

Advanced Dynamic Flow Expands

The Diagnostic Capabilities of Fetal Echocardiography



Elena Sinkovskaya, MD, PhD

Assistant Professor, Maternal-Fetal Medicine
Director, Research in Ultrasound
Eastern Virginia Medical School

Alfred Abuhamad, MD

Mason C. Andrews Professor and Chair of Obstetrics and Gynecology
Eastern Virginia Medical School

Toshiba's Advanced Dynamic Flow (ADF), available on the Aplio™ Platinum series ultrasound systems, offers high-resolution, color flow that enables physicians to identify particularly small blood vessels and complex blood flow. ADF offers superior spatial resolution at high frame rates to accurately depict flow with directional information even in tiny vessels. Conducting a fetal echocardiography examination using ADF enables a key clinical evaluation during the early stages of a pregnancy. This examination permits physicians to perform a comprehensive

evaluation of the baby's cardiovascular system in utero, achieving high-resolution imaging of the fetus' heart, arteries, veins as well as a study of blood flow. A thorough fetal echocardiographic exam can identify potential anomalies during the early stages of a pregnancy and help direct appropriate pregnancy management.

For the heart, we can obtain high-resolution snapshots of the key anatomical structures using ADF (Figures 1-11). For example, we can appreciate the four chambers and assess inlet blood

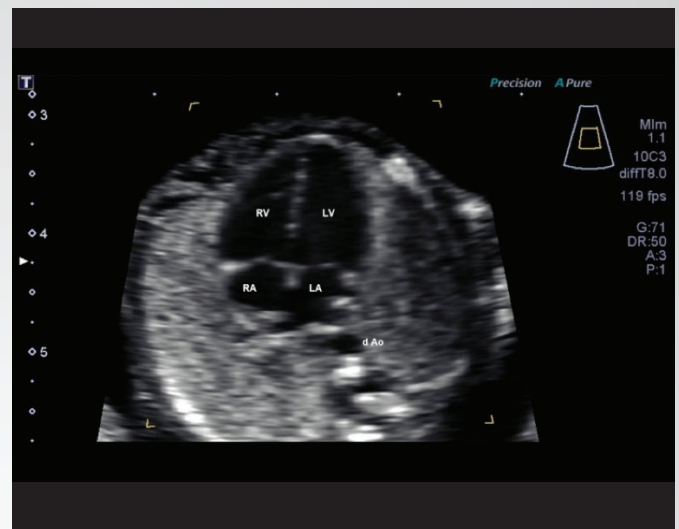
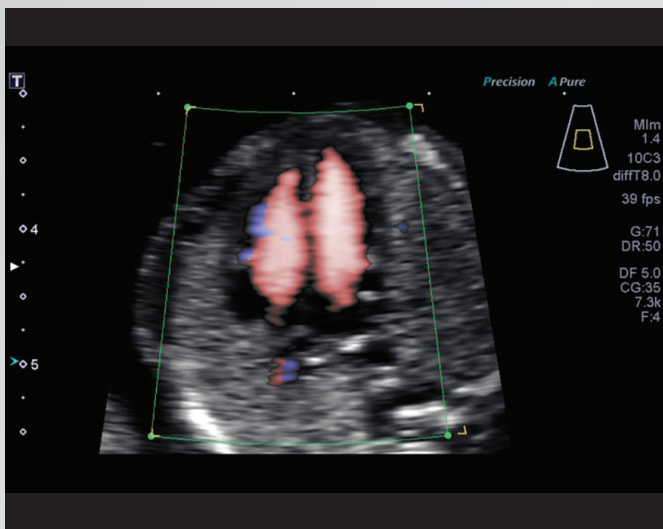


Figure 1: Transverse section of the fetal chest at the level of the four-chamber view obtained from a fetus at 16 weeks gestation showing normal inlet blood flow.

dAo – descending aorta, RV – right ventricle, LV – left ventricle, RA – right atrium, LA – left atrium

