

In Need of a Title...?

The Hip Baby ??




Baby Hippie ??



Review of Developmental Dysplasia of the Hip in the Newborn

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**ORTHOPAEDIC & SPINE
 CENTER OF THE ROCKIES**

23 month old girl referred for subtle limp and possible leg length discrepancy

Born at 38 wks gestation, 2nd born to mom, cephalad position (not breech)
 Started walking at 15 mos of age

What do you see...?

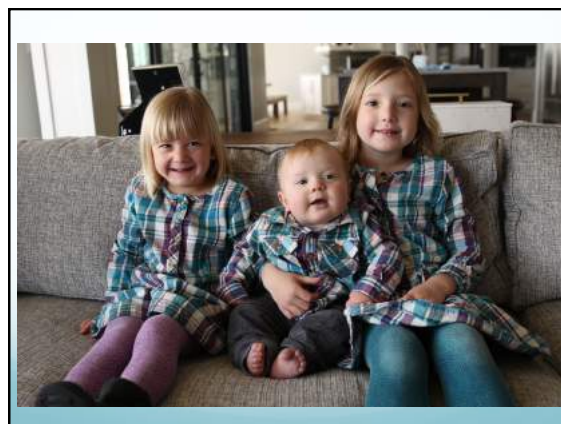



Objectives

- Review Risk Factors for congenital hip dysplasia
- Review Anatomy and Imaging for DDH
- Present a stepwise approach to Evaluation, Diagnosis, and Treatment of a baby with hip dysplasia
- Example Cases

Why might you care?

- Primarily responsibility of the Infant's Pediatrician
- Diagnosis often made or assisted by Parents, Grandparents, Other Family, Physical Therapists, Friends
- Caught early treatment is successful and "easy"
- Caught late treatment is a big deal



Background

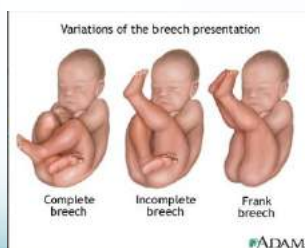
- ~1/1,000 babies affected
- CDH/DDH – congenital or developmental hip dysplasia
- Left side 60%, Right side 20%, Bilateral 20%
- Spectrum from: dislocated → dislocatable → subluxatable → stable, but shallow socket or decreased head coverage
- Associated conditions – Torticollis, Metatarsus Adductus, Congenital Calcaneal valgus

4 Main Risk Factors

1. Firstborn
2. Female
3. Family Hx
 - 6% risk if affected sibling
 - 12% risk if one parent
 - 36% risk of a parent and sibling
4. Breech

Breech

Sustained hamstring forces and pull distally and vector of force points out back of socket



Other Risk Factors

- Oligohydramnios (low amniotic fluid)
- Torticollis or other Foot conditions (clubfoot, metatarsus adductus, calcaneal valgus)
- Genetic syndromes – Ehler's Danlos, Arthrogyposis, Larsen' Syndrome, Spina Bifida
- Cerebral Palsy (increased muscle tone/spasticity)

Associated Conditions

Torticollis
-about 15% have DDH



Tilt Toward and Turn Away

Metatarsus Adductus
-about 2-10% have DDH



Heel bisector between 3rd & 4th toes

Pathoanatomy

- Combination of Bony and Soft Tissue Involvement
 - Variable from mild dysplasia to frank dislocation
- Bony Involvement – typically shallow acetabulum
- Soft Tissue – Pulvinar (fatty tissue in the socket pushing hip out), Inverted Labrum and Elongated Ligamentum Teres

How does DDH occur ? (Pathophysiology)

The affected hip spontaneously slides out.

subluxatable hip

- Posterosuperior rim of acetabulum loses its sharp margin, becomes flat & thickened.
- The capsule becomes loose and more elastic.
- The ligamentum teres elongates.

