DEVELOPMENTAL DISLOCATION OF THE HIP [DDH]

Older terminology was Congenital dislocation of the hip.

DDH means 'developmental dysplasia of the hip'.

DDH is better than CDH as dislocation is not always congenital.

DDH includes: Acetabular dysplasia

Dislocatable on Barlow's test

Dislocated: Early: Reducible

Irreducible [Teratologic] : Larsen's syndrome

Arthrogryposis

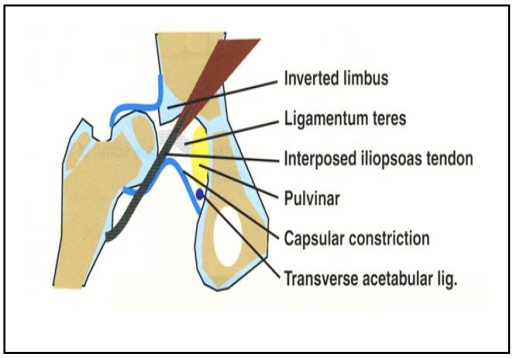
Incidence: 1: 1000

Risk Factors

Family history	20%
First born	common
Female	85% [7:1]
Breech	40%
Premature	More common
L side	65%
Package Disorder	Torticollis, Plagiocephaly, Metatarsus varus
Flat foot.	

Pathology

Anteverted neck
Shallow acetabulum
Excessive capsule
Inverted limbus
Narrow medullary cavity of the femur



Structures obstructing reduction of a dislocated hip are

Inverted Labrum [Limbus]
Capsular constriction
Tight iliopsoas tendon
Inferior transverse acetabular ligament
Fibrofatty pulvinar
Hypertrophied ligamentum teres

Natural course of DDH

90% of unstable hips stabilise by 9 weeks of age.

Only reduction is effective when it is performed before 18 months. The maximum remodelling of the acetabulum occurs by this time.

After 18 months: Pelvic osteotomy is required.

Salter's is performed <8 years; Dega's osteotomy >8 years

Secondary osteoarthritis occurs at 20-45 years

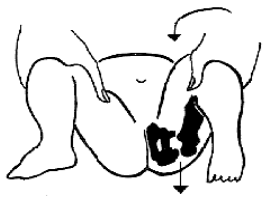
Hip check during first 3 weeks

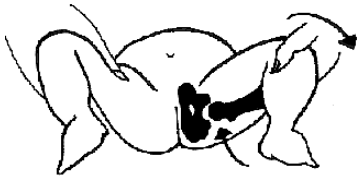
Family history
Pregnancy history: Full term or not
Caesarean or not
Breech or not
Other congenital problem: inspect Feet, knees,
Spine, neck for Torticollis

Hip examination

Asymmetric skin folds is not a reliable sign
Galleazzia test for limb length
Abduction of the Hip: usually 90º
Tests: Barlow's, Ortolani's tests

Barlow's test



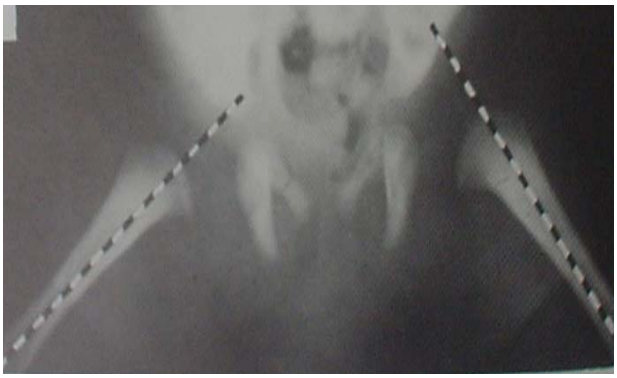


Positive in Dislocatable hip
Examine one hip at a time
With one hand to stabilise pelvis
and the other hand held over hip under question with thumb over the groin and fingers over the greater trochanter. Now slightly adduct.
Pressure over the lesser trochanter dislocates the head.