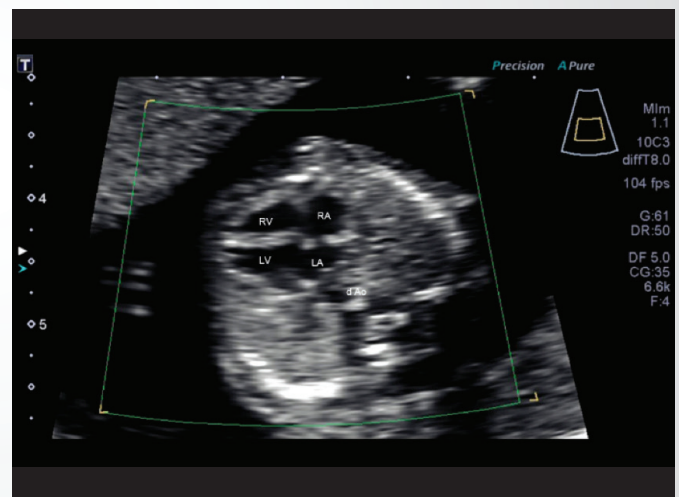
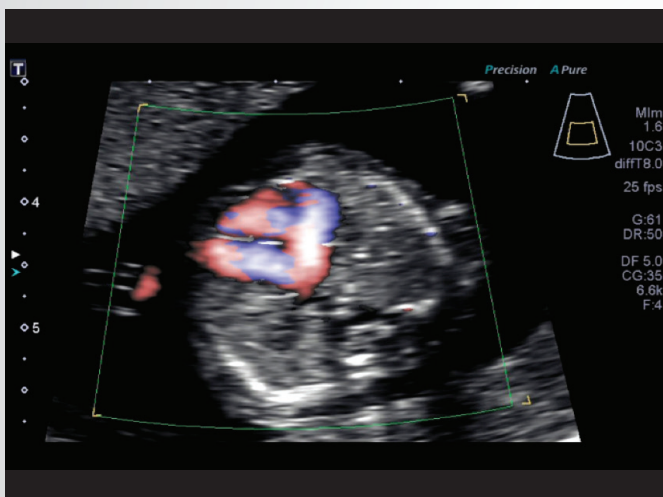


Figure 2: Transverse section of the fetal chest at the level of the four-chamber view obtained from a fetus at 13 weeks gestation showing normal inlet blood flow and intact interventricular septum.

RV – right ventricle, RA – right atrium, LV – left ventricle, LA – left atrium, dAo – descending aorta

flow, outflow tracts, and the interventricular septum. Blood flow within the great vessels (aorta, pulmonary artery, pulmonary vein, superior vena cava, inferior vena cava) is depicted in great detail. In addition, the appearance of the atrial appendages, which normally are not visible via traditional echocardiography is clearly visualized using ADF. ADF permits a view into the development of the heart, at a particularly early stage including during the first trimester, which offers clinical benefits for the early detection of fetal anomalies.

With the Aplio 500 Platinum, we can also visualize the comprehensive renal system anatomy and vascular function in a fetus, including the blood flow and branching details within the main renal artery and vein and other intra-renal vessels (Figure 12). Also, ADF can be used to image the fetal umbilicoportohepatic system with great spatial resolution and accuracy (Figure 13).

ADF is an important tool that enables physicians to perform a sophisticated fetal cardiovascular assessment of the fetal heart

