Legg Calve Perthes disease

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- Definition
- Clinical Features
- Natural evolution
- Radiology and classification
- Aims of treatment
- Preventive intervention
- Corrective intervention
- Salvage intervention

Perthes disease (1910)

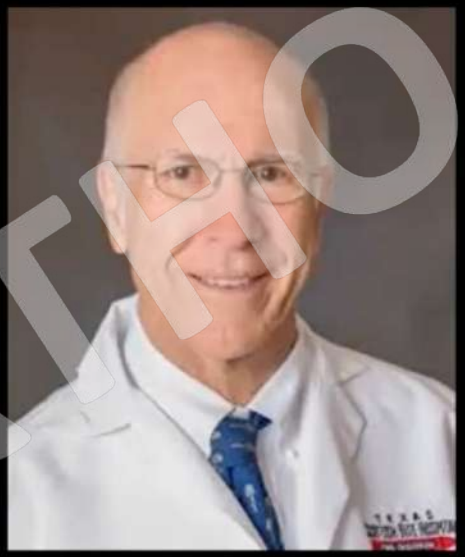
- Georg Perthes Germany

- Jacques Calve France

- Arthur Legg USA

Waldenstrom

Antony Catterall



Tony Herring

The Natural History of Non-operatively Managed Legg–Calvé–Perthes' Disease

Ramez Ailabouni,[1] Bryn O. Zomar,[2,3] Bronwyn L. Slobogean,[4] Emily K. Schaeffer,[2,3] Benjamin Joseph,[5] and Kishore Mulpuri[2,3]

J Child Orthop. 2020 Feb 1; 14(1): 58–67. doi: 10.1302/1863-2548.14.190153

PMCID: PMC7043118 | PMID: 32165982

Evolution of Legg-Calvé-Perthes disease following proximal femoral varus osteotomy performed in the avascular necrosis stage:a prospective study

Kumar Amerendra Singh,[1] Hitesh Shah,[1] Benjamin Joseph,[2] Alexander Aarvold,[3] and Harry K. W. Kim[4]

The epidemiology of Perthes' disease in south India

B Joseph [1], V Chacko, B S Rao, A J Hall

Affiliations + expand

PMID: 3264822

Dr. Benjamin Joseph

Definition

- ***Perthes: Is Idiopathic, Self limiting, Avascular necrosis of the capital femoral epiphysis.***

Excludes: Sickle cell, excludes Hypothyroidism and non idiopathic causes.

Etiology

- Unknown
- Important to rule out underlying causes in Extremes of age, Bilateral affection

-Hypothydroidism

-Coagulopathy/ Sickle cell

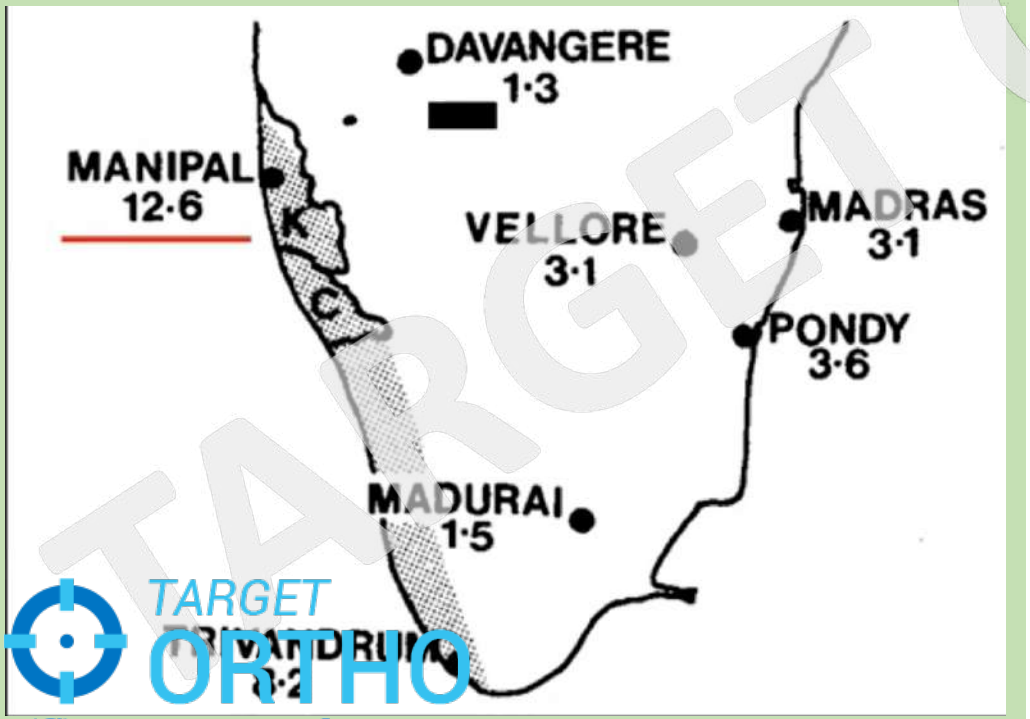
-Skeletal dysplasia

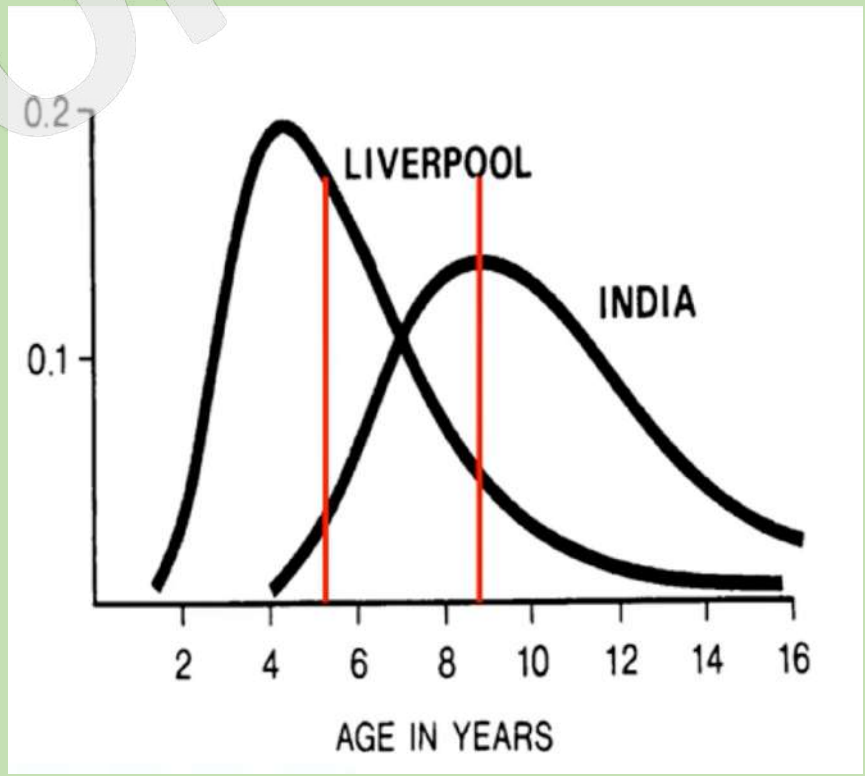
Theories

- Hereditary
- Second hand smoking
- ADHD
- Mechanical stress
- Blood flow: Arterial/ Venous congestion

Epidemiology

- Males> Females
- 5-10 Years
- Painless limp
- Limited abduction/ IR
- History >3-4 weeks