Ortolani's test

Positive in early life [<3months]
Both hips examined at same time
Hip at 90º; Knee 30 º Flex
Now Abduct with finger pressure over the greater trochanter

X ray



Von Rosen View: <4 months

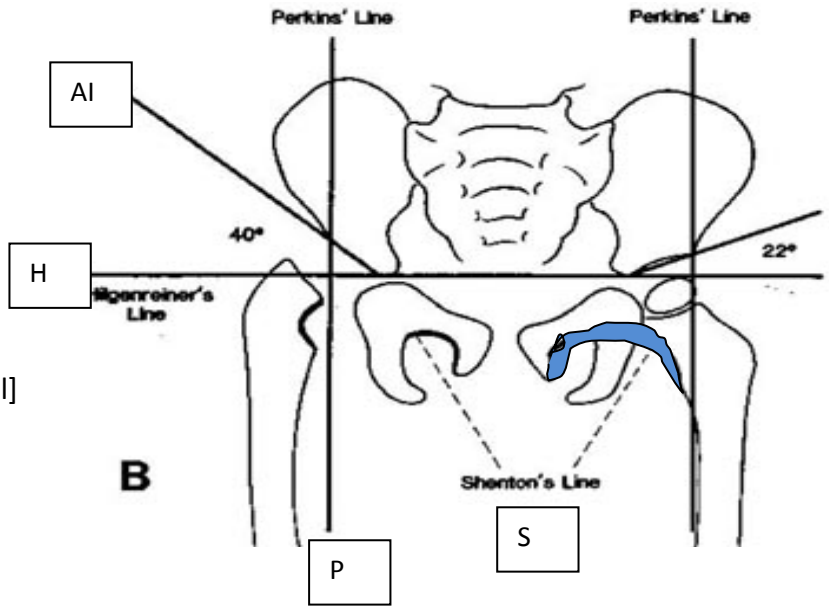
Patient is supine with hips abducted 45º and in internal rotation

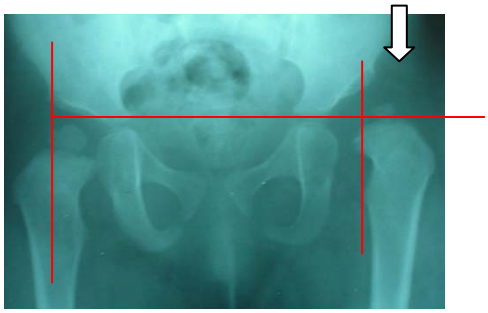
AP projection of the pelvis is then obtained

Axis of the femoral Shaft points towards the triradiate cartilage

X rays at 4 months

H Hilgenreiner's line
P Perkin's line
S Shenton's line
AI Acetabular Index:
Normal 27.5 [>30º Pathological]