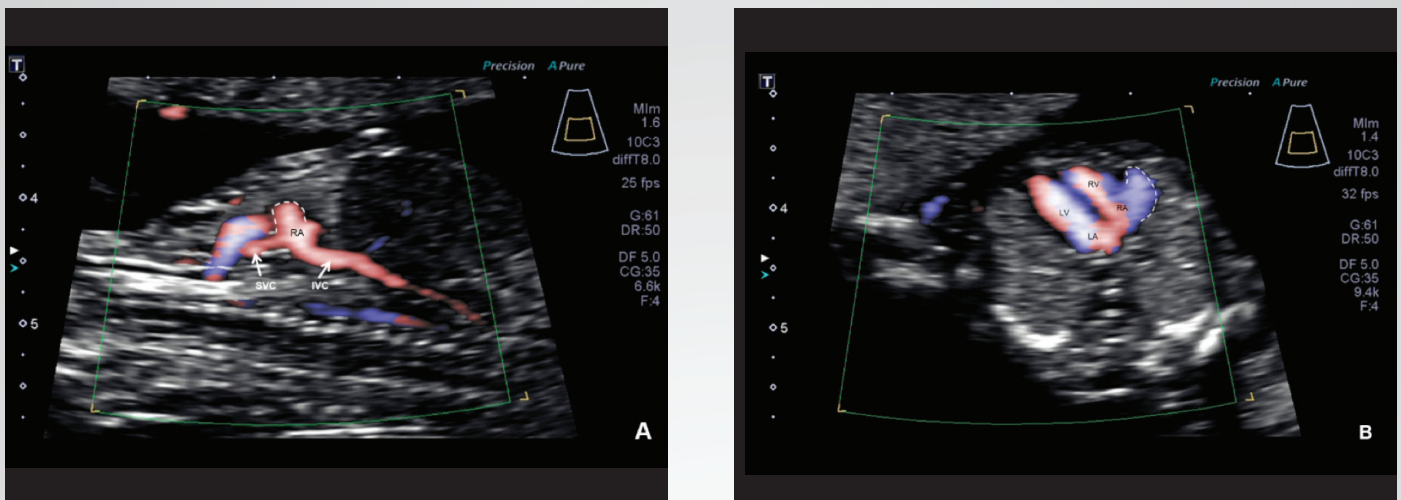


Figure 3: ADF highlights the appearance of the right atrial appendages. (A) Right parasagittal section of the fetal chest obtained from a fetus at 13 weeks gestation showing the drainage of the superior and inferior caval veins into the right atrium. (B) Transverse section of the fetal chest obtained from a fetus at 13 weeks gestation showing the four-chamber view.

RA – right atrium, SVC – superior vena cava, IVC – inferior vena cava, RV – right ventricle, LV – left ventricle, LA – left atrium

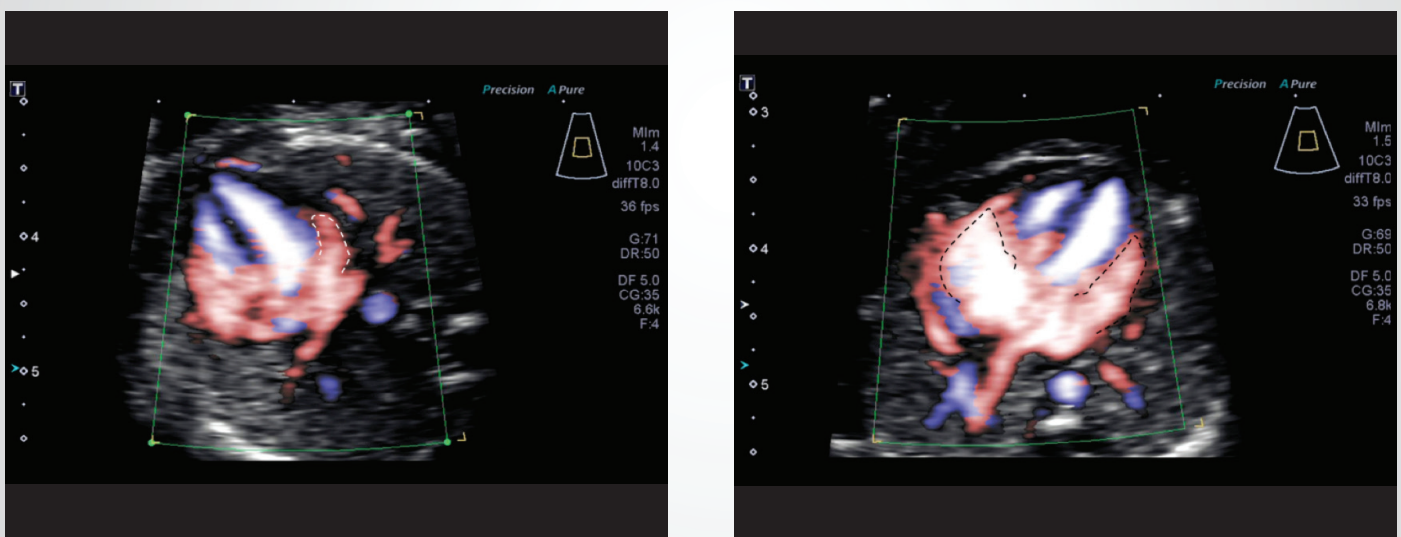


Figure 4: Transverse section of the fetal chest at the level of the four-chamber view obtained from a fetus at 16 weeks gestation showing the drainage of the pulmonary veins into left atrium. ADF highlights the appearance of atrial appendages.

at the earliest possible stage of pregnancy, as early as 12 weeks. Typically, such insights were not previously visible until week 20 of pregnancy. Patients benefit from receiving these early insights, potentially giving them assurances that their gestation is progressing normally. The benefits of ADF from the Aplio 500 Platinum ultrasound system are wide-ranging, providing

physicians and patients the ability to detect many potential health issues as early as possible. The clarity of the images provides a distinct improvement in visualization of the fetal anatomy. This ensures that physicians can evaluate more fully the development process of a fetus and provide better care and more accurate treatment options for patients.

