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How to record uterine artery Doppler in the first trimester

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BACKGROUND

Effective screening for pre-eclampsia can be achieved by measurement of the uterine artery pulsatility index (PI) at 11–13 weeks' gestation, used in combination with maternal history, blood pressure, serum pregnancy-associated plasma protein-A and placental growth factor[1]. For a false-positive rate of 5%, it has been estimated that the new combined method of screening can predict 90% of cases of pre-eclampsia requiring delivery before 34 weeks and 45% of cases of late-onset pre-eclampsia[2,3]. Early-onset, rather than late-onset, pre-eclampsia is associated with an increased risk of perinatal morbidity and mortality, and both short-term and long-term maternal complications. Early identification of women at risk of developing pre-eclampsia and growth restriction is likely to facilitate targeted antenatal surveillance and possibly intervention. It would also potentially avoid the development of serious complications, through interventions such as administration of low-dose aspirin and antihypertensive medication, and early delivery[4].

For uterine artery PI measurement, the gestational age must be between $11 + 0$ and $13 + 6$ weeks. Transabdominal ultrasound should be used to obtain a midsagittal section of the uterus and cervical canal. The internal cervical os should be identified and the transducer tilted gently from side to side in each paracervical region, using color flow mapping, to identify the uterine arteries as aliasing vessels coursing along the side of the cervix and uterus (Figure 1). Pulsed wave Doppler should be used to obtain flow velocity waveforms from the ascending branch of the uterine artery at the point closest to the internal os. When three similar consecutive waveforms are obtained, the PI should be measured and the mean PI of the left and right arteries calculated[5] (Figure 2).
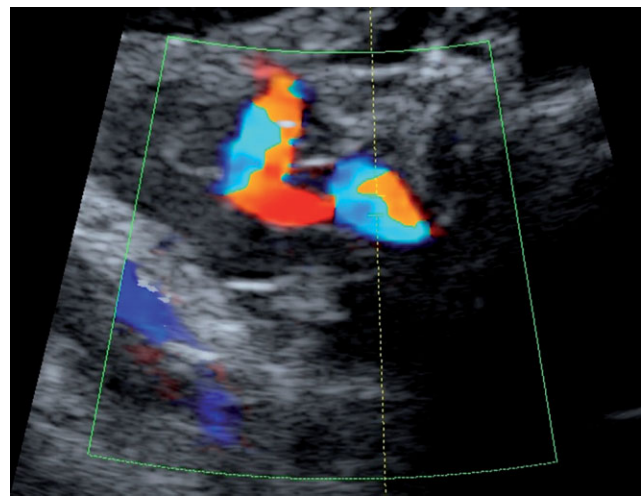

Figure 1 Parasagittal section of the uterus and cervix. Color flow mapping is used to identify the uterine arteries as aliasing vessels coursing along the side of the cervix and uterus.

PRACTICAL POINTS

1. Obtain a sagittal section of the uterus and cervical canal. Zoom to the area of interest.
2. Identify the internal cervical os. Gently tilt the transducer from side to side using color flow mapping to identify the uterine arteries. When you apply color Doppler, narrow the color box and adjust the velocity scale and the filter.
3. Apply pulsed wave Doppler with the sampling gate set at 2 mm to cover the whole vessel. Ensure that the angle of insonation is $< 30°$.
4. Record at least three consecutive uniform waveforms.

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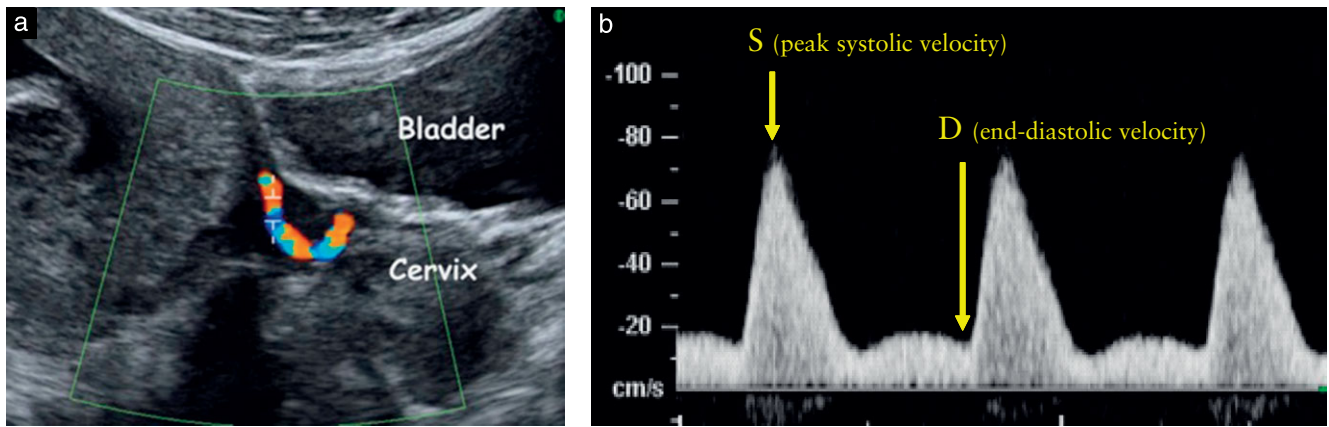
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Figure 2 (a) The ascending branch of the uterine artery at its paracervical portion and at the point closest to the internal os is identified and pulsed wave Doppler is used to obtain flow velocity waveforms. (b) When three similar consecutive waveforms are obtained, the pulsatility index (PI) should be measured and the mean PI of the left and right arteries calculated. The PI is calculated as the difference between the peak systolic velocity (S) and the end-diastolic velocity (D), divided by the mean velocity (Vm): PI = (S−D)/Vm.

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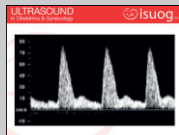
Slides summarizing practical points, with accompanying illustrations and videoclips, are provided as supporting information online.