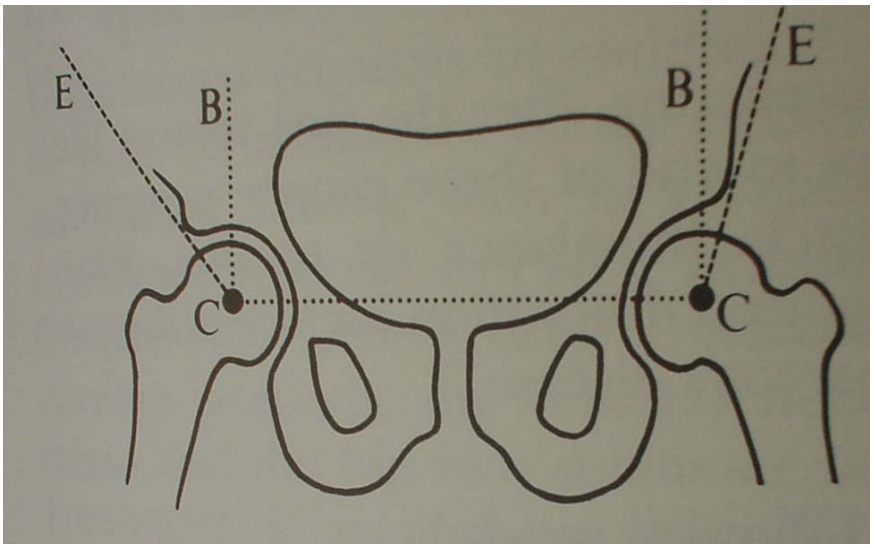


In dislocation of the joint, the physes of the head is in the outer and upper quadrant [Left]

X ray > 5 years.

CE angle [centre edge angle]

N > 25º
< 15º abnormal



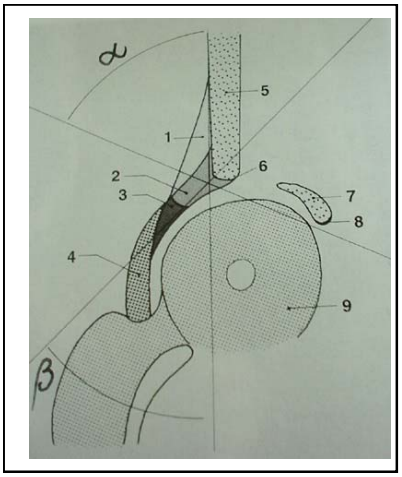
Ultrasound

Gives accurate diagnosis
Useful under the age of six months.

Non-invasive
Can be assessed in the Harness

Dynamic ultrasound:
gives information about stability

Alpha angle >45-60° dysplasia;
<45° dislocation



1. Periosteum of ilium

2. Cartilage. Acetabular. Roof

3. Acetabular labrum
4. Joint capsule
5. Ilium
6. Promontory of acetabulum rim
7. Iliac bone
8. Inf. Margin of ilium
9. Femoral head

Normal: 1. Dynamic: stable
2. Head cover > 40%
3. Alpha angle >60°

Disadvantages

Operator dependent

TREATMENT

1. All new born requires screening with Barlow's and Ortolani's test, Abduction, Galleazzia test.

2. Usually first 3 weeks does not require any treatment. If unstable at 3 weeks, needs Pavlick Harness

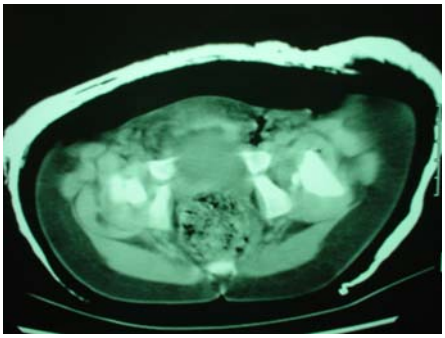
3. After 4 weeks, repeat the ultra-sound in the harness. If head is unreduced, fixed abduction splint is used.

4. At 3 months, when X ray is suspicious, an arthrogram is done under anaesthesia to check whether hip is concentrically reduced.

When there is no concentric reduction, adductor tenotomy and then look for concentric reduction under Image intensifier.

