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Ultrasound Category

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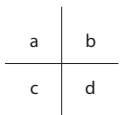
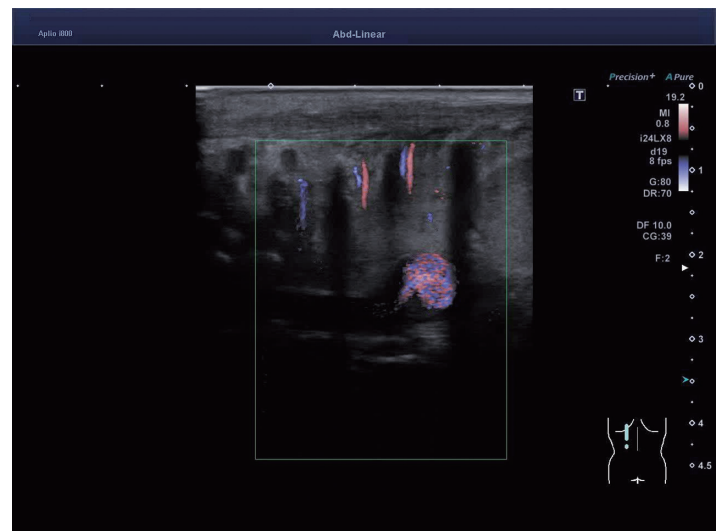
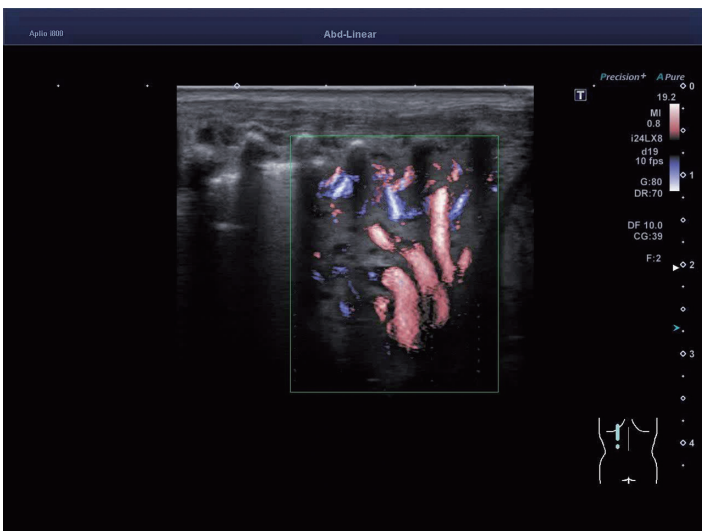
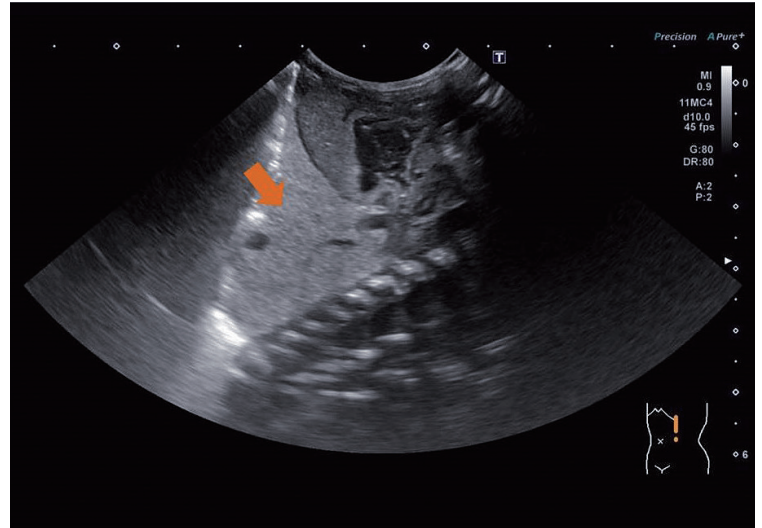
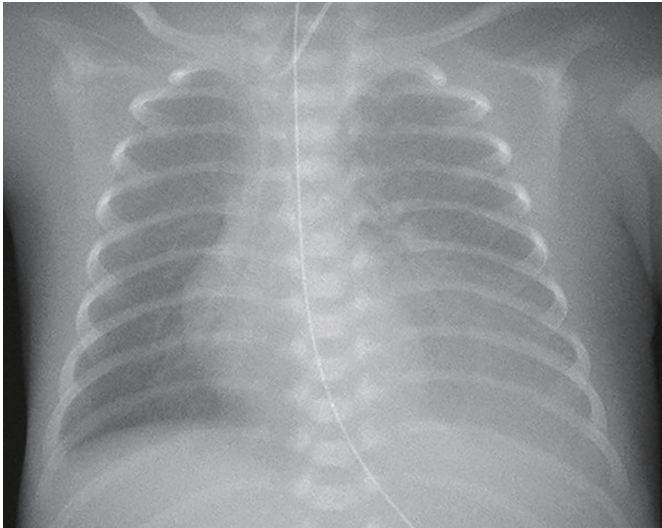
Abdominal