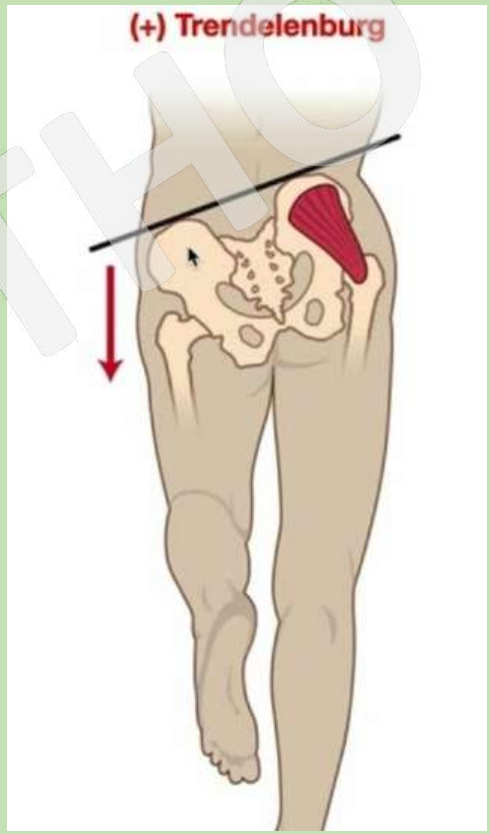




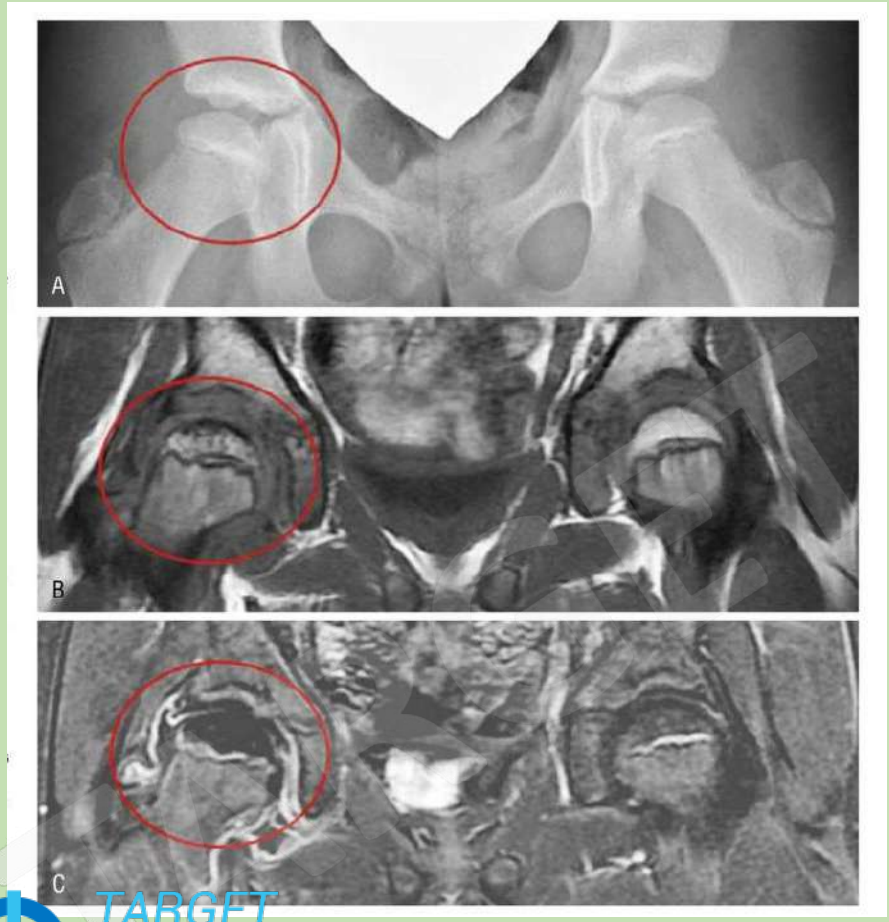
Clinical Features

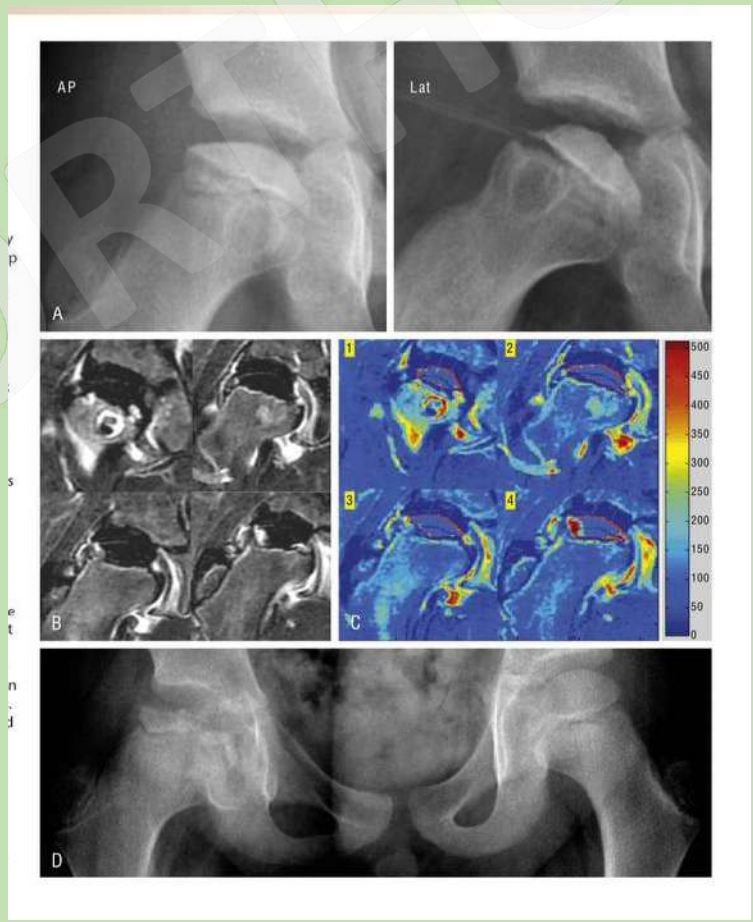
C/F

- Painless limp
- May Have pain
- Referred to knee/ Groin
- Restricted Hip Abduction/ IR or both
- May have some Supra trochanteric shortening

