

Innovative technology promises an exciting future for Women's Imaging

State-of-the-art 3D ultrasound machines have been installed to a number of Queensland X-Ray practices. The advent of 3D volume imaging heralds an exciting decade ahead. Queensland X-Ray's Women's Imaging service will be significantly enhanced by this revolutionary form of imaging which enables a new level of diagnostic accuracy.

3D/4D Obstetric Ultrasound Imaging

3D ultrasound imaging allows the operator to obtain volumes simultaneously in three planes. It also enables post-processing and manipulation to be performed following completion of the study. Being able to image in three planes brings ultrasound into capabilities previously limited to MRI. In contrast to MRI, however, it is readily available and allows dynamic assessment. Although at this stage, it is frequently considered "pretty pictures", it heralds an exciting future in ultrasound imaging.



Figure 1 - Facial profile at 38 weeks gestation with photograph of same baby following delivery.

4D imaging refers to simultaneous visualisation of the surface rendered image acquired while scanning the object. This is most commonly presented in obstetric imaging and popularised on television. It is obtained through continuous high volume acquisition and parallel calculation of 3D rendered images. In addition to providing excellent anatomical detail, it allows parents to appreciate the development of their child in the form of easier to interpret images. It is a particularly strong bonding experience and

enables the various stages of pregnancy to be truly appreciated. We do not however believe this should be viewed as a chance to obtain a "picture" and examinations will only be performed for appropriate and legitimate medical indications.



Figure 2 - Second trimester 3D ultrasound scan.



Figure 3 below -
(a) Early intrauterine pregnancy of 10 weeks gestation,
(b) 18 weeks gestation and
(c) 32 weeks gestation.

Role of 3D Imaging in Gynaecology and Saline Infused Sonohysterography

Although highly publicised in obstetric imaging, it is probably in gynaecology that the application of 3D imaging has become more widespread and offers significant benefit to diagnosis.

Applications include:

1. **Uterine Anomalies** - being able to see the views in a coronal plane was previously only possible on MRI. This allows anomalies such as subseptate/septate uterus to be clearly identified. This is particularly relevant in patients with recurrent First Trimester miscarriage.
2. **Uterine Myomas** - precise location with respect to endometrial cavity - determine surgical approach (hysteroscopic v abdominal myomectomy). Distinguishing pedunculated fibroid.

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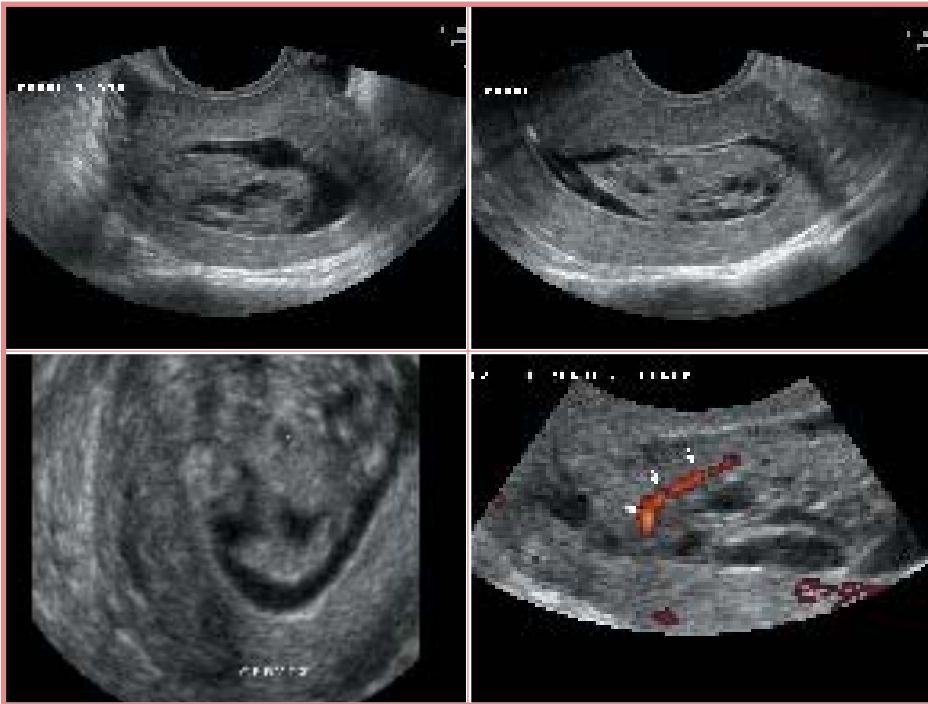