Postnatal Risk Factors

Increases Risk w/ ADDuction

Protective w/ ABDuction

Clinical Exam Tips

- Relaxed Baby (well fed, calm, quiet room)
- Pants and Diaper OFF
- Examine one hip at a time
- Very light/gentle movements
Feel of the hip movements is a delicate event
- Spend adequate time to get good exam, or re-examine at another time if unable to get a good exam.
- Experience counts

Barlow's sign

Attempt to *dislocate* / *subluxate* the femoral head from the acetabulum

Hip is ADDUCTED, a gentle push applied to slide the hip POSTERIOR

Thumb medially, apply a postero-lateral force

Hip felt to slide out of acetabulum
POSITIVE

Once the force stopped, the hip slides back

Positive Barlow

Ortolani's sign

Reverse of Barlow's test.
Attempt to reduce a dislocated hip

Thigh held b/w thumb and index finger

With the other fingers gently lift the GT and simultaneously abduct the hip

Positive result – Femoral head slips into the socket with a *palpable CLUNK*

Repeat both the tests to be sure of the findings

Metax OBTOLANI 1900-1988

Positive Ortolani



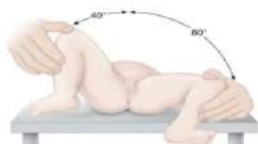
Galeazzi's Sign



At neutral ADDuction one leg shorter (but only if dislocated hip); not useful for mild dysplasia or subtle subluxation

Limitation of Abduction

MOST RELIABLE SIGN



Looking for any asymmetry at the extremes of Abduction (to pick up a dislocated hip); usually not helpful for mild dysplasia

Asymmetric gluteal, thigh, labial folds



However, asymmetric thigh folds present in up to 40% of babies (thus not super reliable)

Walking child:

- ❖ LLD
- ❖ ↓ Abduction
- ❖ Tip-toe-walking
- ❖ Trendelenberg gait
- ❖ Waddling [B/L]
- ❖ ↑ lumbar lordosis



Imaging

- Ultrasound
 - From 6 weeks to 4 months of age
- X-ray
 - After 4-6 months of age
- Rarely CT or MRI
 - Occasionally use CT after spica casting to confirm reduction
 - Occasionally use MRI if suspicion of Avascular Necrosis (AVN) from Pavlik harness

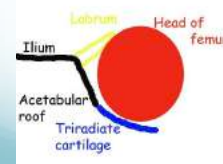
Ultrasound

- Shows the relationship of the femoral head with the acetabular socket
- Ideally **wait until 6 wks of age** (most sensitive)
- Not as helpful beyond 4 months of age
- Quality/Results = Very dependent on skills of the technologist or radiologist



Hip Ultrasound

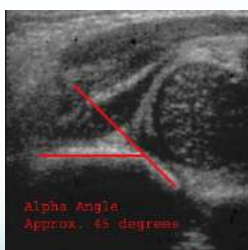
“A Spoon with an Egg on it”



Alpha Angle



Normal >60

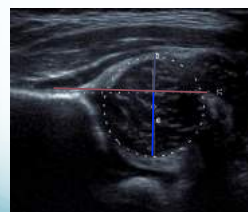


DDH (shallow socket) <60

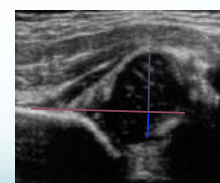
% Head Coverage

Normal: >50%
Head Covered

Red = Edge of Ilium
Blue = Covered Head (below line)
Green = Uncovered Head (above line)



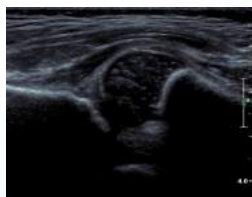
Normal Hip



DDH = Decreased head coverage

U/S Stress Views

- Laxity present or not?
 - Subluxatable
 - Dislocatable



US Preventative Service Taskforce 2006


- Routine U/S screening not recommended
- Up to 60-80% of hips identified as abnormal or suspicious AND up to 90% of those with initial abnormal U/S resolve spontaneously with NO intervention

U. S. Preventive Services Task Force. Screening for developmental dysplasia of the hip: recommendation statement. *Pediatrics*. 2006;117:898-902.