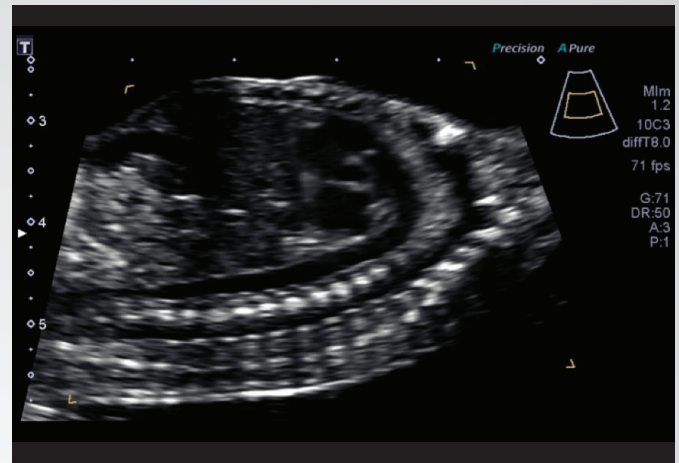
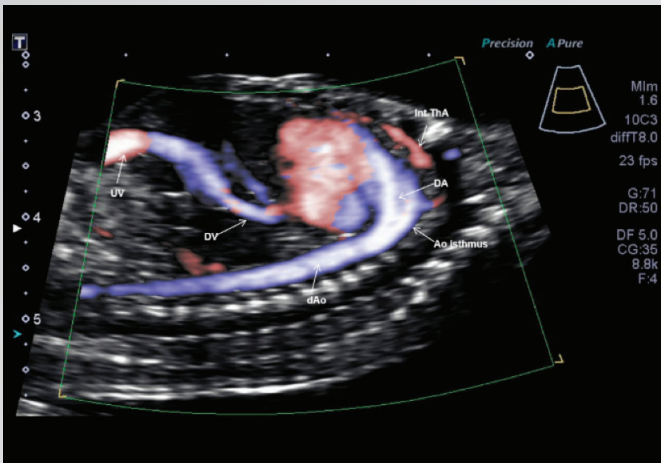


Figure 5: Sagittal section of the fetal chest obtained from a fetus at 16 weeks gestation showing the relation of the aortic and ductal arches (DA). dAo – descending aorta, UV – umbilical vein, DV- ductus venosus, Ao isthmus – aortic isthmus, Int. ThA – internal thoracic artery

