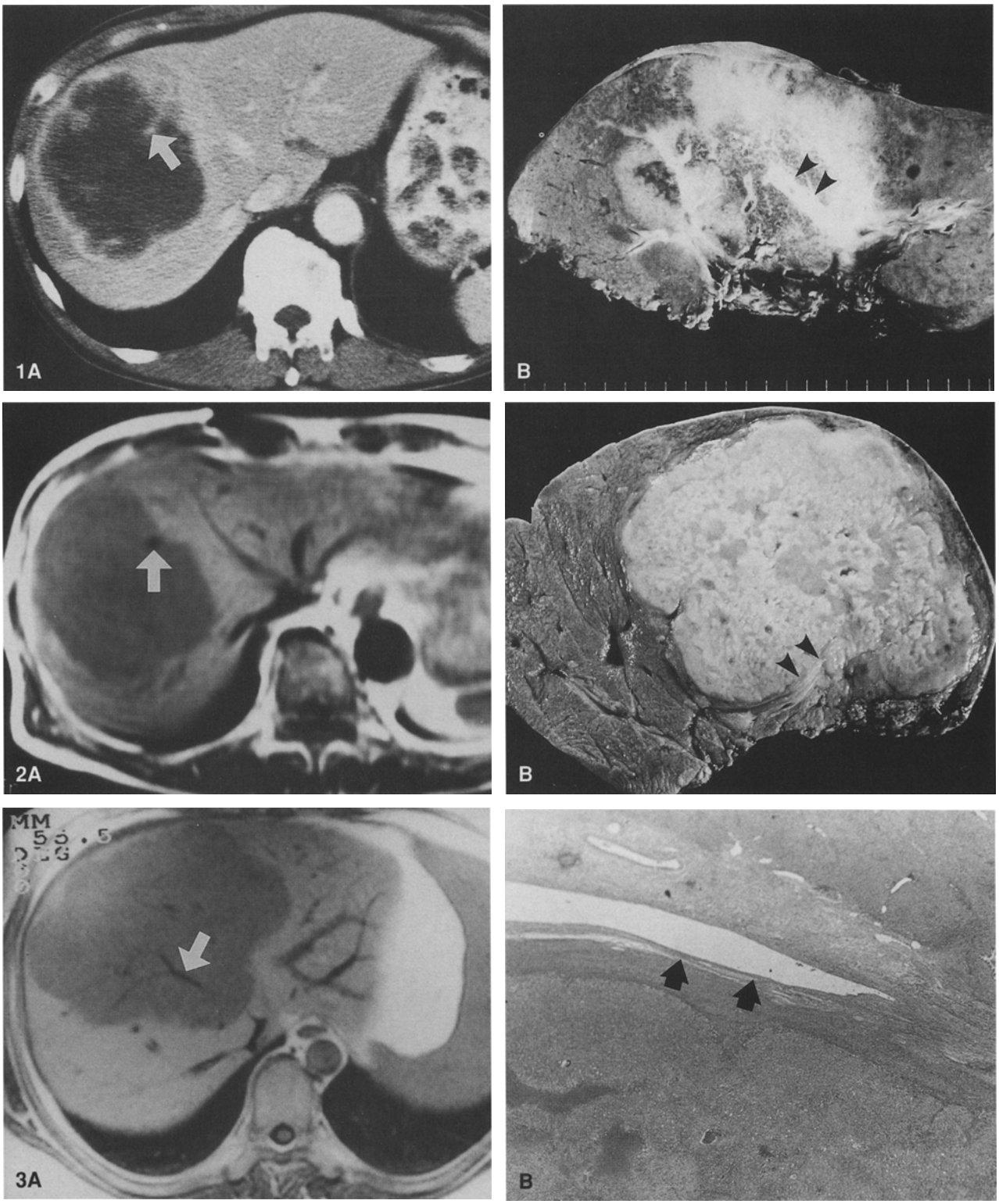

Fig. 1. *Case 1.* **A** Early phase of dynamic incremental CT demonstrates a heterogeneously hypodense tumor with intratumoral portal vein (*arrow*). **B** Gross specimen shows irregularly marginated solid tumor with patent portal branch (*arrowheads*).