5. When reduced hold it in a human position ie.,

90º of flexion and 45º abduction in a Hip spika

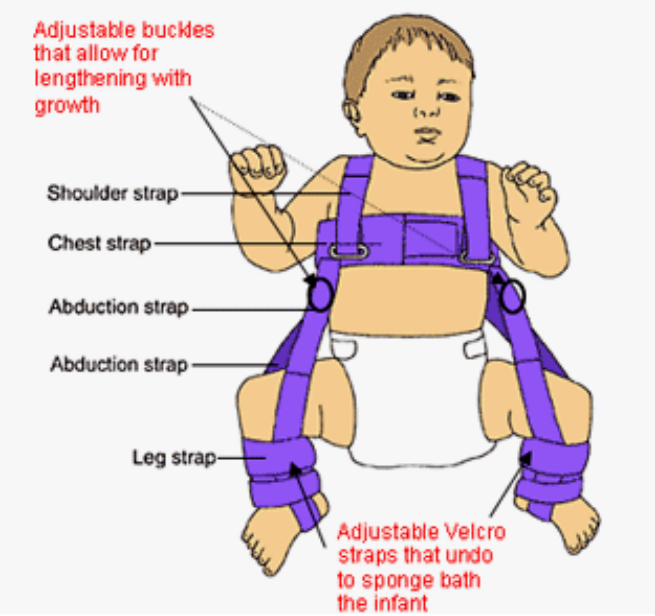


6. Following spika, a CT scan is done at day one and then at one week and at 6 weeks to confirm concentric reduction

7. Failure to achieve concentric reduction needs an open reduction. Sometimes femoral or pelvic osteotomy is required.

Pavlick Harness

- Parts: Shoulder harness; Booties
- Anterior strap controls flexion
- Posterior strap controls the abduction
- Indication: 0-6 months
- Safe zone of Ramsey: Flexion 90º and Abduction 45º



Problems	Solution
Posterior wall defect and persistent subluxation	Prolong harness; Consider Arthrogram
Failure of reduction and lax joint	Fixed abduction brace
Inferior dislocation of the hip	Decrease flexion by 20°
Femoral nerve neuropathy	Decrease flexion by 20°
Osteonecrosis [1-4%]	Decrease abduction
Poor harness fit	Change sizes
Poor compliance	Parent education; Think about fixed splint like Von Rosen

OPEN REDUCTION

Open reduction: Medial approach
Anterolateral approach

MEDIAL APPROACH [LUDLOF'S]

Indication 6 months – 1 yr

Technique

Small groin incision [from the femoral art pulses to medial]
Divide Adductor longus
Visualize Adductor brevis with anterior branch of Obturator Nerve

Go between Adductor brevis and Pectineus and identify iliopsoas
Psoas tenotomy distal to the MCFA
Arthrogram

Hip joint capsulotomy and divide the ligamentum teres
Trace to transverse acetabular ligament.

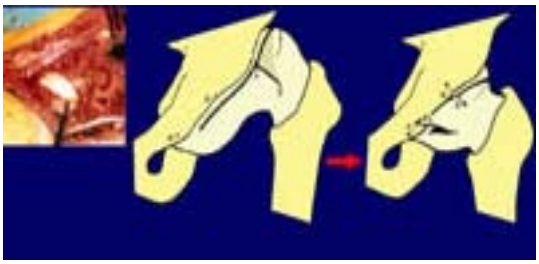
Disadvantages of medial approach

Poor exposure
Unable to reef redundant capsule

Advantage

Less Avascular necrosis
Less invasive and less scar

Contraindication: Teratologic dislocation



ANTEROLATERAL APPROACH [SMITH PETERSON]

Indication 12 months to 8 years

Technique
Bikini incision - lateral femoral cutaneous nerve of thigh retracted medially
Interval between Tensor fascia lata and Sartorius
Ligate ascending branches of Lateral circumflex femoral artery lying on rectus femoris
Iliac crest apophysis is split and elevate abductors laterally
Both heads of Rectus Femoris divided [AIIS]
Capsule: T incision of capsule. Transverse along the labrum and vertical along the neck
Iliopsoas divided at the pelvic brim [only tendon the muscle]
Open the joint and trace the ligamentum teres to transverse acetabulum ligament and divide it
Excise bulky ligamentum teres and pulvinar fat
Reduce the head in the joint and double breast capsular flaps
Femoral shortening if reduction is tight.