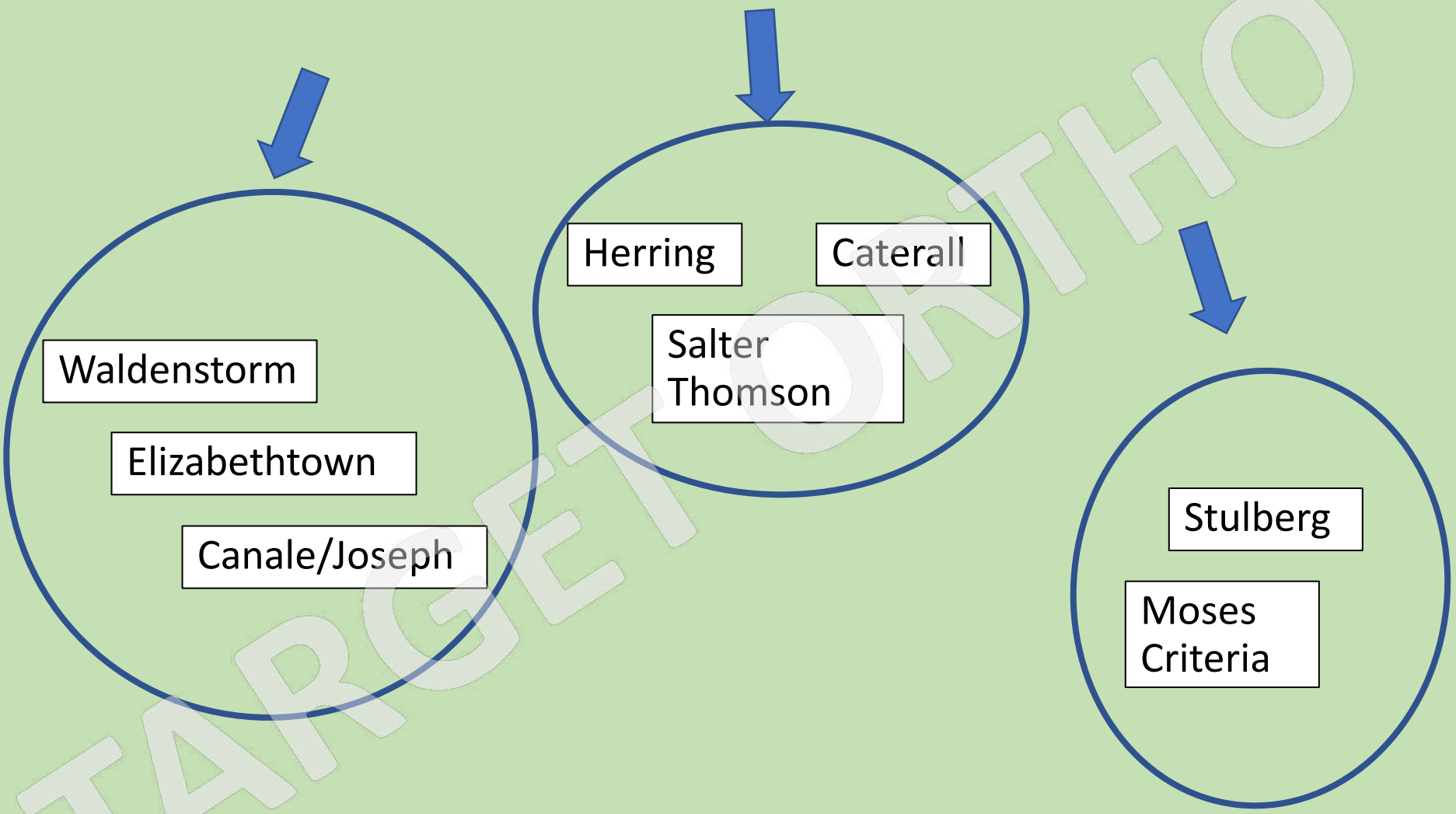


Other Imaging besides Xray





Perthes disease Classifications

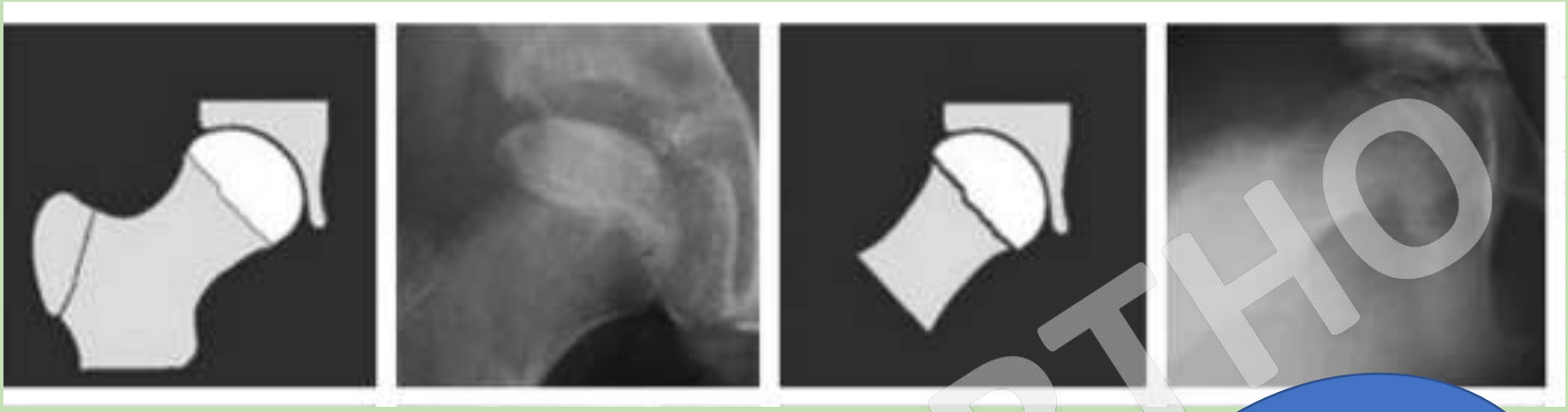


Staging classifications

- Waldenstorm, canale, Elizabethtown, Joseph
- Defines the stage at which the disease has progressed

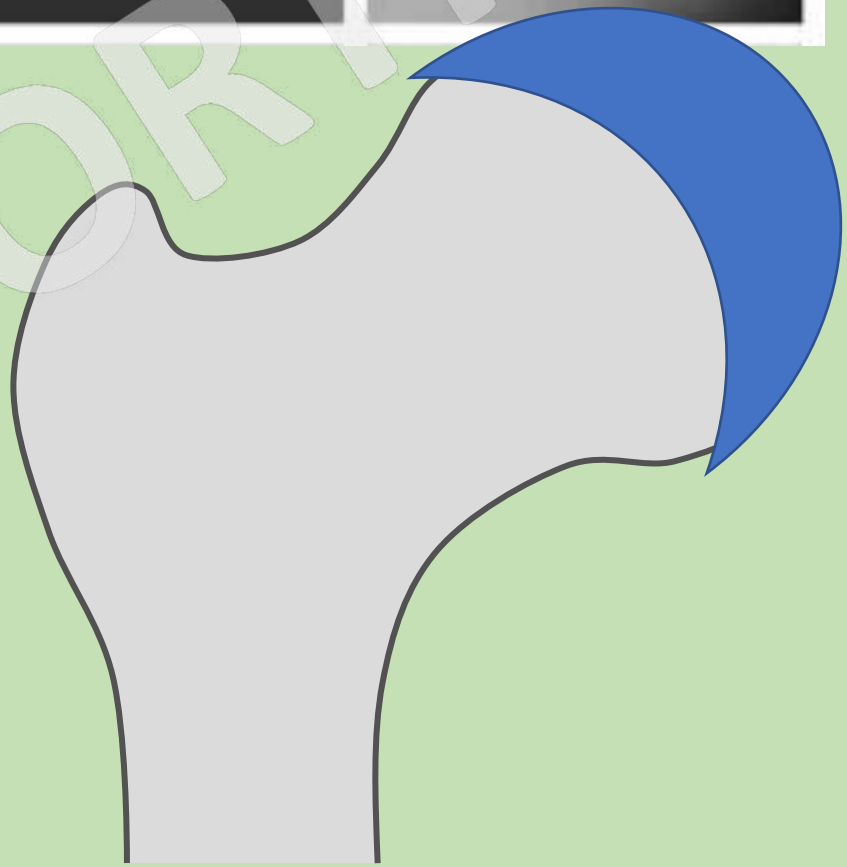
Waldenstorm staging

- Avascular Necrosis/ Initial (3-6 months)
- Fragmentation (6m to 2 y)
- Revascularization and regeneration (18 m)
- Complete healing



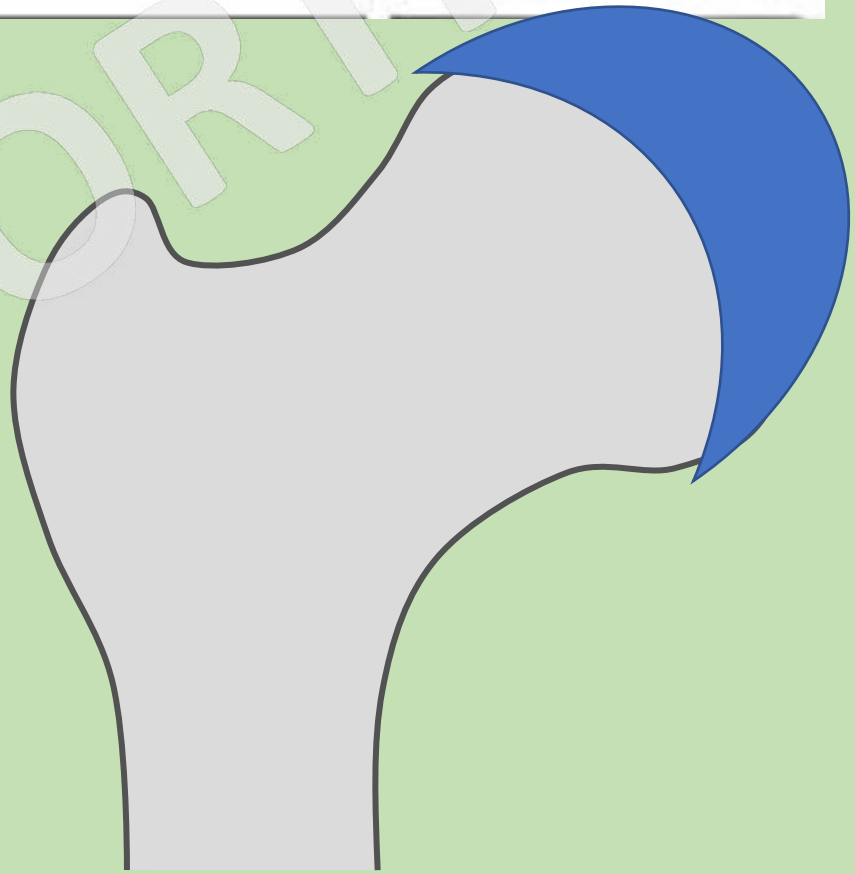
Ia:

