INITIAL RELIABILITY OF A NOVEL TECHNIQUE FOR ULTRASOUND DIAGNOSIS OF INFANT HIP DYSPLASIA: HISTOGRAM ANALYSIS OF ACETABULAR CURVE TRACINGS

Myles Mabee, Jacob Jaremko
Radiology and Diagnostic Imaging Imaging
University of Alberta
Disclosure Statement

- I do not have an affiliation, financial or otherwise, with a pharmaceutical company, medical device or communications organization.
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**Developmental Hip Dysplasia**

- Present from birth
- Involves the ball and socket joint of the Acetabulum and Femoral Head
- Socket is too shallow and the ball slips out
**Diagnosis Techniques**

- **Ultrasound**
  - Graf Method
  - Standard Plane showing necessary structures:
    - Horizontal iliac wing
    - Os Ischium
    - Femoral Head
    - Measure alpha angle

- **X-Ray**
  - Limited utility until after 6 months – bone is not ossified before then
Motivation

- 2D US has ‘fair’ reliability
- Up to 1/3 of cases are missed until later in childhood
- Overcalls (required repeat scans)
**Histogram Technique**

- Normally alpha angle is drawn using two straight lines (linear)
- Acetabulum curve is not linear and a lot of diagnostic information is contained in the amount of ‘rounding’
- No current way to quantify amount of rounding
**Histogram Technique**

- Draw a curve using polynomials which fits
- Report peak angle from histogram (alpha)
- Report relative standard deviation of all normal lines (level of curve rounding)

- Red Lines are Normal to Slopes
- Blue Line is curve representation
Histogram Technique

- Showed that our non-linear method has reliability approaching current 2D methods
  - 60 hips, two users
  - ICC 0.94 inter-observer, 0.95 intra-observer
  - Angles differed by -0.9 ± 5.7 degrees

- Potential to provide more information than current techniques
Future Work

- Apply histogram method to 3D data
  - Interpolate the curve across entire acetabulum
  - Create mesh to fit over acetabulum geometry and use for a new ‘3D alpha angle’
Questions?