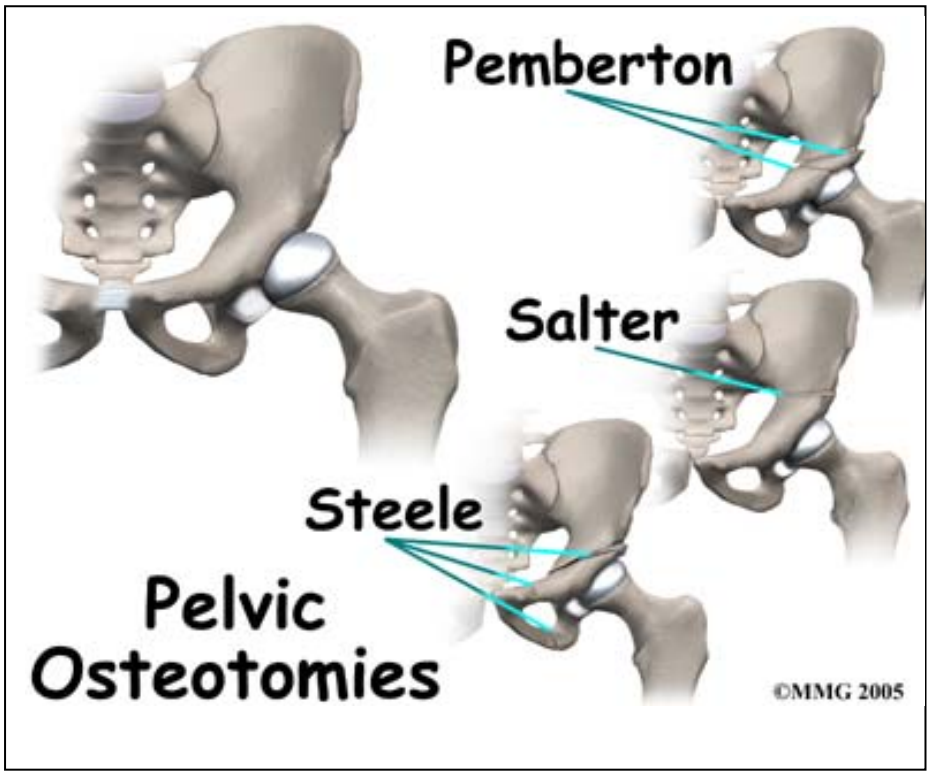
PELVIC OSTEOTOMY

TYPES

I **Redirectional osteotomy**: Increase anterior-lateral coverage of the femoral head by redirecting roof of the acetabulum.

Eg: Salter's osteotomy in younger kids [<8 years]
Dega's osteotomy in older kids [> 8 years]
Ganz or Bernes [>15 years]

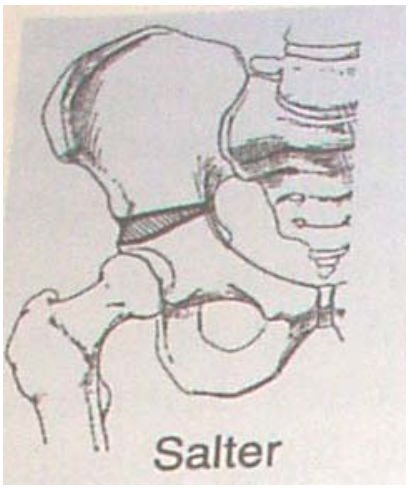
Other less commonly done osteotomy
Dial osteotomy [Wagner]
Double osteotomy [Sutherland]
Triple [Steel]



II **Reshaping Osteotomy**: Pemberton osteotomy

III **Augmentation of the roof of the acetabulum:** Chiari's osteotomy
Shelf (Staheli)

SALTER'S OSTEOTOMY



Prerequisite

Head of the spherical should be spherical
Concentric reduction should be possible
Age < 8 years

Approach: Antero-lateral like Smith Peterson through a bikini incision

Osteotomy: From Greater Sciatic notch and Anterior inferior iliac spine

Distal fragment is rotated: Entire acetabulum, pubis and ischium is rotated with a hinge at symphysis pubis to cover anterior and lateral aspect of the head

Osteotomy site is opened anteriorly: Wedge from the anterior part of the Ilium is placed and fixed with K Wires

Hip spika for 6 weeks.