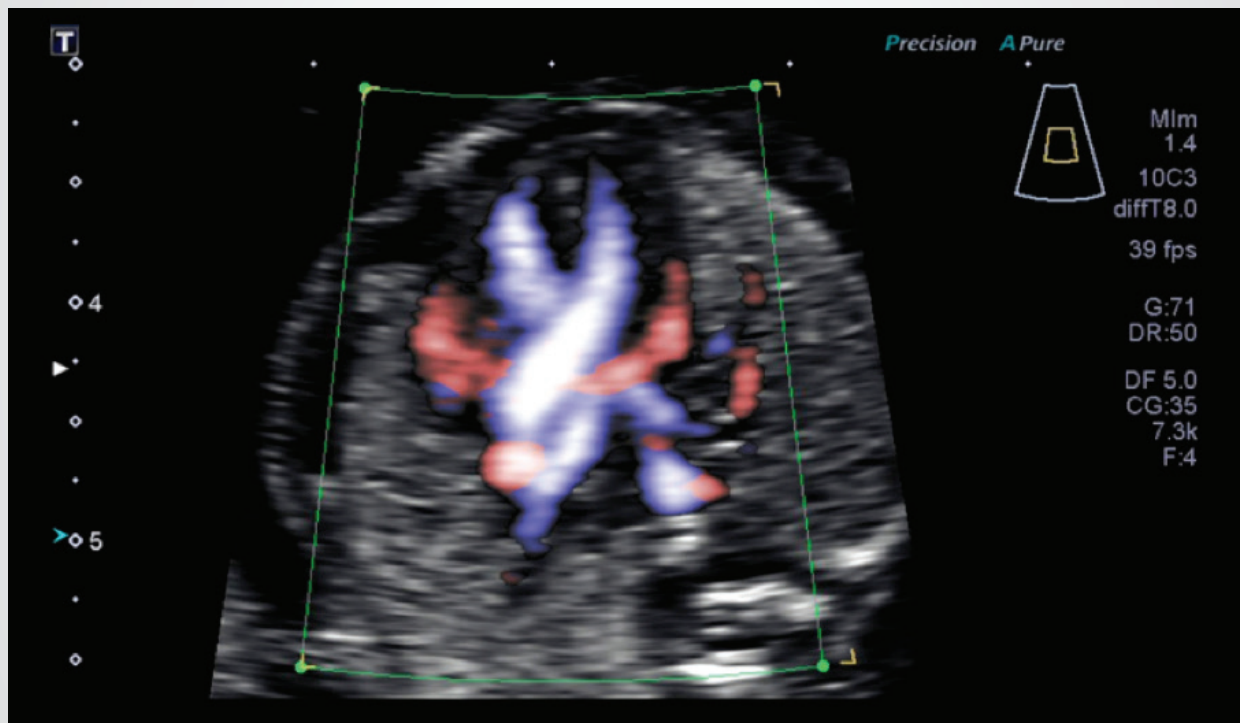


Figure 6: Transverse/oblique section of the fetal chest obtained from a fetus at 16 weeks gestation showing the relation of the great vessels and outflow tracts.

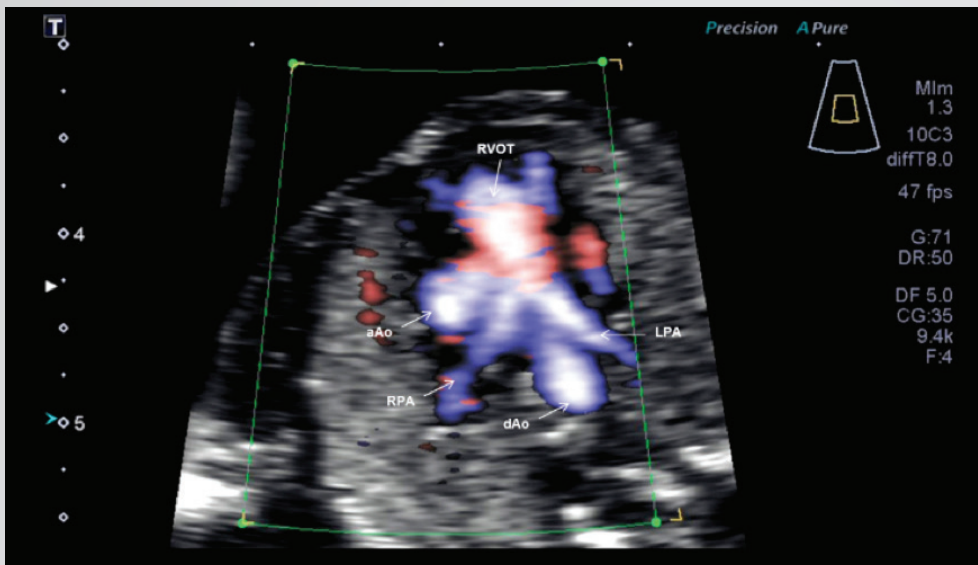


Figure 7: Transverse section of the fetal chest at the level of the three vessel view obtained from a fetus at 16 weeks gestation showing the right ventricular outflow tract (RVOT) and bifurcation of the pulmonary artery.

dAo – descending aorta, *aAo* – ascending aorta, *RPA* – right pulmonary artery, *LPA* – left pulmonary artery