- All or part of epiphysis is affected
- No loss of height
- Increased sclerosis



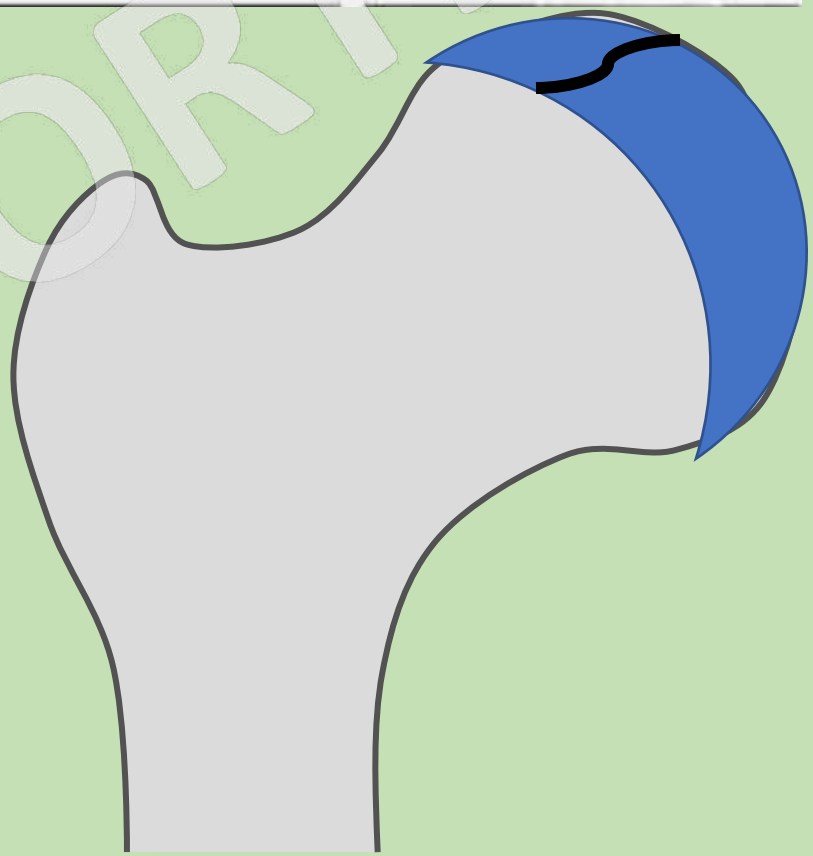
Ib:

- All or part of epiphysis is affected
- loss of height
- Increased sclerosis



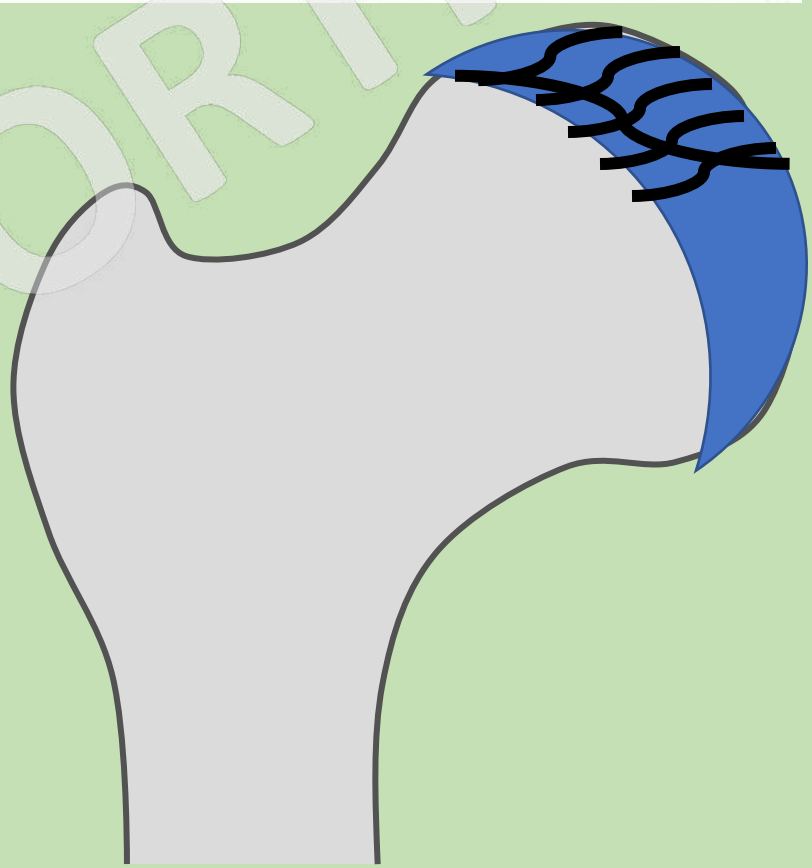
2a:

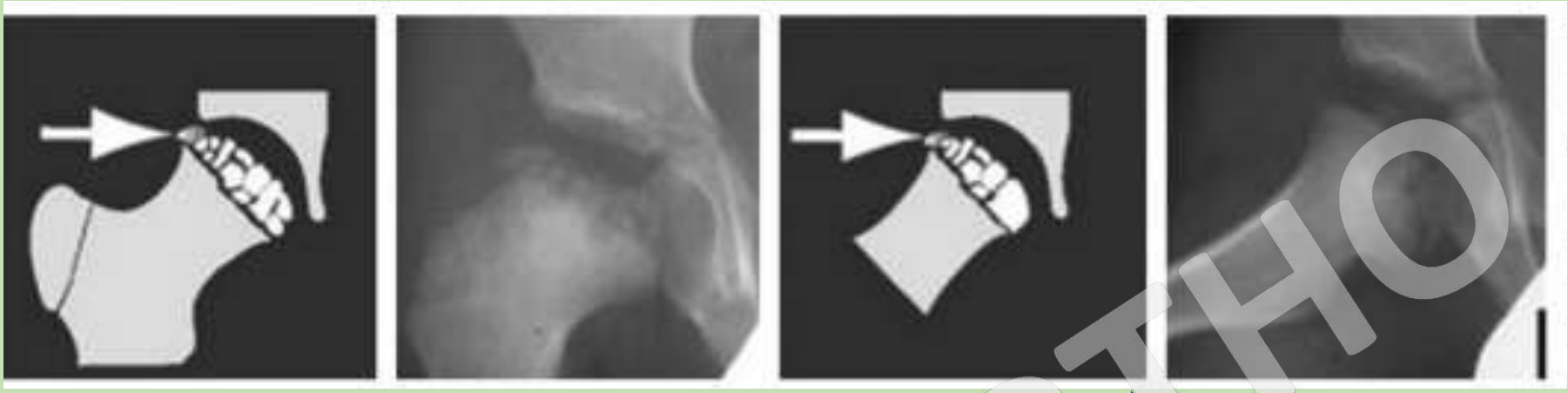
- Early fragmentation
- Some fissure now visible