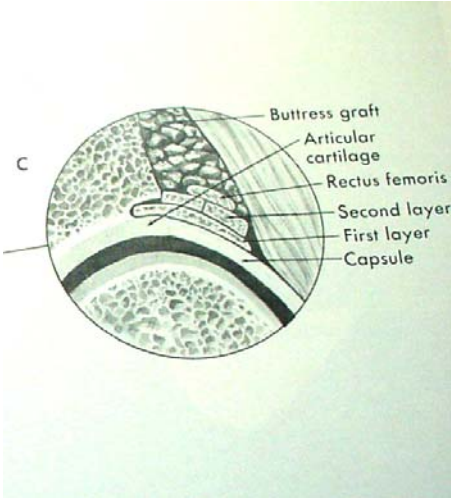
Salter recommends: 18 Months to 6 years for dislocation and 18 M to 12 yrs for Subluxation of the hip.

PEMBERTON OSTEOTOMY

Large acetabulum and spherical head
Hinge: at triradiate cartilage
Pericapsular osteotomy curved and bone graft

Upper limit 12 yrs [when triradiate cartilage closes]

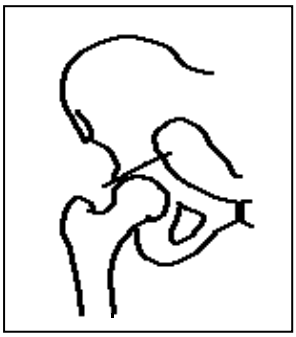
STAHELI'S AUGMENTATION PROCEDURE



Indication: DDH with aspherical head
Normal CE angle is drawn to 35° and measure graft length as shown

Bikini incision 2 cm below and parallel to the Iliac crest
Expose hip through a standard Ilio-femoral approach.
Divide Rectus Femoris reflected head
Placement of acetabular slot is important: at the margin 1 cm deep
Autograft from outer table and second layer right angle to the first one pack them above with Cancellous

CHIARI OSTEOTOMY



Outcomes Related to age of the patient, the degree degenerative change, the degree of the medial displacement of the acetabulum.

It is a medial displacement of ilium for older children,

With deformed head and a CE angle greater than –9°

Medial displacement 40-60%

When an osteotomy indicated

< 8 years = Salter's osteotomy
> 8 years = Dega's osteotomy
Head spherical but acetabulum is large = Phemberton

>8 years, Head not spherical = Chiari's/Shelf procedure

>15 : " but pain is disabling: Arthrodesis or arthroplasty
>15 year, head is spherical: Dial, Ganz or Sutherland or triple

Steele Sutherland Dial

FEMORAL OSTEOTOMY

Indication

1. When femoral reduction causes excessive joint pressure following open reduction, a femoral shortening procedure is required. This is more likely in children over 3 years requiring open reduction.
2. Derotation: Undertake if extreme cast position of the limb is necessary to keep joint reduced

Technique

Separate lateral incision
Guide wires as marker
Amount of shortening, overlap of bone when hip reduced
and bone osteotomised or rotation
Femoral head reduced
Blade and plate fixation
Hip spika: 3-4 months

Avascular necrosis in DDH

Incidence:

Pavlick Harness	1-4%
Open reduction	5%

Ogden's Classification

I Complete fragmentation; no residual deformity due to regeneration

II Lateral growth arrest from occlusion. Superior Branch of MCFA (Coxa magna and valga, subluxation)

III Complete involvement of the head and substantial deformity

Kalamchi and MacEwen classification

I Changes confined to the ossific nucleus
II Type I + Lateral physeal damage (Coxa Valga)
III Type I + Central physeal damage (Coxa brevis)
IV Total damage to the head and physis (Coxa plana and brevia)
V Unclassifiable