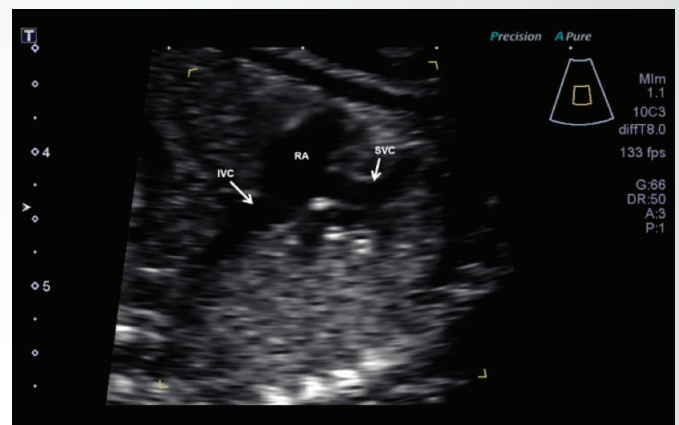


Figure 8: Right parasagittal section of the fetal chest obtained from a fetus at 16 weeks gestation showing the drainage of the superior vena cava (SVC) and inferior vena cava (IVC) into the right atrium (RA).

AzV – azygos vein

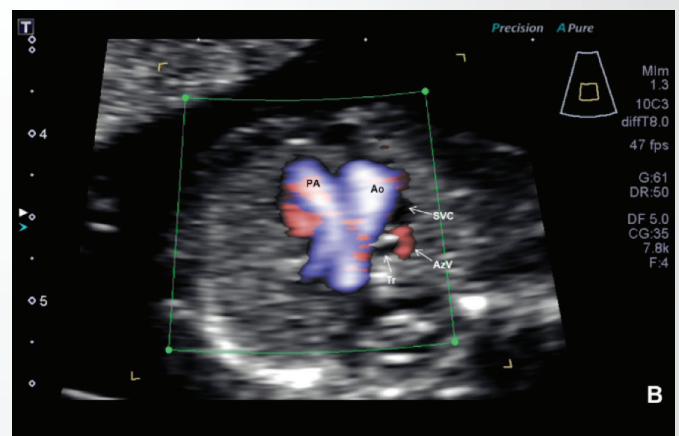


Figure 9: Transverse sections of the fetal chest at the level of the three vessel view (A) and three vessel trachea view (B) obtained from a fetus at 13 weeks gestation showing the relation of the great vessels.

PA – pulmonary artery, *aAo* – ascending aorta, *RPA* right pulmonary artery, *LPA* – left pulmonary artery, *Tr* – trachea, *dAo* – descending aorta, *AzV* – azygos vein

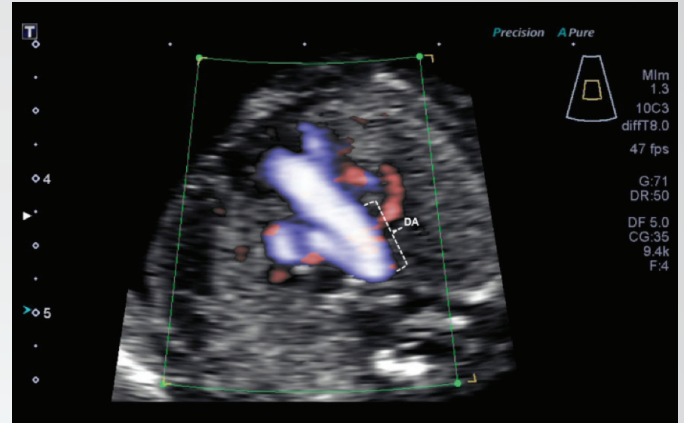
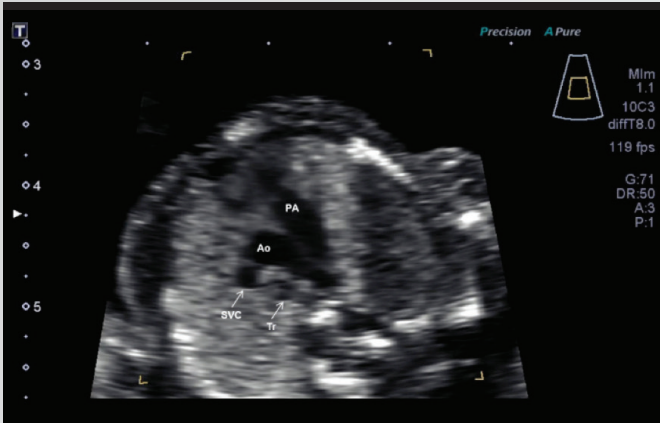


Figure 10: Transverse section of the fetal chest at the level of the three vessel trachea view obtained from a fetus at 16 weeks gestation showing the aortic and ductal arches.

