

Diagnostic Imaging Pathways - Common Procedures

Ultrasound

A pulse of ultrasound is transmitted into the body via a small probe (transducer). Depending on the tissue characteristics and the interfaces present, the beam will be partially reflected, absorbed or transmitted. An image is generated based on the reflected ultrasound beam. Doppler ultrasound depends on the alteration of the frequency of the ultrasound beam when reflected by moving blood cells. The blood flow direction and velocity can be calculated and can provide an assessment of the severity of vessel stenosis. Colour doppler also depends on frequency changes induced by blood cell movement; information is colour coded for frequency and direction, allowing a more graphic and immediate assessment. Colour flow imaging is based on echo signal amplitude, rather than frequency (i.e. velocity of blood flow). This provides higher sensitivity to the presence of blood flow.

Advantages of Ultrasound

Ultrasound is non-invasive, relatively inexpensive, widely available, does not employ ionising radiation, and provides anatomical information in almost any plane. It has widespread application (see below).

Disadvantages of Ultrasound

In the obese patient ultrasound penetration may be limited so that deep structures may not be well seen. There is a trade-off in ultrasound between using the highest frequency probe possible to achieve high resolution and a lower frequency to achieve beam penetration. The ultrasound beam is also arrested by gas in the abdomen and is unable to penetrate bone. Ultrasound is much more operator-dependent than other imaging modalities.

Indications

For specific indications, please refer to the imaging pathways. Use of ultrasound is widespread for imaging the abdomen, pelvis, small parts (scrotum, thyroid, etc), breast, musculoskeletal applications, and transthoracic echocardiography. It is the main modality used in obstetric scanning. Endoluminal ultrasound applications include transrectal prostate ultrasound, transvaginal ultrasound, endoscopic ultrasound, and transoesophageal echocardiography. Doppler techniques are used to image vascular structures (arteries and veins) to assess flow characteristics and to detect thromboses and stenoses.

Ultrasound is extremely useful as a real-time guiding procedure for fine needle aspiration biopsy or core biopsy and drainage of fluid collections.

Newer ultrasound techniques include [contrast-enhanced ultrasound](#) and elastography.

Preparation for ultrasound

Abdomen: The patient is normally fasted prior to the examination to allow adequate examination of the gallbladder, biliary tract, pancreas and other retroperitoneal structures. The patient should be discouraged from emptying the bladder to facilitate pelvic examination.

Pelvis: A full bladder is necessary, since this acts as an acoustic window for the pelvic organs. In females a transvaginal ultrasound may be an alternative to examine the uterus and adnexa.



Information for Consumers

For information published at this website, please access the following: [Ultrasound](#)

For information published by the Royal Australian and New Zealand College of Radiologists, please access InsideRadiology at: www.insideradiology.com.au

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