American Academy of Orthopaedic Surgeons

- 2014 Guidelines
- Moderate evidence does NOT support universal U/S screening of newborns
- Moderate evidence DOES support an imaging study before 6 mos of age with **one or more** of the following **risk factors**:
 - Clinical instability
 - Family Hx
 - Breech

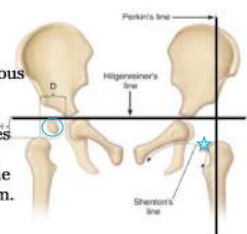
https://www.aaos.org/uploadedFiles/PreProduction/Quality/Guidelines_and_Reviews/Developmental%20Dysplasia%20of%20the%20Hip.pdf



Xrays

Features of an Unossified pelvis:


- Upper femur is not ossified.
- Most of the acetabulum is cartilagenous in the form of Triradiate Cartilage
- **Hilgenreiner's Line** : A line through the triradiate cartilages
- **Perkins line** : A line perpendicular to the first, at the lateral margin of the bony acetabulum.
- **Shenton's Line**



- In a normal hip, the **medial beak of femoral metaphysis lies in lower inner quadrant.** ☆

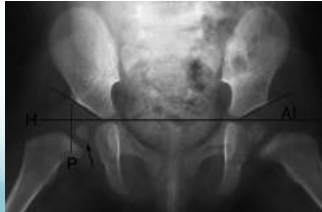
Acetabular Index

- Angle formed by junction of Hilgenreiner's line and edge of acetabulum
- Normal <30° at **any** age
- By 2 years of age ≤24°



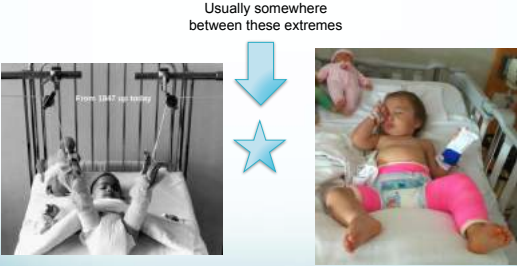
Femoral Ossific Nucleus

- Top of the femur that will become the femoral head
- Age at ossification (ie seen on xray) varies (from 4 mos to >1 year of age)
- Often R and L side ossify at slightly different stages



Spectrum of Treatment

Usually somewhere between these extremes



Bryant's traction

Hip Spica cast after open surgical reduction

Treatment depends on Age

- Birth to 6 months
 - Pavlik harness 90%+ effective
 - Sometimes rigid abduction brace (Rhino or other)
- 6 mos to 2 Years
 - Closed reduction/arthrogram with Spica Casting
 - Open surgical reduction with Spica Casting
- 2 years or Older
 - Surgical
 - Proximal migration requires both Femoral shortening osteotomy and usually Acetabular osteotomy

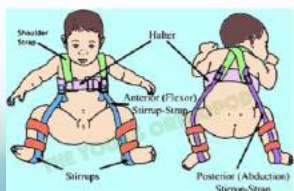
Pavlik Harness

Holds hip in Flexion and Abduction (points the femoral head into the socket)

-For unstable hips – worn “full time” (except for clothing changes/ bathing)

-For stable hips w/ mild DDH often just at night time or 12/24 hrs

-Overall 90%+ percent effective at treating/resolving DDH if caught early



Typical Pavlik Schedule for early Dx DDH

- Full time for first 6 weeks (if Ort or Barlow +)
- Recheck q1-2 weeks until stable hip (Barlow neg)
- U/S at 6 weeks
- Start weaning out of harness
 - Out 4 hrs /day for 2 weeks then
 - Out 8 hrs /day for 2 weeks then
 - Night only for last 2 weeks
- Repeat U/S at 3 mos old and d/c harness if Normal