[Grand Prize Award]

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An extremely preterm infant diagnosed with pulmonary sequestration via noninvasive ultrasonography

Ibaraki Children's Hospital, Ibaraki
Yusuke Hoshino

System used: Aplio i800

Reason for examination: An extremely preterm infant was born at 24 weeks and 6 days with a birth weight of 632 g. An X-ray examination revealed an area in the left lower lung at which the radiolucency was decreased, raising suspicions of a space-occupying lesion. Ultrasonography was performed for the purpose of detailed examination.

Image findings: A low intensity lesion was identified in an area surrounded by the lung, diaphragm, and spinal column. The interior of the lesion was richly vascularized. The blood vessels were confirmed to be arterial based on blood flow signals. A main artery, when traced toward proximal, was found to bifurcate from the descending aorta. Based on the finding that the blood supply vessel bifurcated from the descending aorta, a diagnosis of pulmonary sequestration was established.

Clinical comments: Although diagnosis of pulmonary se-

questration is generally made by contrast-enhanced CT, extremely preterm infants are vulnerable to various risks. These include transfer to the examination room, hypothermia attributable to the environment, exposure, and renal damage caused by contrast media. Ultrasonography, which can be performed noninvasively at the bedside, was well indicated for the patient. Furthermore, since the lesion was considered to be located on the dorsal side, scanning of the patient's back could be performed with the patient lying in the lateral position. An important advantage of ultrasonography is that it also allows observations of lesions from different directions.

Technical comments: Physiologically, newborns have a low tidal volume and high respiration rate. In color Doppler imaging, it was difficult to identify blood flow signals due to respiratory motion artifacts. To confirm signals from arteries with high flow velocity, Advanced Dynamic Flow (ADF) mode that provides high resolution and reduces aliasing was used. This reduced motion artifacts and enabled visualization of arterial blood signals at appropriate frame rates.

Comments on images: (a) Chest X-ray images showed a suspected space-occupying lesion in the left lower lung. (b) Observations of the anterior axillary line revealed that the lesion was located in an area surrounded by the lung,

diaphragm, and spinal column.

