Faculty Disclosure
I have no relevant financial relationships to disclose.

Learning Objectives
(1) Describe two key elements of the ACR-AIUM-SPR-SRU Practice Parameter for performing hip US
(2) Discuss the AAP Guidelines for when a Pediatrician should order hip US
CLASSIFICATION USING THE STANDARD FOUR POSSIBLE VIEWS

Coronal Plane

Transverse Plane
STANDARDS, GUIDELINES and PRACTICE PARAMETERS USED IN PERFORMING THE EXAMINATION

Accepted and Published by the American College of Radiology 1998

(Minimum two view exam proposed in 1993 combines the Harcke & Graf Methods)

Revised 2013 (Resolution 15)

A Committee of the ACR and AIUM published a new Joint Standard in 2009

(J Ultrasound Med 28:114-9, 2009)

ACR- AIUM-SPR-SRU Practice Parameter Revised 2013, Renamed 2015
Principles
- Rest & Stress
- Orthogonal Views
- Stability & Morphology

Methods
- Linear array
- Supine or lateral
- Measurement optional
2 VIEW EXAM COMPONENTS

(1) Coronal View
   With or without flexion
   Stress Optional
   Measurement Optional
2 VIEW EXAM COMPONENTS

(2) Transverse View
Hip flexed
Stress Required
COMPONENTS OF CLASSIFICATION (and REPORTING)

SONOGRAPHIC FINDINGS

• Position- Use All Views
  • Stability- Use Stress Views (C/F and T/F)
  • Morphology- Use Static Views (C/N and T/N)
POSITION AND STABILITY

- Seated at rest, stable
- Seated at rest, lax with stress
- Subluxated, not dislocatable
- Dislocatable
- Dislocated (reducible / not reducible)
MORPHOLOGY

• Bony acetabulum slope
• Bony acetabulum superior margin
• Labrum and echogenic tip
• Femoral head coverage
• Femoral head ossification
OPTIONAL MEASUREMENT

- Used by some institutions
- At times asked for by Orthopaedics
- Alpha / Beta angle (Graf)
- Coverage [d/D] (Morin and Harcke)
- Ultrasound machine software
## Sonographic Acetabular Morphology

<table>
<thead>
<tr>
<th>Hip Type</th>
<th>Alpha Angle (degrees)</th>
<th>Beta Angle (degrees)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1A</td>
<td>60 or more</td>
<td>55 or less</td>
</tr>
<tr>
<td>Type 1B</td>
<td>60 or more</td>
<td>55 – 77</td>
</tr>
<tr>
<td>Type 2</td>
<td>43 – 60</td>
<td>55 – 77</td>
</tr>
<tr>
<td>Types 3/4</td>
<td>43 or less</td>
<td>77 or more</td>
</tr>
</tbody>
</table>
The "d/D x 100" or percent coverage has been used to assess actabular development. (Morin and Harcke)

"The 50% Rule"

\[
d/D = \frac{34}{64} \times 100
\]

\[
d/D = 53\%
\]
d/D was developed as a sonographic estimate of the Acetabular Index

**Fig. 2.** — d/D ratio (mean values and range) as a function of the acetabular index (AI).
Be aware that $d/D$ has evolved into 2 variations

$d/D$ as a measure of acetabular depth

$d/D = 54\%$

$d/D = 44\%$

$d^*/D$ as a measure of femoral head coverage

$d^*/D = 27\%$
Correlation of femoral head coverage and Graf $\alpha$ angle in infants being screened for developmental dysplasia of the hip.