Fig. 2. *Case 2.* **A** T1-weighted SE image (400/15) demonstrates a homogenously hypointense tumor containing a portal branch (*arrow*). **B** Gross specimen shows irregularly marginated solid tumor with patent portal branch (*arrowheads*).

Fig. 3. *Case 3.* **A** T1-weighted SE image (400/15) demonstrates a homogeneously hypointense tumor with a portal branch (*arrow*). **B** Photomicrograph of the specimen (H&E stain) shows a patent portal vein branch (*arrowheads*) coursing through the tumor.

Table 1. Summary of subjects

Case	Age/sex	Tumor size (cm)	US	CT	MR	Pathological proof	Order of ITPV[a]
1	70/M	9	+	+	+	Surgery	Tertiary
2	74/F	7	+	+	+	Surgery	Tertiary
3	23/M	8.5	+	+	+	Surgery	Secondary
4	83/F	7	+	+	−	Autopsy	Secondary, tertiary
5	51/F	8	+	+	−	Autopsy	Secondary, tertiary

[a] Intratumoral portal vein

(Figs. 2, 3). Some narrowing of the ITPV was identified and confirmed by angiography.

Although ITPVs usually show some narrowing and wall thickening at pathological examinations, they were free of tumor thrombi.

Discussion

Whereas ITPV has been considered a specific sign of benign hepatic lesions [7, 8], portal vein invasion or encasement is believed to be a characteristic feature of malignant hepatic tumors [1–3]. Although malignant hepatic tumors with radiologically demonstrable intratumoral portal tracts have been reported in hepatic lymphoma or metastasis [4, 6], these are described as exceptional cases. Intratumoral portal tract is also reported in well-differentiated hepatocellular carcinomas at pathological examinations [9], however, they are usually small branches and are not demonstrable by using US, CT, or MRI.

Several investigators have reported characteristic radiological findings in cholangiocarcinomas [5, 10, 11], such as delayed enhancement, irregular margins, or bile duct dilatation, the ITPV has been described only in one case [5]. Because it has been difficult to demonstrate intratumoral portal branches radiologically, little attention has been paid to intratumoral patent vessels. Usually, only vascular invasion is sought during pathological examinations, and patent intratumoral vessels are not usually described without a clinical suspicion of focal nodular hyperplasia. Unfortunately, we could not collect a sufficient number of cases to calculate the incidence of ITPV in cholangiocarcinomas. We suspect that the true incidence of ITPV may not be rare for this tumor. In accordance with the recent advances in development of imaging modalities, we can clearly demonstrate ITPVs noninvasively by using US, CT, or MRI. A well-enhanced intratumoral septum may resemble ITPV on CT; however, MRI can demonstrate ITPVs as flow voids with multiplanar images.

Intrahepatic cholangiocarcinoma is the second most common primary malignant hepatic tumor; however, we could not locate any report in the literature describing a distinct portal tract in a cholangiocarcinoma. Intrahepatic cholangiocarcinoma is an adenocarcinoma with varying degrees of cellular elements, stromal connective tissue, and mucin production [12, 13]. It also has several histological variants and variations in growth patterns. As the lesion can originate from minor branches of intrahepatic bile ducts and can grow invasively around portal vessels, this unusual finding may be observed. However, the true etiology of ITPV is still not clear.

In conclusion, the presence of ITPV is not a specific clue to the diagnosis of benign hepatic lesions and it could be a diagnostic pitfall in imaging diagnosis. If an ITPV is demonstrated, even in the case of a large hepatic tumor, cholangiocarcinoma should be considered in the differential diagnosis, as should malignant lymphoma, metastasis, and focal nodular hyperplasia. Additional signs such as delayed enhancement or irregular margins [5, 10, 11] should be considered to avoid misdiagnosis.

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