PA – pulmonary artery, Ao – aorta, SVC – superior vena cava, Tr – trachea, DA – ductal arch

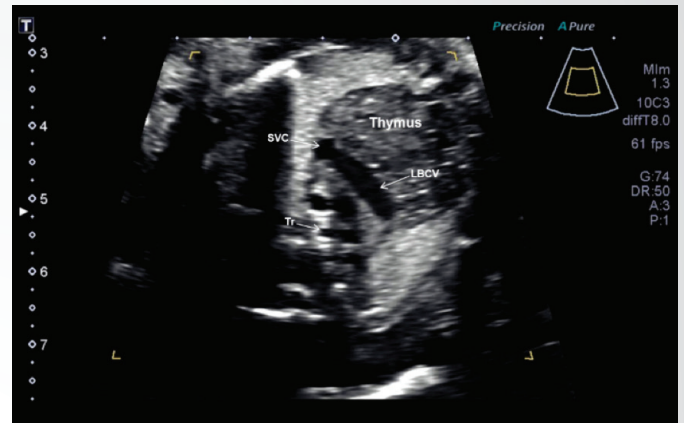


Figure 11: Transverse oblique view of the upper fetal chest at the level of drainage of the left brachiocephalic vein (LBCV) into superior vena cava (SVC) obtained from fetus at 26 weeks gestation.