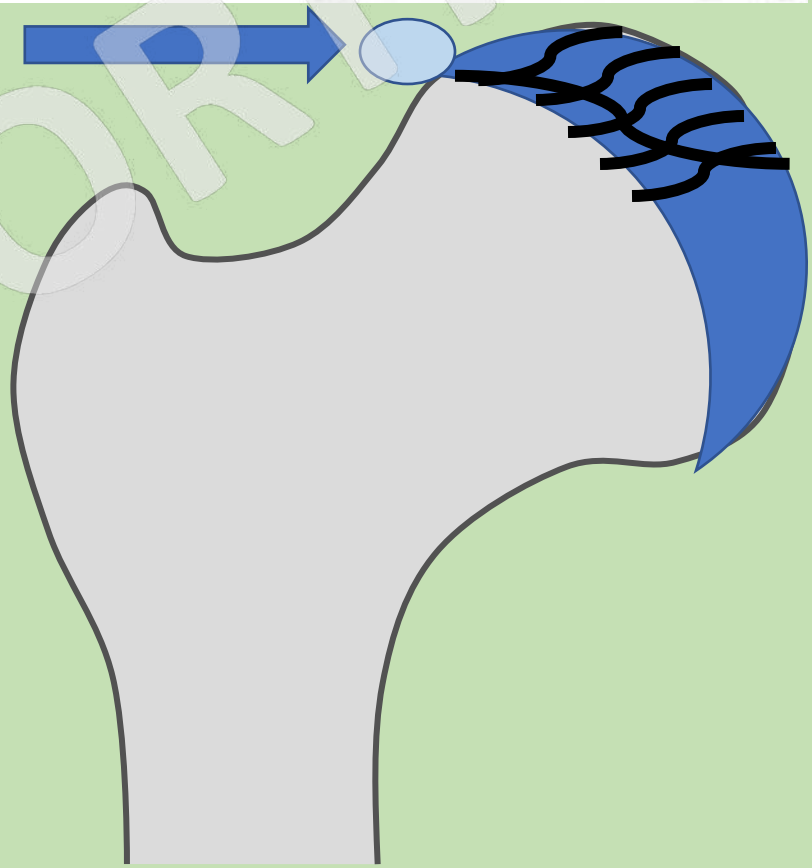


2b:

- Advanced fragmentation
- No new bone lateral to epiphysis

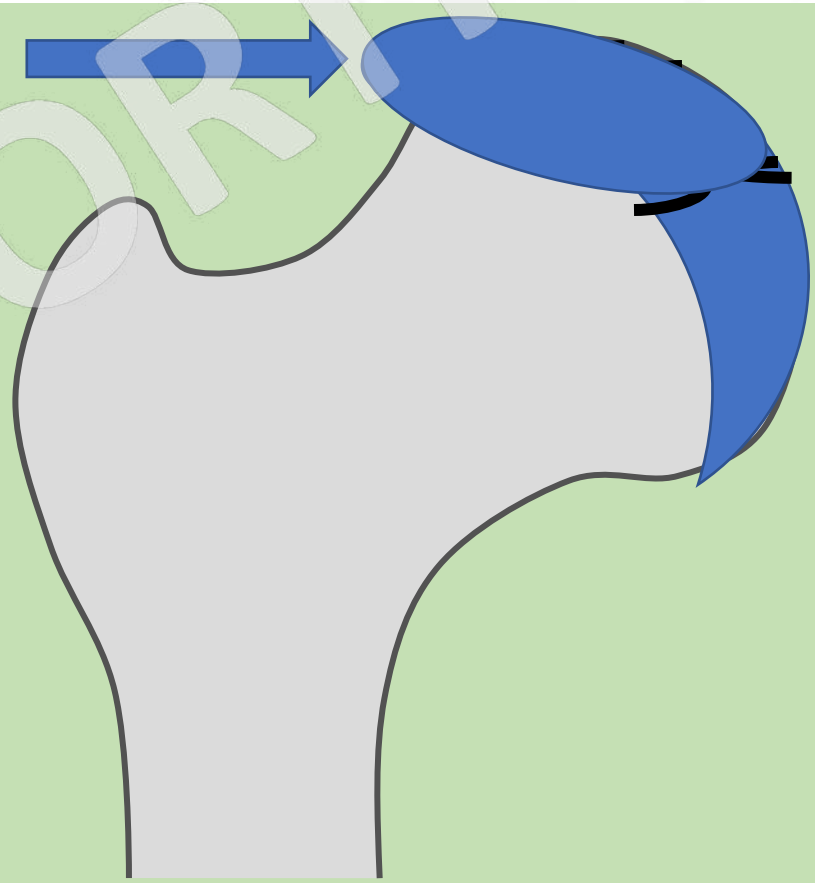






3a:

- Early new bone visible
- Bone is porotic
- Covers < 1/3 width



3b:

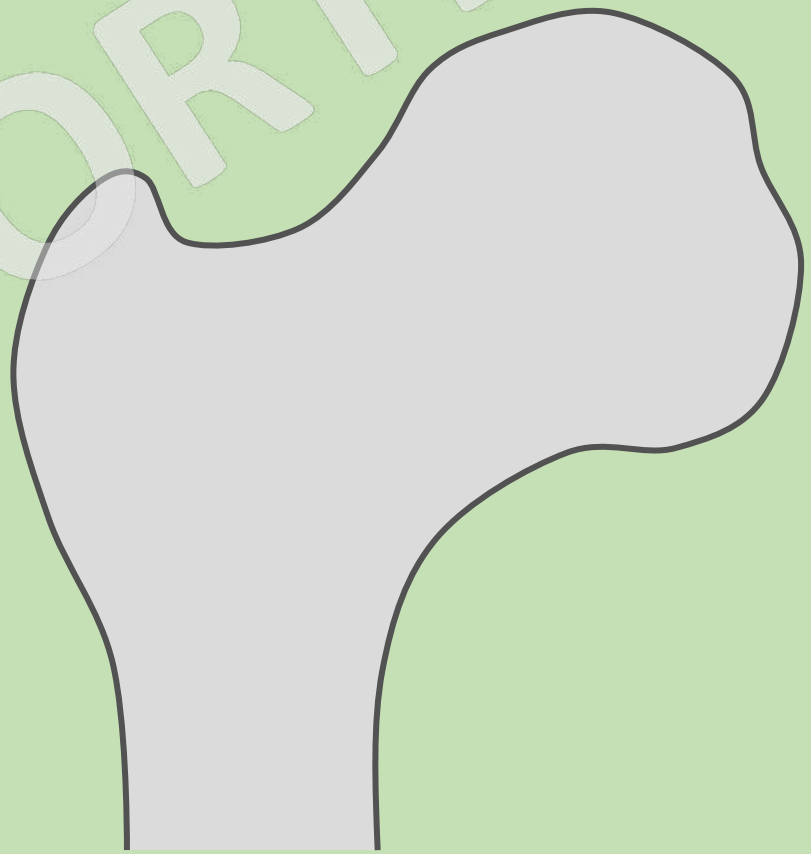
- Mature new bone visible
- Bone is similat
- Covers > 1/3 width