Pavlik Complications

- Failure to maintain reduction
 - Especially for “high” dislocations
 - > 2 mos old at start of tx
- Femoral nerve palsy
 - More common in hospital/NICU treated babies vs those tx at home
 - Usually resolves spontaneously
- AVN (avascular necrosis)
 - Usually resolves but can lead to a Perthes like hip and have long term problems

Abduction Brace



-Typically used in older babies and children w/ DDH

-Can sometimes be used if Pavik fails to obtain or maintain reduction in infants

-Don't fit well in car seat

-Can be used in ambulatory children (although when I use them typically worn at night in patients with slowly correcting DDH w/ elevated Acetabular Index)



1. Pothier, Orlan. 2003. Mar-Apr 23(2):195-7.
Use of an abduction brace for developmental dysplasia of the hip after failure of Pavlik harness use.

Successful in 13 of 15 in this case study...

Treatment Neonate

- Positive Barlow or Ortolani
 - Immediate Pavlik → Recheck Stability at 1-2 weeks → If stable continue Pavlik and obtain U/S at 6 weeks → depending on Alpha and % head coverage = Wean (usually out of harness by 3 months) → X-ray at 6 mos, 1 year, 2 years, 5 years (debatable f/u beyond)
- IF stable hip but abnormal U/S depends on #'s but either observe and repeat U/S in 6 weeks or night time Pavlik then repeat U/S

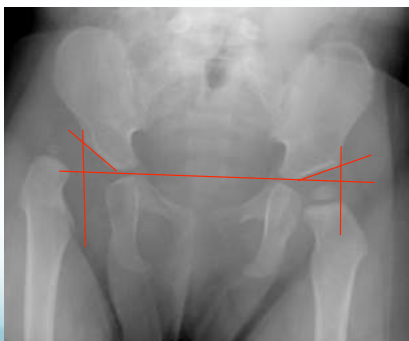
Treatment 1-6 Mos Old

- Pavlik or Abduction Brace
 - To obtain reduction or to encourage deeper acetabular development if shallow hip on U/S
- Before 4 mos of age U/S preferred imagine to follow improvement and > 4mos change to X-ray
- If unable to obtain reduction of dislocated hip with Pavlik or Abduction brace after 3-4 weeks discontinue (to prevent AVN) and switch to other methods: athrogram w/closed vs open reduction and spica casting...

Case Presentations

- Example patients from real live clinic patients...

17 month old w/ limp and walking "on her toes" but only on the Right
 Started walking 1 month ago... PT noticed a mild LLD.



Surgical open hip reduction with
 Salter Pelvic Ostotomy and pinning
 Femoral shortening and varus
 ostotomy w/ plate fixation and Spica
 casting

Remove pins and change cast at 6
 weeks

Out of cast at 3 months post op

Femur hardware removal at 1 year



2 years and 9 months old
 Walking well
 Hip Development looks good
 LLD about 1.5 cm



23 month old girl referral for subtle limp and possible leg length discrepancy

Born at 38 wks gestation, 2nd born to mom, cephalad position (not breech)
 Started walking at 15 mos of age

What do you see...?



Conclusion...

- Hip dysplasia is generally treated successfully and “easy” to treat IF CAUGHT EARLY!
- Delayed diagnosis is a big deal and leads to significantly more complicated treatment

• QUESTIONS ???



References

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- Flynn JM, Widmann RF, *Limping Child – Evaluation and Diagnosis*. J American Academy of Orthopaedic Surgeons, 9(2): 89-98 March/April 2001.
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- Kotlarsky P, Haber R, Bialik V, Eidelman M, *Developmental Dysplasia of the Hip: What has changed in the last 20 years?* World Journal of Orthopaedics 2015 Dec 18; 6(11): 886-901.