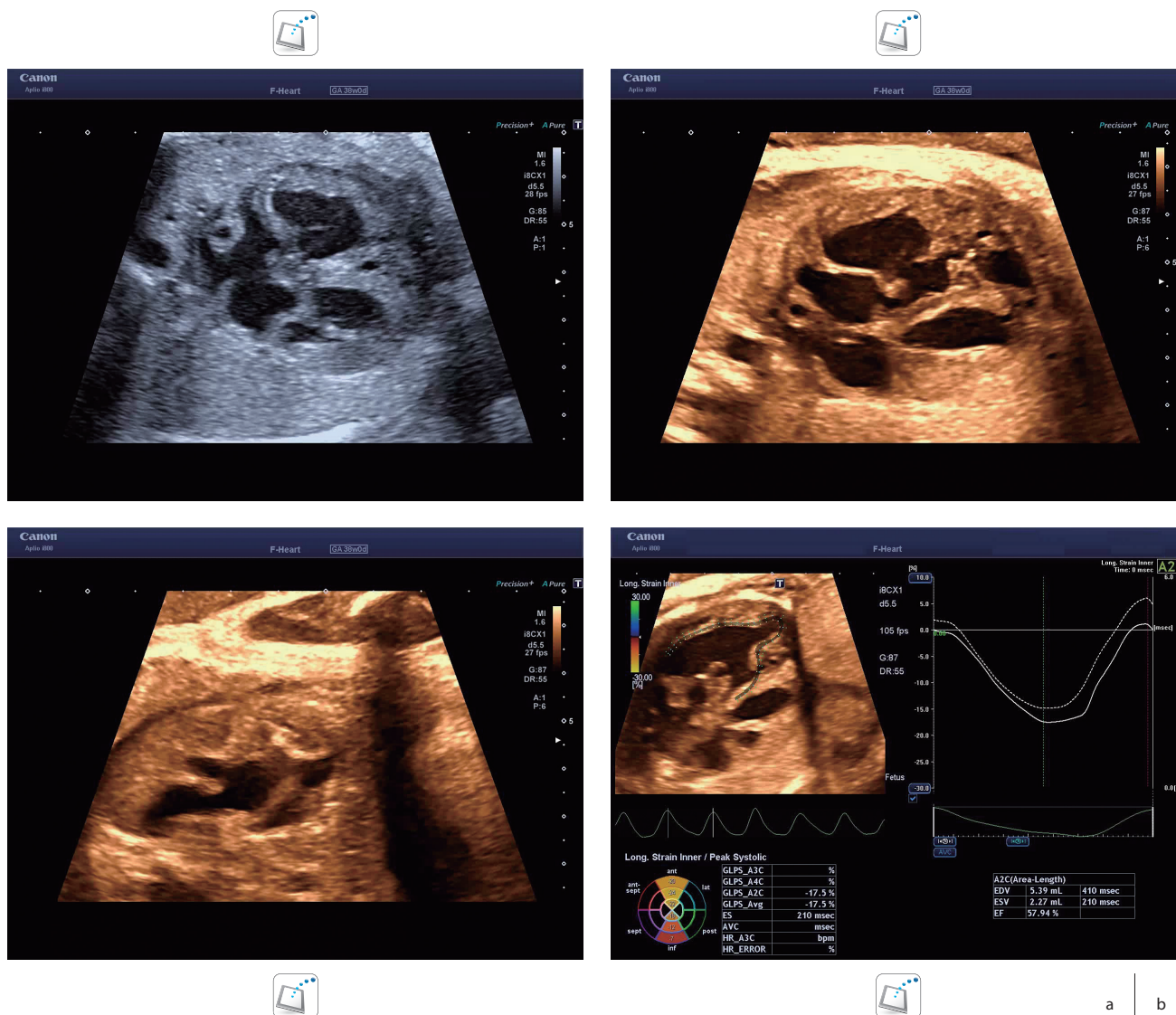
(c) Observations in ADF mode revealed extensive blood vessel growth in the lesion.

(d) Based on the finding that supply blood vessel bifurcated from the descending aorta, a diagnosis of pulmonary sequestration was established.

Sex	Age
Male	Infant and young child (0-6 years)



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a	b
c	d

Double outlet right ventricle (DORV) involving AV discordance

National Cerebral and Cardiovascular Center, Osaka

System used: Aplio i800

Reason for examination: The patient was referred to our center by a local doctor due to tricuspid valve closure, Ventricular Septal Defect (VSD), and transposition of the great artery. Initial examination confirmed that both great arteries originated from the left ventricle. Because this condition is extremely rare, we decided to carefully identify the ventricular level while keeping in mind atrioventricular discordance. Following identification of the ventricular level, particularly reduced contractile performance of the right ventricle was evaluated to establish a therapeutic strategy after birth.

Image findings: Based on the morphology of the ventricular cavity, moderator band, and the position of valve leaflets, the left side of the fetal heart was identified as the right ventricle. Since the pulmonary artery and great artery originated from the right ventricle located on the left side, a diagnosis of double outlet right ventricle was established. VSD could be confirmed but was restrictive. Mitral regurgitation occurred in a cleft of the mitral valve. The aorta was thin and mitral stenosis was observed. The func-

tion of the left ventricle in the right side was poor. Based on the results of 2D speckle tracking, a diagnosis of decreased contractile performance of the left ventricle was established.

Clinical comments: Identification of the atrioventricular level is one of several points to be confirmed via fetal echocardiography. Before diagnosing as an extremely rare pathological condition—i.e., Double outlet left ventricle (DOLV)—atrioventricular discordance was suspected, and a diagnosis of DORV could be established. Both structural diagnosis and evaluations of the contractile performance of both ventricles with speckle tracking made it possible to obtain valuable information for establishing a postnatal therapeutic strategy. For the newborn's heart structure, the contractile performance of the left ventricle decreased as diagnosed before birth. The prognosis indicated repairs of both ventricles were not feasible.

Technical comments: To better define the boundaries of the structures and thereby facilitate morphological evaluations of the heart, a gold-colored map was used with lower DR and higher precision settings. Images for tracking were obtained by adjusting depth and angle of view and using spot zoom to adapt the fetal rapid heart rate. Furthermore, it proved possible to evaluate ventricular contractile performance at a high frame rate of 105 fps by setting the parameter of Frame Rate to maximum.