Stage IV Complete Healing : No Radiological sign of AVN

Stage IV

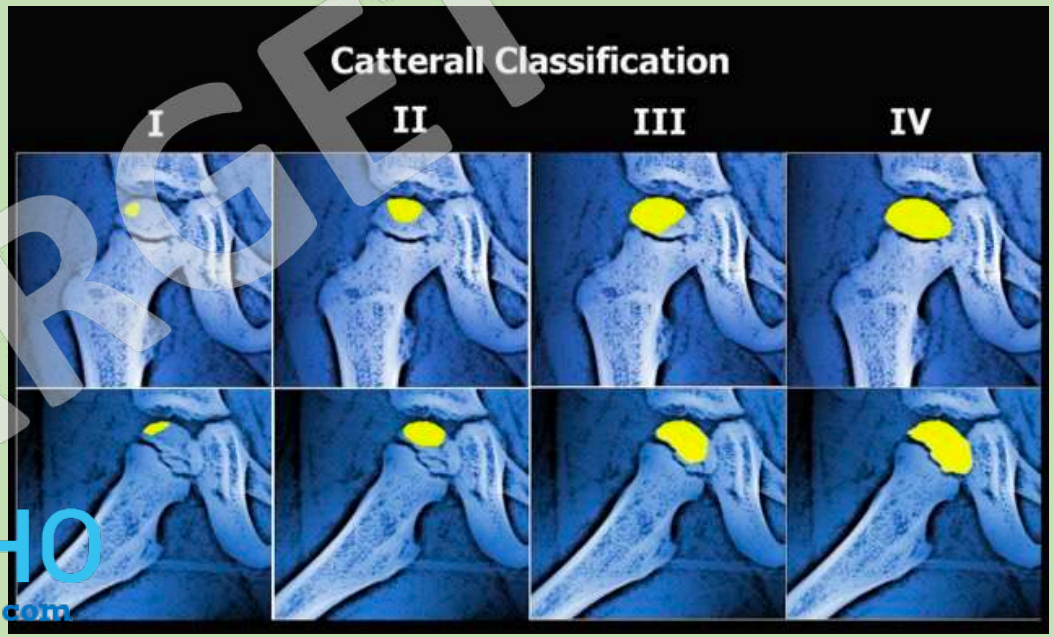
No AVN

Residual remodelled bone



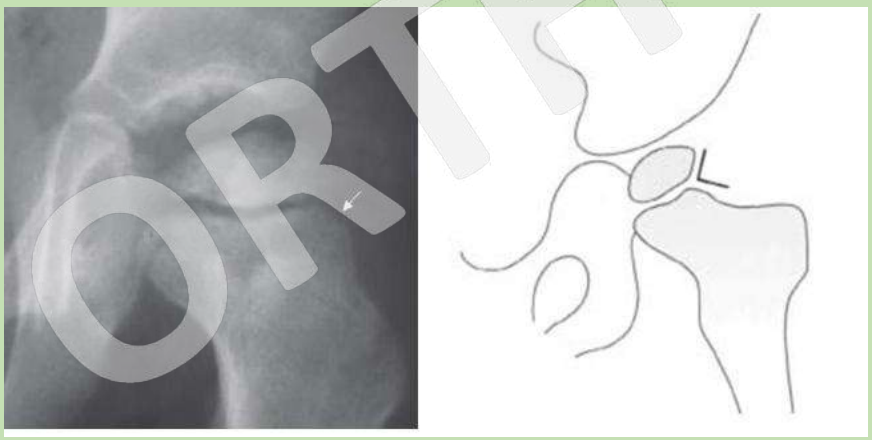
Catterall classification

Catterall	
	Based on Head involvement
Group I	Anterior epiphysis only (25%)
Group II	Anterior epiphysis + Central sequestrum (50%)
Group III	Only a small part of epiphysis not involved (75%)
Group IV	Total Head involvement (100%)



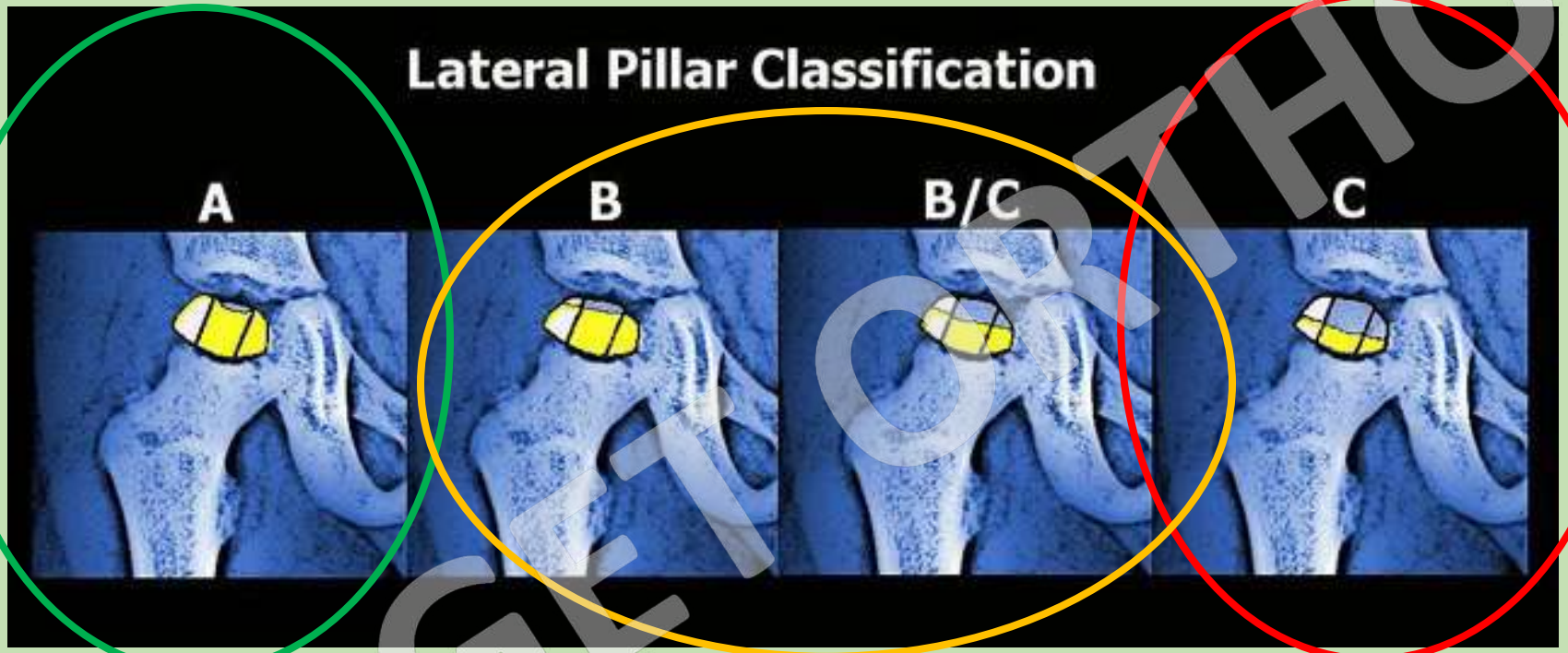
Head at risk signs by Catterall
(During active stage)

- **C**alcification lateral to epiphysis
- **G**age Sign
- **M**etaphyseal Cyst
- **L**ateral subluxation
- **H**orizontal proximal femoral epiphysis



