Paediatric Hips

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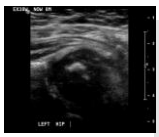
Indications for ultrasound

- **Selective screening** of babies born with risk factors or clinical abnormality
- Scan at 6-8 weeks (use corrected age if preterm)
- As long as hip is clinically stable
- Monitoring
- US every 6 weeks

Contra-indications



- Femoral head ossification (4-8 months)
- Late presentations
- Difficult to examine

- Performing prior to 6 weeks
- Decreased accuracy due to immaturity of the hip
- As long as the hip is stable clinically it is safe to wait till 6 weeks*

*Bracken J, Tran T, Ditchfield M. Developmental dysplasia of the hip: Controversies and current concepts. Journal of Paediatrics and Child Health. 48(2012)

Equipment

- Transducer
  - 9MHz
  - 12 MHz
- Measurement software
- Positioning
  - Supine
  - **Lateral decubitus**

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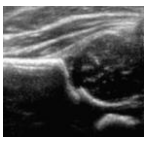
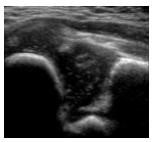
Imaging 2 images

Coronal



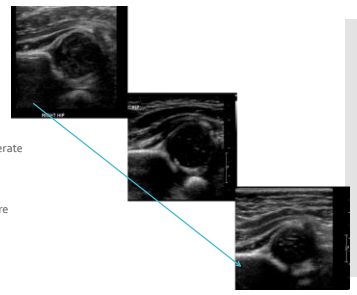
Transverse



a. ACR–AIUM–SPR–SRU Practice parameter for the performance of the ultrasound examination for detection and assessment of developmental dysplasia of the hip. 2014
2. Bracken and Ditchfield. Ultrasonography in developmental dysplasia of the hip: what have we learned? Ped Radiol 2012;42:1048-31

Terminology : Ultrasound

- Mild
- Moderate
- Severe



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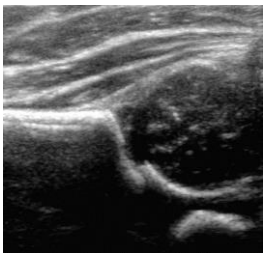
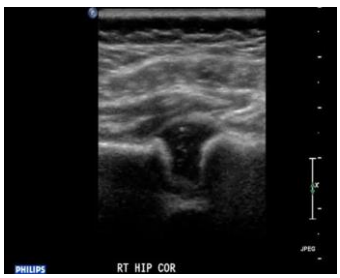
Positioning

Coronal

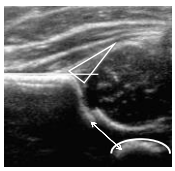


Coronal plane



Coronal plane landmarks

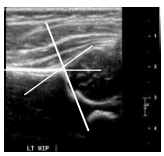
- Ilium
- Labrum
- Femoral head
- Tri-radiate cartilage
- Ischium
- Greater trochanter
- Leg flexed
- Acetabular roof



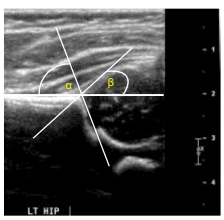
Modified Graf angles

- Baseline
- Roof line
- Inclination line
- (or cartilaginous roof line)

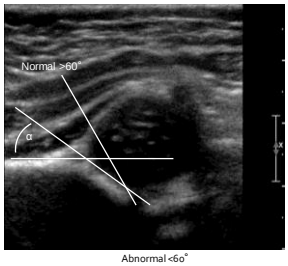
- Normal hip
- α > 60°
- β < 55°



Modified Graf



Normal



Abnormal <60°

α angle

- Normal (>60°) → Graf I
- Mild (50-60°) → IIa, IIb
- Moderate/Severe (<50°) → IIc, D, III, IV
- Normal β angle (<55°)

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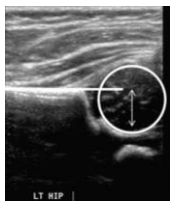
Graf classification

Graf type	Bony roof α angle	Bony rim	Cartilage roof β angle	Age
I Mature hip	> 60°	Angular/slightly rounded	Covers femoral head Ia β<55° Ib β >55°	Any age
IIa Physiologically immature	Adequate α = 50-59°	Rounded	Covers femoral head	0-12 weeks
IIb Delayed ossification	Deficient α = 50-59°	Rounded	Covers femoral head	>12 weeks
IIc	Severely deficient	Rounded to flattened	Covers femoral head	Any age
III Eccentric hip	Poor α <43°	Flattened	Pressed upwards	Any age
IV Eccentric hip	Poor α < 43°	Flattened	Pressed downwards	Any age