Comments on images: (a) Four chamber cross-sectional image. The top and bottom on the screen indicate the left

and right sides of the fetal body, respectively. Atrial levels were normal. Coronary sinus could be observed in the left atrium, suggesting a persistent left superior vena cava. The atrial septum was wide, which is a finding suggestive of ostium primum defect.

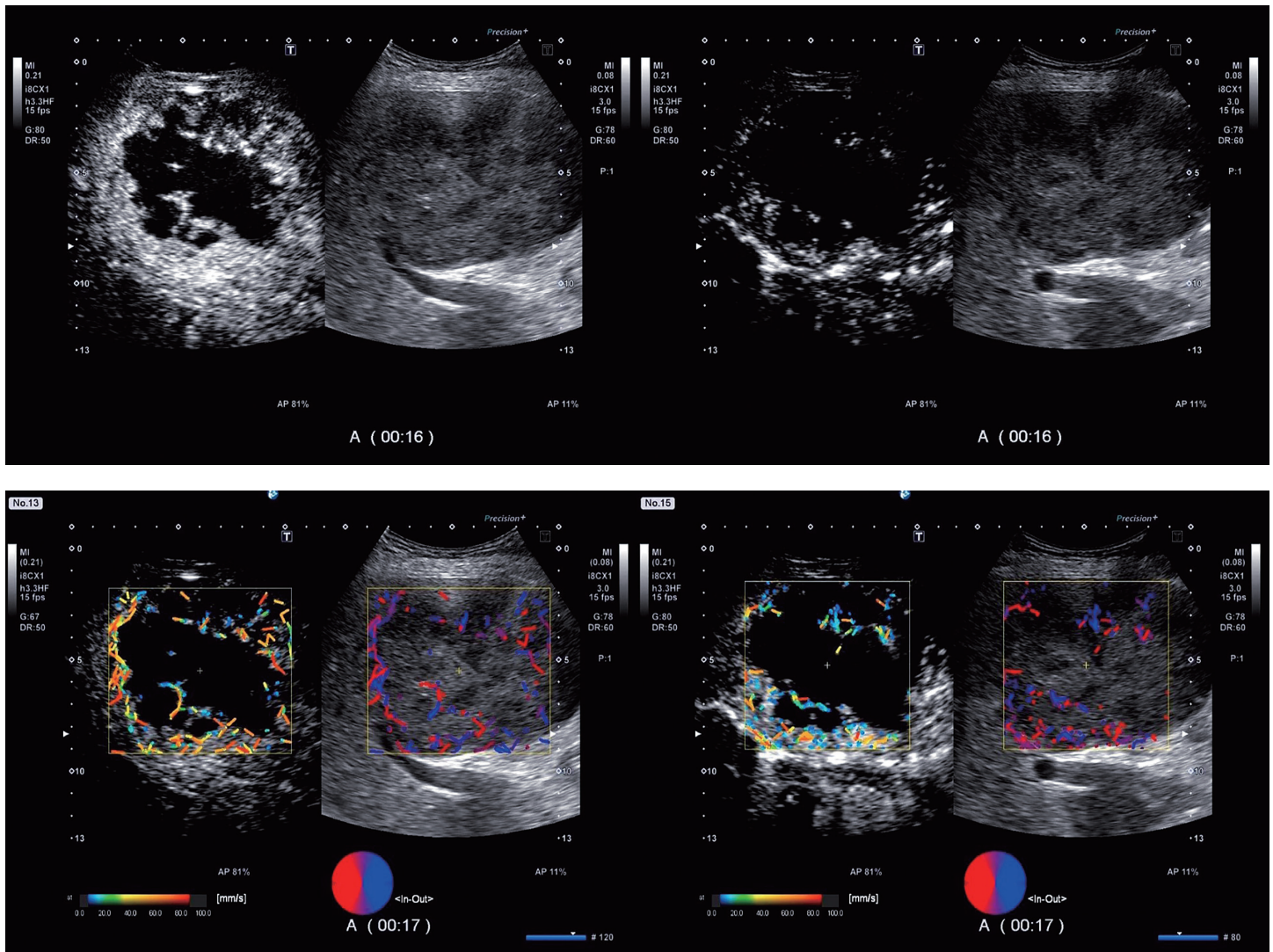
(b) The mode was changed to one facilitating morphological observation through enhancing the contours. The ventricular cavity in the left side of the fetus had a rough wall and moderator band could be identified. The atrioventricular valve was attached closer to the cardiac apex. The ventricle located on the left side was identified as the right ventricle.