***C**atterall **g**ave **m**e **l**arge **h**eadache*

Lateral Pillar classification



- Based on the height of the lateral pillar on AP Xray
- Prognostic information

Moses and stulberg

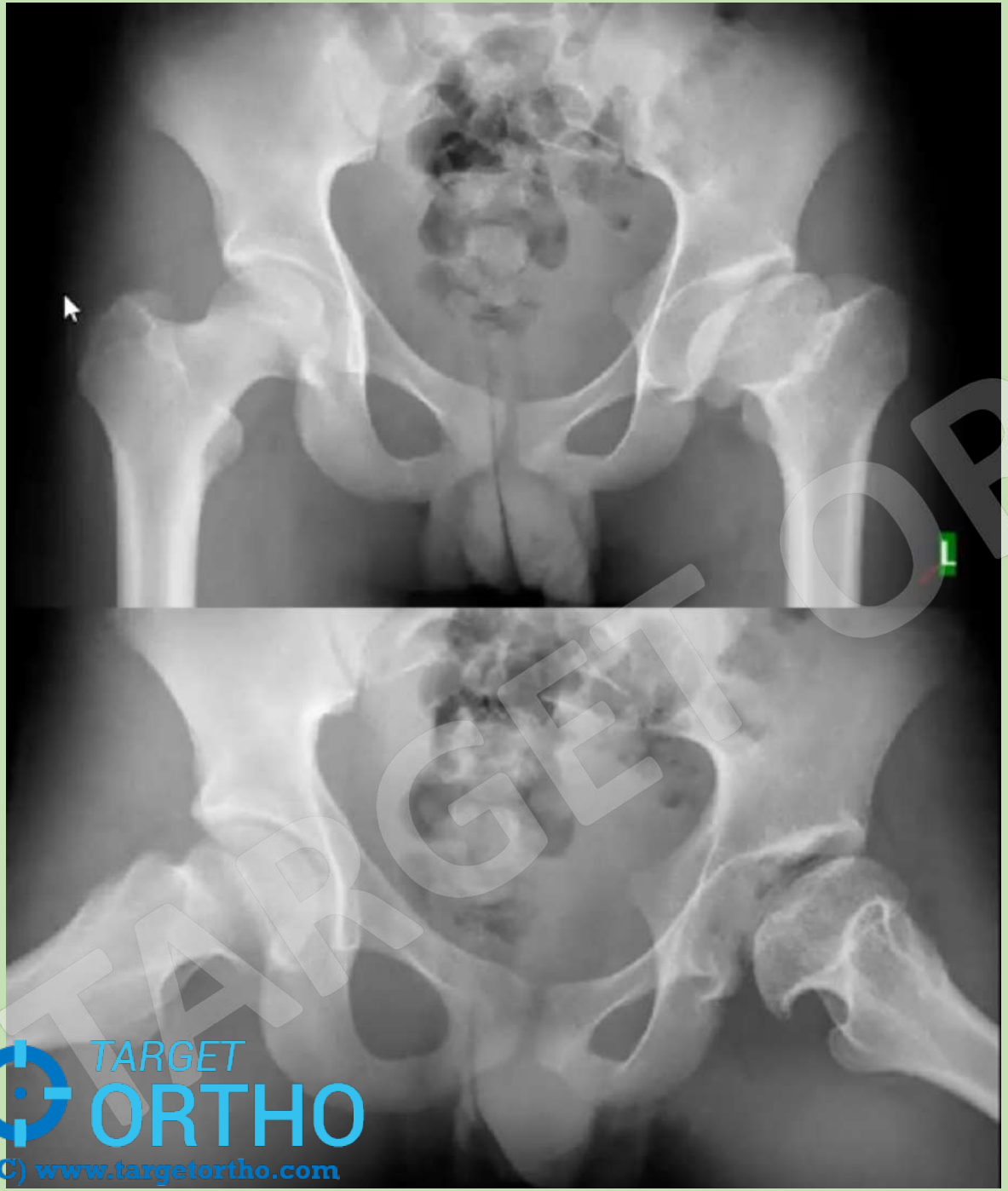
- 2mm concentric circles
- To Objectively measure asphericity

Stulberg Classification

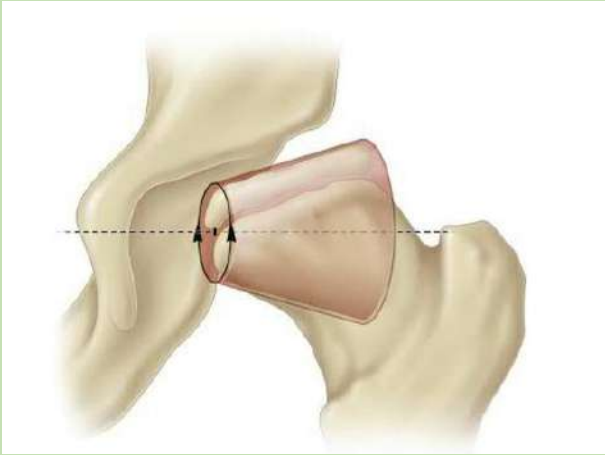
Class	Description	Radiologic aspect	Prognosis
I	Spherical congruent	Normal	Good
II	Spherical congruent, <2mm head shape change	Coxa magna, Breva Irregularis	Good
III	Aspherical congruency >2mm change	Non spherical head, Not flat	Mild to moderate arthritis
IV	Aspherical congruency	Flat head and acetabulum	Moderate to early arthritis
V	Aspherical incongruency	Flat head	Early arthritis

II

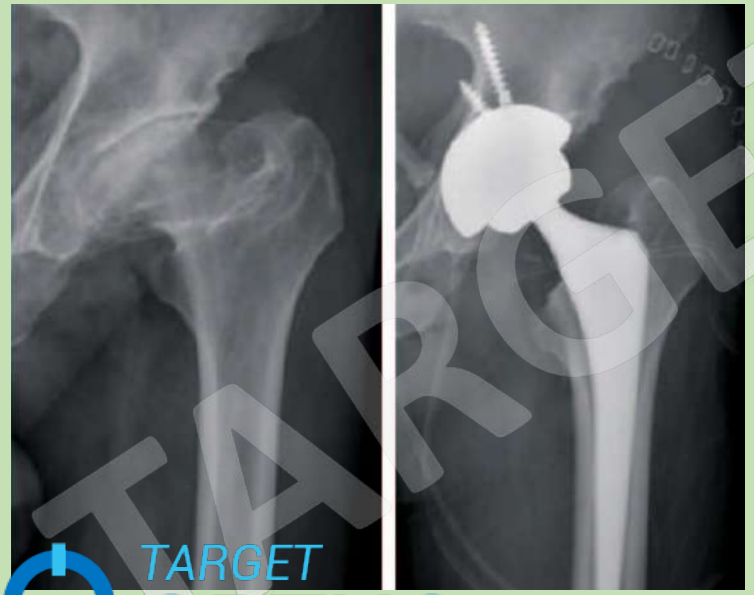
III



IV



V



The final aim of treatment in Perthes disease is :

- Prevent deformity
- Prevent incongruity

- Delay/ Avoid onset of degenerative joint disease in adult life

In Early stage:

Elizabeth towne	Type 1a, 1b	Type 2a, ?2b
Caterall	I	II
Salter Thompson	A	

- Maintanence of motion of hip
- Containment of epiphyseal portion to protect weight bearing region

In Late stage:

Elizabeth towne	?2b, 3a,3b	
Caterall	III	IV
Salter Thompson	B/C	B/C

- Prevent lateral subluxation/ extrusion of hip
- Prevent DJD
- Manage hinge abduction

"Salter's Principles"

Stage of disease: When to contain?

Stage 1a, 1b, 2a	Contain
Stage 2b	Contain if Good ROM
Stage 3a, 3b	Do not contain

Age of onset

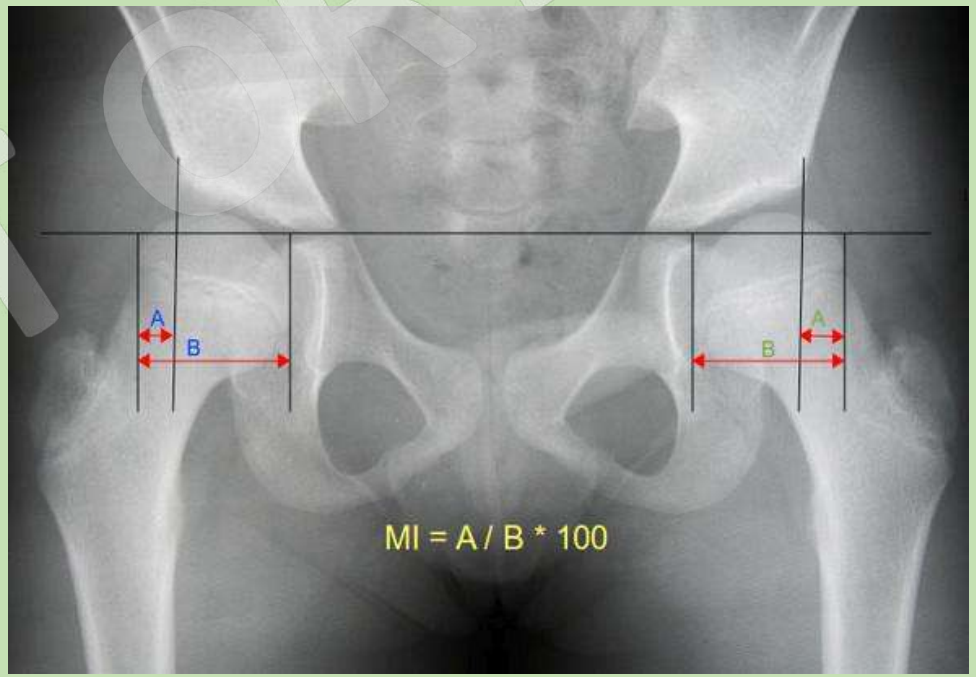
- Early Onset: Age < 6 years → May Wait
- Late Onset: Age 6 to 12 years → Early containment
- Late onset =. Poorer Prognosis