“We found that femoral head coverage is positively correlated with $\alpha$ angle, and we also found upper and lower threshold values of femoral head coverage (51% and 39%).....”
STANDARDS, GUIDELINES and PRACTICE PARAMETERS USED IN WHO SHOULD BE EXAMINED AND WHEN

Clinical Practice Guideline:
Early Detection of DDH
Pediatrics 2000; 105: 896-905

EVIDENCE-BASED CLINICAL PRACTICE GUIDELINE
Adopted by the American Academy of Orthopaedic Surgeons
September 5, 2014
IMPORTANT CONSIDERATION:

THE NATURAL HISTORY OF UNTREATED DDH

Barlow 1962: Instability resolved in some cases

Pratt 1982: Acetabular dysplasia resolved in some cases without treatment
Some dysplastic hips will get better without treatment.

We can’t tell these hips from those that will not.

“THE ISSUE”

NATURAL HISTORY

VS

EARLY TREATMENT SUCCESS
ULTRASOUND’S advantages led to its use in newborn screening. Studies were conducted in European countries with National Health Care delivery models.

Questions needed answering were:


The Major debate (still argued) concerns universal screening vs risk factor screening
In the United States the evidence based Practice Parameters specify Risk Factor Screening

**81,564 Newborns**


Lene Bjerke Laborie · Trond Jacob Markestad · Henrik Davidsen · Kari Røine Brurås · Stein Magnus Aukland · John Asle Bjørlykke · Hallvard Reigstad · Kari Indrekvam · Trude Gundersen Lehmann · Ingvild Øvstebø Engesæter · Lars Birger Engesæter · Karen Rosendahl

**Conclusion** The first 16 years of a standardised selective US screening programme for developmental dysplasia of the hip resulted in acceptable rates of early treatment and US follow-ups and low rates of late subluxated/dislocated hips compared to similar studies.
## Infant risk characteristics for finding a positive exam

<table>
<thead>
<tr>
<th>Category</th>
<th>Female (%)</th>
<th>Male (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>11.5 / 1000</td>
<td>4.1 / 1000</td>
</tr>
<tr>
<td>Females</td>
<td>19 / 1000</td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>4.1 / 1000</td>
<td></td>
</tr>
<tr>
<td>Pos Fam Hist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>32 / 1000</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6.4 / 1000</td>
<td></td>
</tr>
<tr>
<td>Breech</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>133 / 1000</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>29 / 1000</td>
<td></td>
</tr>
</tbody>
</table>
NOTE:

A positive clinical exam does not MANDATE an ultrasound.

Hip ultrasound in the first two weeks is discouraged because \[\text{ACR-AIUM <3-4 wks}\]

- Physiologic laxity is common
- Spontaneous improvement occurs
KEY RISK FACTOR
Female Gender
Family History & Male
Family History & Female
Breech & Male
Breech & Female

RECOMMENDED ACTION
Periodic Clinical Exam
Periodic Clinical Exam
Optional Future Imaging
Optional Future Imaging
Recommend Future Imaging*

* [ACR-AIUM Frank Breech Female and Parent or Sib w/DDH]
DETECTION AND NONOPERATIVE MANAGEMENT OF PEDIATRIC DEVELOPMENTAL DYSPLASIA OF THE HIP IN INFANTS UP TO SIX MONTHS OF AGE

EVIDENCE-BASED CLINICAL PRACTICE GUIDELINE
Adopted by the American Academy of Orthopaedic Surgeons
September 5, 2014
www.aaos.org/guidelines
Evidence does not support universal ultrasound screening of newborn infants.

Evidence supports performing an imaging study before 6 months of age in infants with one or more of the following risk factors: breech presentation, family history, or history of clinical instability.

The use of an AP pelvis radiograph instead of an ultrasound to assess DDH in infants beginning at 4 months of age [ACR-AIUM Radiograph 6 months]
Serial Ultrasound Exams can guide treatment decisions……

• Don’t treat too early
• Don’t treat longer than necessary
• Contain costs where possible
PILLOW
PAVLIK HARNESS
SPLINTS
OVERHEAD SKIN TRACTION
SURGICAL REDUCTION

