

Percutaneous interventional procedures in an era of liver transplantation

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Percutaneous needle biopsy¹⁻⁴ under image guidance have been increasingly used in the diagnostic work-up of focal hepatic lesions. In addition, percutaneous ethanol injection therapy (PEIT)⁵ and radiofrequency ablation (RFA)⁶ are useful in managing hepatocellular carcinomas (HCC).

A liver mass with an elevated serum α -fetoprotein (AFP) does not automatically indicate HCC. Moreover, AFP is an inadequate surveillance assay in high-risk groups. The diagnosis of HCC depends on radiological appearances and histologic examinations. In most cases, contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI) is highly accurate for the diagnosis of malignant liver cancers.^{4,7} Hence, they have led to a drastic decline in the requirement for liver biopsy of space-occupying lesions.⁸

The European Association for the Study of the Liver (EASL) recommends needle biopsy of lesions ranging from 10 to 20 mm in diameter to patients with cirrhosis, since detection sensitivities of small malignant liver tumors (<2 cm) in cirrhotic liver are less than 13-67%.^{7,9} Furthermore, false positive results for HCC were reported as 7% in liver transplantation (LT) recipients in the USA.¹⁰

The sensitivity of fine needle aspiration biopsy (FNA) of liver lesions reported range from 67 to 100%, the specificity 80 to 100%,¹¹ and the accuracy 91%.^{11,12} Image guided percutaneous needle biopsies are generally a safe and highly effective tool for diagnosing liver tumors. Major complication rates and associated mortality rates by liver

biopsy are 0.05-0.18% and 0.006-0.031%, respectively. Major complication rates and mortality rates of PEIT and RFA are less than 2% and up to 0.1%, respectively.^{13,14}

The biggest shortcoming of percutaneous biopsy is the potential risk of implantation of malignant cells into the needle tract. The incidence of needle tract implantation (NTI) of HCC has recently increased from 0.003-0.009% to 1-5%.^{2,15-18} The increased survival in patients with HCC may be one of the reasons for the high incidence reported in recent publications. Moreover, as the use of percutaneous interventional procedure becomes more popular, NTI of HCC is predicted to increase. In systematic review, the incidence of NTI following biopsy of HCC is 2.7% overall, or 0.9% per year.³ Although the use of ethanol was thought to prevent NTI after PEIT,¹⁹ the frequency of NTI is yet between 0.2-1.4%.²⁰ Llovet et al²¹ reported a high rate (12.5%) of NTI after RFA, but later studies reported substantially lower rates.^{1,6} This discrepancy is thought to have occurred due to the small number of patients and percutaneous biopsy before RFA in this study.

The following risk factors affect the chances of NTI¹: (1) the superficial or subcapsular location of the tumor,² (2) more number of needle passes^{13,15} and the frequency of repositioning the needles (3) larger needle bore,¹⁶ (4) the use of an end-cutting needle,^{2,13,16} (5) the absence of or a too thin layer surrounding normal liver parenchyma along the needle tract,^{13,15} (6) high-grade (moderate or poor) differentiated HCC,^{2,13,20,21} (7) high serum AFP level,²¹ (8) tumor larger than 2 cm, (9) biopsy before RFA,²¹ and (10) patient with

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immunosuppression.¹⁹ Maturen et al²² suggested that a biopsy needle within an introducer could prevent needle tract seeding. In this method, the introducer stayed in place while multiple passes with the biopsy needle were made.²² Despite the usage of small caliber needles, PEIT may increase the risk of NTI compared to biopsy alone due to their multiple needle punctures and their stay in liver over an extended period.²⁰ Therefore, larger volumes of ethanol during needle placement for PEIT may minimize the risk of NTI because of the sterilizing effect of alcohol along the needle tract and fewer needle punctures.¹⁹ Routine ablation of the needle tract during RFA and the use of an internally cooled electrode may also decrease the incidence of NTI.^{1,2,21} Patients with small or well-differentiated HCC are expected to have a longer life span than those with large or poorly differentiated HCC.¹⁵ Since the chance of detection of NTI is higher in the former,^{1,15,16} ablation should also be considered for both the lesion and the needle tract in cases of biopsy from a small liver nodule.

Helical CT is the preferred imaging technique to demonstrate NTI.^{2,15} The implanted tumors may show hyper-attenuation on the arterial phase. Thereafter, they show high to iso-attenuation on portal and equilibrium phase. The cause of the difference in the enhancement pattern between implanted tumors and HCC in the liver during the equilibrium phase is that the implanted tumor tissue is supplied only by the systemic arteries, unlike liver.²

NTI can be treated with local excision with clear margins and/or ablation, embolization, or local radiotherapy.^{15-17,19,20,22} Surgical resection offers the best chance to eradicate the implanted tumors, and the seeding did not adversely affect patient survival with the lesion being treated successfully by resection and local ablation.^{2,3,12,15-18,23}

The size of the tumor implant and extrahepatic dissemination of the implanted tumor can be thought to affect the outcome after resection.²³ However, the prognosis of HCC is usually dependent on liver function and the characteristics of intrahepatic lesions, not on the severity of metastatic lesions.²⁴ Therefore NTI itself rarely affects patient survival.^{2,12,15-17,19,20,22}

A study of Ahn et al²⁵ reported that incidence of NTI after percutaneous biopsy or PEIT is similar to the previous study,²⁶ and that percutaneous transhepatic biliary drainage (PTBD) can also induce NTI. Several treatment modalities are recommended for NTI of HCC and their results are

known to be acceptable. However, in this study, even though the prognosis of HCC is usually independent from the degree of metastasis, one fourth of the patients recurred after surgical excision and only method of excision for implanted nodules was significantly associated with recurrence. Thereby, when NTI is detected, en bloc wide excision of implanted tumor appears to be a preferable option.

Currently, LT has been proved to be an effective treatment option for HCC. Percutaneous procedure, including needle biopsy, PEIT or RFA in those patients would have a poor long term outcome of successful LT, because it turns a potentially curative lesion into an untreatable situation due to extrahepatic tumor dissemination along the needle track.²³ Thus, some investigators emphasize that percutaneous interventional procedures are generally contraindicated and these procedures should be undertaken only in specialized liver transplant centers for selected cases of HCC.

In conclusion, although uncommon, NTI after needle biopsy for HCC can occur with an incident that is not negligible. In order to avoid NTI, percutaneous biopsy should only be considered in cases when imaging results are ambiguous, or pathologic confirmation is necessary before nonsurgical treatments, such as transcatheter arterial chemoembolization (TACE), PEIT, RFA, or chemotherapy.^{17,23} Since needle tract seeding may present after percutaneous interventional procedure and even after RFA, attention must be paid to the needle tract during extended follow-up.

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