% Coverage

- Coronal image
  - Baseline
  - Femoral head
- Normal
  - %coverage
    - >50% (Terjesen[1])
    - >58% (Morin/Harke[2])



1. Terjesen T, Bredland T, Berg V. Ultrasound fro Hip Assessment in the Newborn The Journal of Bone and Joint Surgery 71 B: 767-773 1989
2. Morin C, Harcke H, MacEwen G The infant hip: real time ultrasound assessment of acetabular development. Radiology 157:673-677 1985

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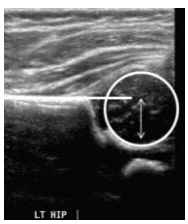
% Coverage

- Normal (>58%)
- Mild (50 – 58%)
- Moderate (35 – 50%)
- Severe (<35%)



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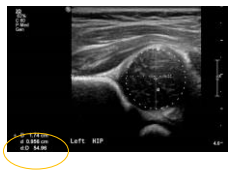
Mild DDH

- Normal (>58%)
- Mild (50 – 58%)
- Moderate (35 - 50%)
- Severe (<35%)



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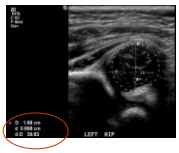
Moderate DDH

- Normal (>58%)
- Mild (50 – 58%)
- Moderate (35 - 50%)
- Severe (<35%)



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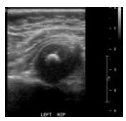
Severe DDH

Normal (>58%)

Mild (50 – 58%)

Moderate (35 - 50%)

Severe (<35%)



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Transverse plane

- Femoral metaphysis
- Ischium
- Labrum
- Pulvinar
- U shape

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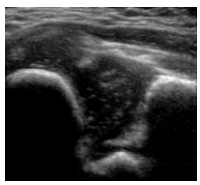
Dynamic assessment



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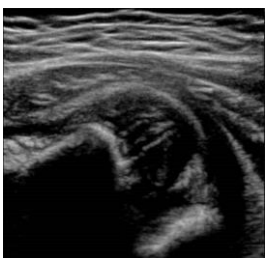
Transverse plane with stress

Subluxation with stress



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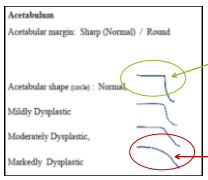
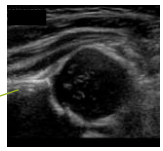
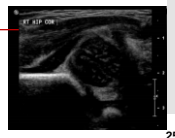
Morphology







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Pulvinar

- Fibro fatty tissue
- US - hyperechoic
- Increased thickness seen in dysplastic hips

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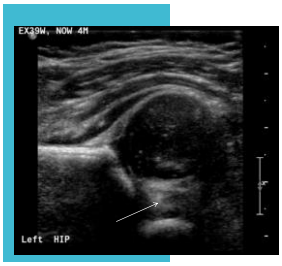

A Scan Protocol

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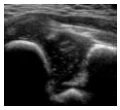
1. Coronal plane (3)
   1. No measurements
   2. α β angles
   3. % coverage

2. Transverse plane (2)
   1. At rest
   2. Barlow stress manoeuvre
      - Evaluation of pulvinar



Worksheet

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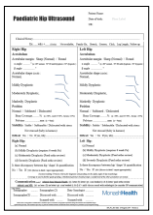
- Document examination
- Include
  - Graf angles
  - % coverage
  - Morphology
  - Dynamic assessment
  - Risk factors
  - Follow up



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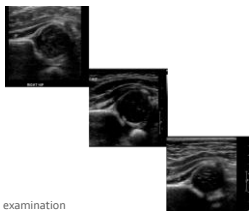
Overall classification

- Normal
- Mild dysplasia
- Moderate dysplasia
- Severe dysplasia



Make note of:
- Difficulty with the examination
- Discrepancy between classifications
- α – mild, morphology - moderate

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Recall

- 6 weeks review US
- **Mild** dysplasia- no treatment or specialist referral
- **Moderate- Severe** dysplasia
  - Orthopaedic clinic
  - Treatment
  - Review US every 6 weeks
  - X-ray after 7 months

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Thanks

- Images and clips
  - Monash Health sonographers
  - J Bracken, T Tran, M Ditchfield (Monash Health)
- Assistance
  - David Harding, Janet Hough (MH physiotherapists)
  - Cain Brockley, Allison Holley (ASA Paediatric SIG)

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