Figure 5 - Uterine anomalies can be difficult to diagnose on 2D ultrasound, however are well differentiated on 3D ultrasound. A subseptate uterus can be difficult to distinguish from the anatomical variant of arcuate uterus and a fully septated uterus should be distinguished from a bicornuate uterus, as each has different management options. The patient above presented with a history of recurrent miscarriage. The coronal ultrasound demonstrates a normal convex uterine fundus with a septum extending from the fundus to the cervix. This is the most common anomaly associated with recurrent miscarriage and can be treated hysteroscopically with resection of the septum.

Figure 4 - 3D saline infused sonohysterography showing a large endometrial cavity mass lesion. The localisation of this lesion in the axial, sagittal and coronal plane gives the gynaecologist precise information prior to hysteroscopic resection and the position and size of the vascular pedicle.

3. **Endometrial Cavity** - exact position of polyp, 3D road map for gynaecologist prior to hysteroscopic resection, IUD position.
4. **Adnexa** - ovarian volume, follicular volume measurement - assess optimal oocyte recovery, fertilisation and cleavage and cycle monitoring, ovarian stromal perfusion. Distinguishing ovarian mass from pedunculated fibroid and paraovarian lesions.
5. **Pelvic Floor** - offers the possibility of examining the urethra and pelvic floor muscles in planes not previously possible.
6. **3D Saline Infused Sonohysterography** - improved visualisation of polyps, the position and size of the vascular pedicle, presence of submucosal fibroids or endometrial adhesions, improved global perspective of uterine anatomy and cavity distortion and unsuspected uterine malformations.

Saline infused sonohysterography involves the introduction of a small amount of saline into the uterine cavity which is excellent for discrimination of endometrial polyps and their position and size, and in discriminating from submucosal fibroids or other causes of dysfunctional uterine bleeding.

3D Ultrasound Imaging is available at the following Queensland X-Ray practices:

Mater Women's Diagnostic Centre (Brisbane)

Ph: 3840 6208 Fax: 3844 4277

Sunnybank Women's Diagnostic Centre (Brisbane)

Ph: 3345 2033 Fax: 3345 2635

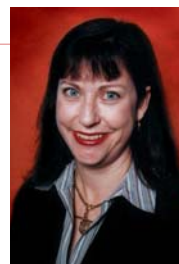
Mater Private Hospital (Townsville)

Ph: 4759 2800 Fax: 4779 7402

Cairns Private Hospital (Cairns Diagnostic Imaging)

Ph: 4046 7800 Fax: 4076 7820

For further information please contact Queensland X-Ray on (07) 3343 9466, or visit our website at www.qldxray.com.au.



Dr Kerry McMahon

Graduated from the University of Queensland in 1989 with M.B.B.S., commenced radiology training in 1994 at the Royal Brisbane Hospital. She obtained FRANZCR in 1997. Post-graduate overseas experience included a Senior Registrar Post at the Royal Infirmary Edinburgh, predominantly in Women's Imaging and obtained a visiting fellowship at 'Sally Jobe Breast Centre', Denver Colorado, USA. After returning to Australia she commenced private practice with Queensland X-Ray in 1999. She is a visiting consultant to Breast Screen.

Special interests include breast imaging (and MRI), obstetric and gynaecology imaging and bone mineral densitometry.