Tr – trachea

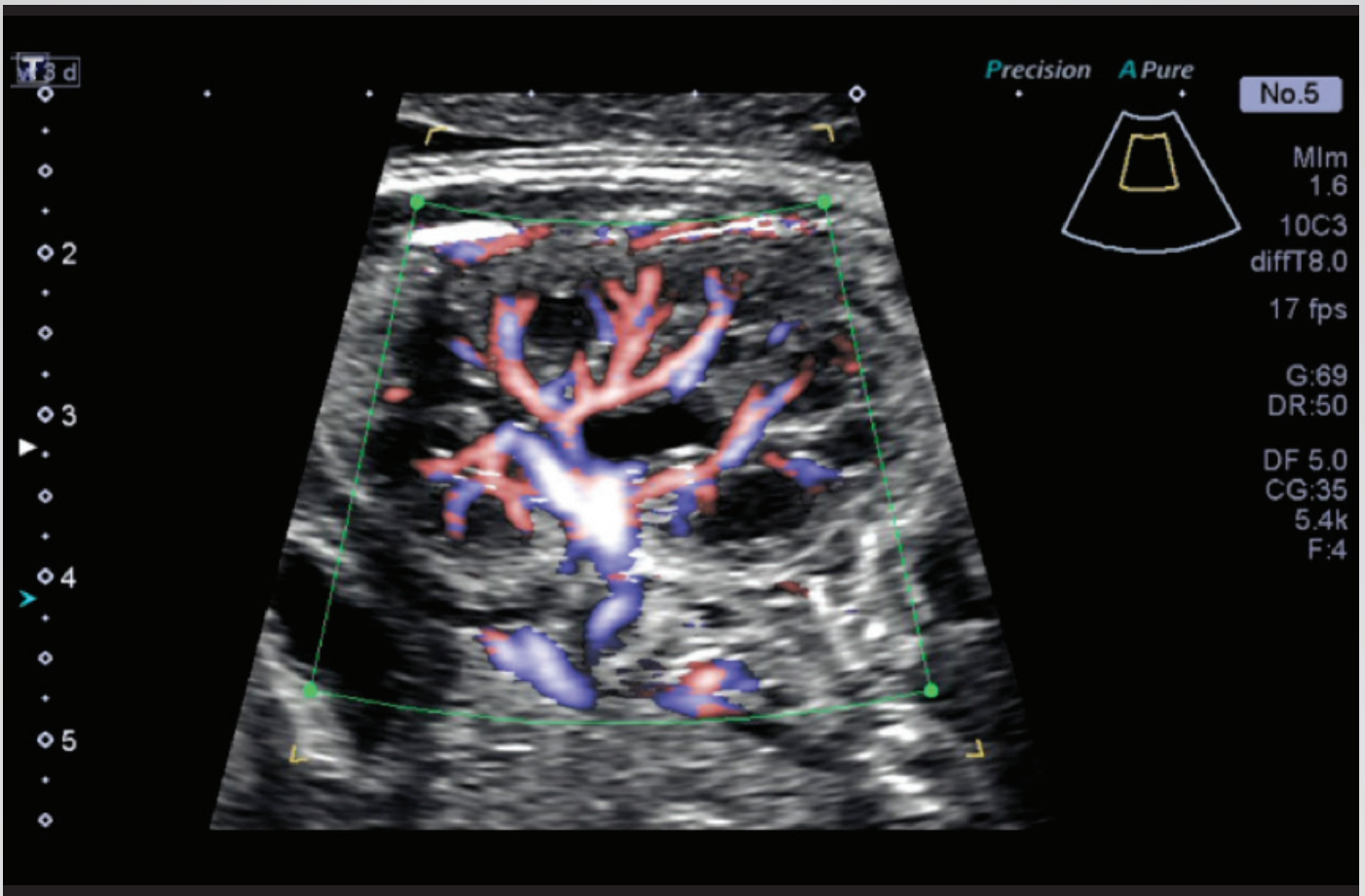


Figure 12: Assessment of the main renal artery, main renal vein, and intra-renal vessels on a fetus at 32 weeks gestation using ADF.

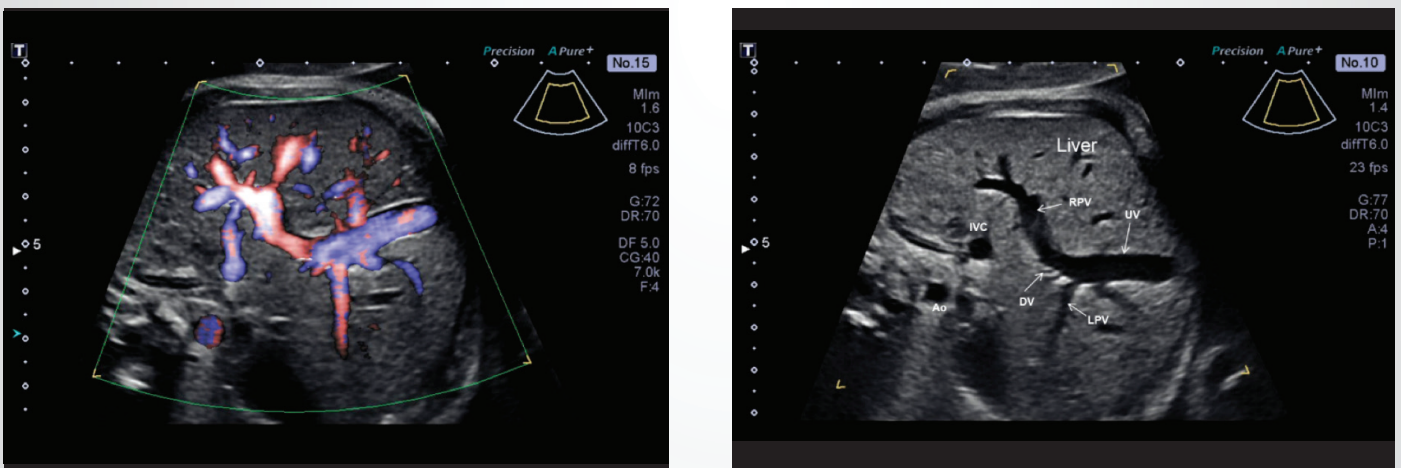


Figure 13: Transverse section of the fetal upper abdomen at the level of the portal sinus obtained from a fetus at 32 weeks gestation. Normal fetal umbilicoportohepatic system is imaged using ADF.

Ao – descending aorta, DV – ductus venosus, IVC – inferior vena cava, LPV – left portal vein, RPV – right portal vein, UV – umbilical vein

The clinical results described in this paper are the experience of the authors. Results may vary due to clinical setting, patient presentation and other factors. ADF provides detailed visualization of blood flow with high frame rates.

Toshiba gives you a voice. What's yours?



TOSHIBA AMERICA MEDICAL SYSTEMS, INC.

2441 Michelle Drive, Tustin CA 92780 / 800.421.1968 medical.toshiba.com

©Toshiba Medical Systems Corporation 2015. All rights reserved. Design and specifications are subject to change without notice.
Aplio is a trademark of Toshiba Medical Systems Corporation.

ULWP12442US
MCAUS0260EB