(c) Pulmonary arterial (left) and aorta (right) originated from the right ventricle located on the left side, based on which a diagnosis of double outlet right ventricle was established. The aorta was thin. Both arteries were positioned on opposite sides, leading to a diagnosis of d-MGA.

(d) 2D speckle tracking of the right ventricle in the left side was performed. This showed favorable contractile performance. The global longitudinal strain (GLS) was 17.5%.

Sex	Age
Male	Fetus





a

b

Hepatocellular carcinoma

Iwate Medical University Hospital, Iwate
Miyuki Hosono

System used: Aplio i800

Reason for examination: An 81-year-old female patient was referred to our department for the treatment of unresectable advanced hepatocellular carcinoma. Systemic chemotherapy with lenvatinib mesylate, a molecular-targeted drug, was initiated. To evaluate tumor hemodynamics, contrast-enhanced ultrasonography (CEUS) was requested.

Image findings: CEUS was performed pre-treatment and at Day 7. Intratumoral blood flow analysis was performed with time-intensity curve, parametric imaging, and contrast vector imaging. The results showed changes in TTP (from 4.2 to 7.1 sec), slope (from 0.2 to 0.1 AU/s), and ve-

locity (from 19.5 to 11.1 mm/s). Response to treatment after 2 months on CT images was identified as PR according to the mRECIST criteria.

Clinical comments: Currently, several molecular-targeted drugs and immune checkpoint inhibitors are expected to enter clinical use. The role of imaging biomarkers that would potentially enable early prediction of therapeutic response is critical. CEUS and Aplio i800 detect declining numbers of intratumoral blood vessels and the attenuation of tumor stains at high sensitivity, allowing early prediction of response to molecular-targeted therapeutic agents.

Technical comments: Uniform imaging conditions were set for temporal observations: MI value: 0.21, CHI frequency: h3.3 HF, frame rate: 15 fps, 2D gain: 80, dynamic range: 50 dB, depth: 13 cm, and focus: approximately 8.3 cm. Sonazoid (0.0075 mL/kg) was bolus injected using an injection device for ultrasound called Sonazoid Shot 5.

Comments on images: (a) On CEUS (left: pre-treatment; right: Day 7), hepatocellular carcinoma was successfully visualized with clear contrast while selecting characteristic

tumor cross-sections allowing for multiple visualization, placing merkmal, and paying attention to the timing of contrast medium administration and breath holding.

(b) Tumor hemodynamics were evaluated by a time-intensity curve (left: pre-treatment; right: Day 7)

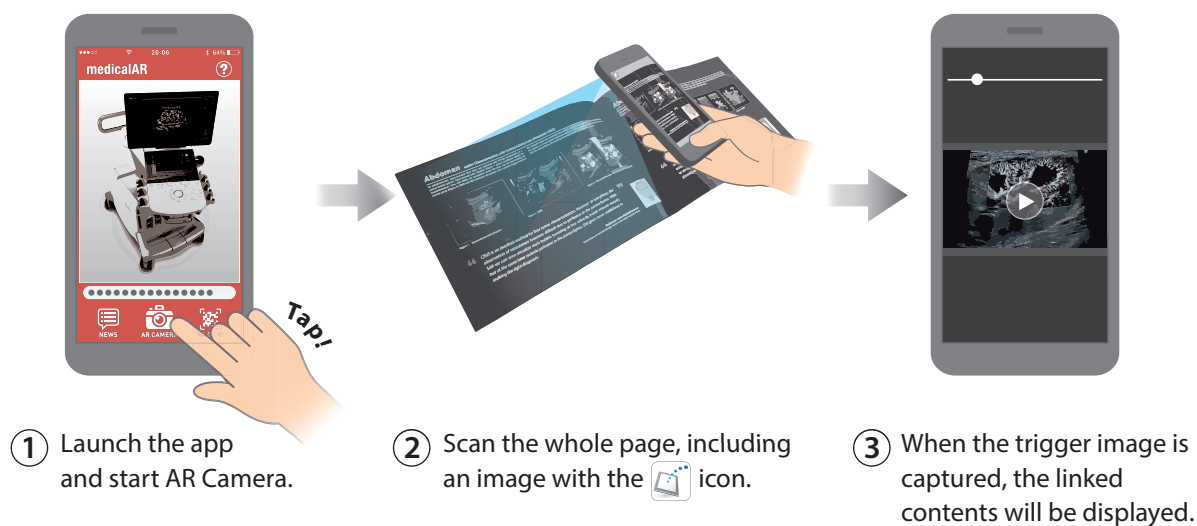
Sex	Age
Female	70+ years

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