TREATMENT OPTIONS
PAVLIK HARNESS EXAM

• Done wearing harness

• Two views –
  Coronal Flexion
  Transverse Flexion

• Passive motion –
  no stress
Ramsey Safe Zone
PROTOCOL FOR SONOGRAPHY

• APPLICATION
• RECHECK/ADJUSTMENT
• WEANING
FREQUENCY DEPENDS UPON THE SEVERITY

- Dislocation/weekly
- Subluxation/2-4 weeks
- Weaning/stress test
DISLOCATED AT REST – UNSTABLE HIP REDUCES AND REDISLOCATES
IN PAVLIK – Seats in ABD and widely Subluxates in ADD, not Dislocating
SERIAL EXAMINATIONS

Look at rest and then observe with passive range of motion allowed by the harness. (no stress)

- Expect a subluxated hip to improve position with ABduction and to worsen with ADduction

- Look first for improvement in position and stability.

- After stability focus on acetabular development.

- Ossification center is a sign of development.
PAVLIK RX IN DISLOCATED HIPS

63% Success Age < 21 da
21% Success Age > 21 da

PAVLIK RX IN SUBLUXATED HIPS

96% Success (Patients)
96% Success (Hips)
4% Residual Dysplasia

Data from Department of Orthopaedics, Nemours/AI DuPont Hospital for Children for cases with initial diagnosis @ N/AIDHC
Unsuccessful Conservative Treatment
Both *axial* and *coronal* T2 fast spin echo MRI sequences provided excellent anatomic definition and required ≤3 minutes per sequence.

Protocol for MRI of the Hips Following Spica Cast Placement.
The 2016 ICD-10-CM Diagnosis Code

- Z13.4 Encounter for screening for certain developmental disorders in childhood
- Z13.828 Screening for musculoskeletal disorder
  (Not recommended: V82.3 Breech)
- Q65.89 Other specified congenital deformities of the hip
  (Synonym “Congenital [R/L] hip dysplasia”)
  (Applicable to “Congenital acetabular dysplasia”)

REPORTING
The 2016 CPT Code 76885

A complete “dynamic” exam

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>76885</td>
<td>Ultrasound, infant hips, real time with imaging documentation; dynamic (requiring physician manipulation)</td>
</tr>
</tbody>
</table>

- CPT Assistant Nov 97:25
The 2016 CPT Code 76886

A limited static exam, can be a single view

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>76886</td>
<td>Ultrasound, infant hips, real time with imaging documentation; limited, static (not requiring physician manipulation)</td>
</tr>
</tbody>
</table>

- CPT Assistant Nov 97:25
REPORT ELEMENTS

- Examination
- Imaging Technique
- Comparison Study
- Findings
- Impression
- Added Comments

NEMOURS RADIOLOGY ENTERPRISE USES A VOICE DICTATION TEMPLATE
EXAMINATION: ULTRASOUND HIPS INFANT

CLINICAL HISTORY: Screening for congenital dislocation of hip

IMAGING TECHNIQUE: Static and dynamic ultrasound examination of both hips was performed in transverse and coronal planes. I personally scanned and stressed the hips.

COMPARISON: None

FINDINGS:

The hips are both seated and stable in position. The morphology of the acetabula is normal for age, with greater than 50% coverage. The ossific nuclei are not present.

IMPRESSION:

Normal ultrasound of the hips.
EXAMINATION: ULTRASOUND HIPS INFANT

CLINICAL HISTORY: Congenital dislocation of hip, unilateral, unspecified laterality.

IMAGING TECHNIQUE: Real-time ultrasound of the hips was performed in coronal and transverse planes at rest and with stress maneuvers.

COMPARISON: None.

FINDINGS:

The right hip has severe lateral subluxation at rest. With stress, the hip is dislocated. The bony acetabulum shows moderate dysplasia. The ossification center is not ossified.

The left hip has severe lateral subluxation at rest. With stress, the hip is dislocated. The bony acetabulum shows moderate dysplasia. The ossification center is not ossified.

IMPRESSION:

Bilateral DDH as described, both hips are dislocatable.
QUESTIONS
???????????????