Expectations for contrast-enhanced ultrasonography

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Sonazoid, the only ultrasound contrast medium that can be used clinically in Japan at present, has been covered by insurance for focal liver lesions since 2007 and for focal breast lesions since 2012.

In addition to serving as a blood pool agent, Sonazoid which is phagocytized by Kupffer cells, enhances normal liver parenchyma in the post vascular phase. Therefore, Sonazoid was first used for the purpose of detection and qualitative diagnosis of focal liver lesions in cases in which qualitative diagnosis with other diagnostic imaging was difficult and cases in which contrast-enhanced CT and MRI were contraindicated due to renal dysfunction or allergy to contrast agents, etc. Over 300,000 examinations have been performed with Sonazoid in the 6 years since 2007. Recently, accurate and appropriate treatment of hepatic tumors that are difficult to detect on B-mode ultrasound has been made possible by clearly depicting hepatic tumors with contrast-enhanced ultrasound. Also, during surgery, lesions that are unclear on B-mode ultrasound can be better detected and the extent of the lesion can be more clearly depicted as a result of enhancement. Contrast-enhanced ultrasound is now an indispensable examination for supporting the treatment of hepatic carcinoma and assessment of the response to treatment, in addition to its use for intraoperative ultrasound; it cannot be replaced by other modalities.

Contrast-enhanced ultrasound with Sonazoid for focal breast lesions is now covered by insurance after being recognized as superior to B-mode ultrasound and contrast-enhanced MRI for differentiating between malignant and

benign breast tumors. It has been 14 months since coverage was authorized, but its use for this purpose is not yet widespread. One possible reason for this is that the clinical usefulness of this method, other than differentiating malignant from benign breast lesions, is not yet clear. In the case of breast lesions that can be depicted on B-mode ultrasound, pathological diagnosis can be made easily by fine needle aspiration cytology or core needle biopsy under ultrasound guidance; therefore, there is very little dependence on contrast-enhanced ultrasound for the differential diagnosis of malignancy. In addition, institutions that perform breast ultrasound do not always have the equipment to perform contrast-enhanced ultrasound. Moreover, most breast ultrasound examinations are performed by sonographers alone; securing a doctor to inject the contrast agent is another obstacle to its widespread use.

In the area of breast imaging, it is hoped that contrast-enhanced ultrasound will be useful for diagnosing the spread of breast cancer, assessing the response to chemotherapy, and diagnosing postoperative recurrence, etc., for which we currently rely on contrast-enhanced MRI. Unlike with contrast-enhanced MRI, which is performed with the patient in the prone position, if the spread of a lesion can be diagnosed with contrast-enhanced ultrasound, which can be performed with the patient in the operative position, it is possible to accurately mark the involved area and resect just the right amount of lesion. Also, unlike contrast agents for CT and MRI, which diffuse into the interstitial space, ultrasound contrast agents, which are microbubbles, probably yield images that accurately reflect tumor blood perfusion; therefore, it may also be useful to assess response to chemotherapy and differentiate between postoperative scars and recurrent lesions.

In order for use of contrast-enhanced ultrasound to become more widespread for imaging areas other than the

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liver, it will need to yield information equal to or greater than that yielded by contrast-enhanced CT and MRI. We will need to find clinically vital information that can only be obtained by use of contrast-enhanced ultrasound, making use of the safety, convenience, and real-time nature of ultrasound, as well as the characteristics of ultrasound contrast agents. Further modification and improvement of ultrasound equipment will naturally be necessary. Ease of use of 3D/4D imaging will be essential. For organs other than the liver, a display method that takes the place of Kupffer images of the liver and better highlights differences between normal tissue and lesions, and between benign and malignant lesions, and allows for extended

observation is needed. It is hoped that equipment capable of contrast-enhanced ultrasound will see groundbreaking advances, that new uses for contrast-enhanced ultrasound in areas other than the liver will be recognized, and that contrast-enhanced ultrasound examinations will advance to the point of being indispensable in the future. Furthermore, advances are being made in research on molecular imaging and molecular therapy that make use of molecularly-targeted ultrasound contrast agents, and it is hoped that contrast-enhanced ultrasound will expand into new ultrasound therapies in the near future and not just be used for diagnosis.