Extent of extrusion

Age < 6 years Extrusion <20%	**Wait. Watch for extrusion**
Age <6 years Extrusion >20%	Contain
Age > 6 Years	Contain, Don’t wait

Extent of extrusion

- Reimer's migration index: =
- a/b x 100



- Extrusion: MI > 20%

Variable	Contain	
Age	>6 or <6 With extrusion	
Extent of involvement	Half or more of epiphysis	
Stage of evolution of the disease	Stage Ia, Ib, Iia and ?Stage Iib	
Extrusion	Present	
Range of Hip motion	Normal	

Variable	Contain	DO NOT Contain
Age	>6 or <6 With extrusion	<6 (No extrusion)
Extent of involvement	Half or more of epiphysis	Less than half of epiphysis
Stage of evolution of the disease	Stage Ia, Ib, Iia and ?Stage Iib	Stage IIIa, IIIb, IV
Extrusion	Present	Absent (<7 Year)
Range of Hip motion	Normal	Restricted

Range of motion

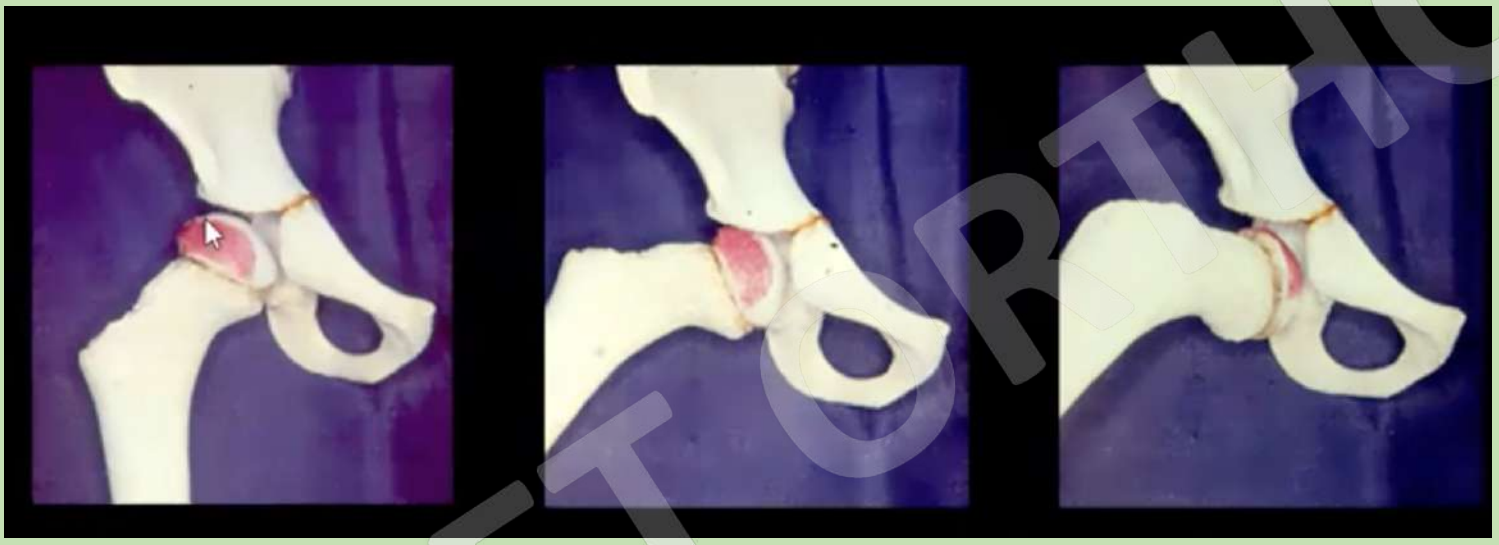
- Perthes: Loss of abduction- Internal Rotation

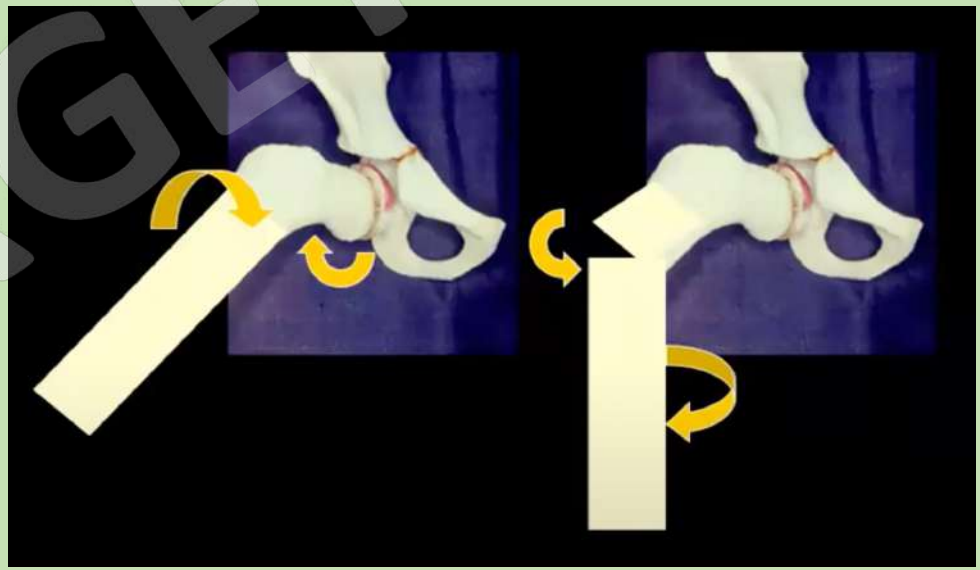
- Varus derotation osteotomy can be performed only if abduction- IR are preserved

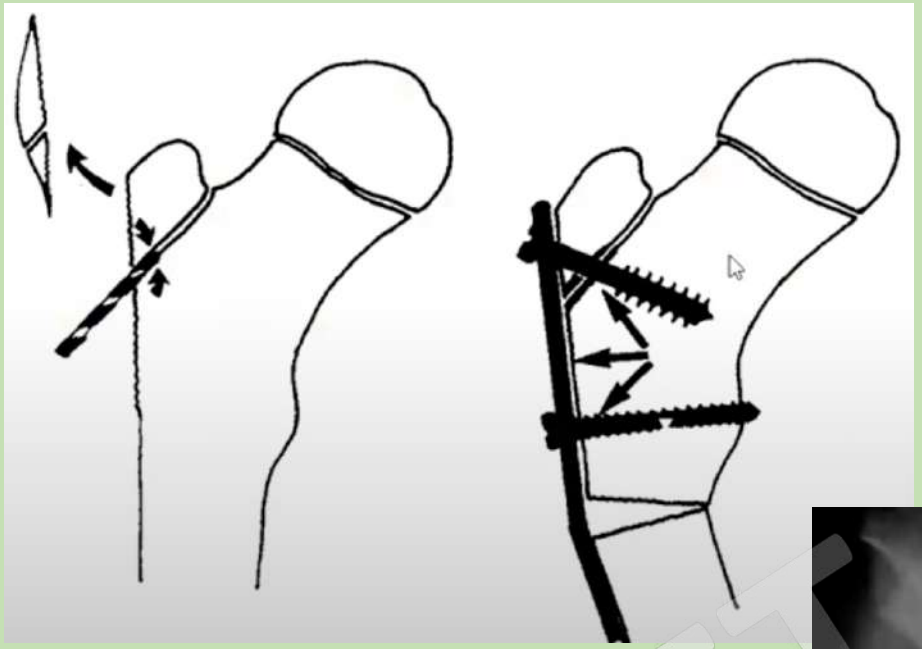
If Stiff

- Traction for 2-3 weeks
- Adductor tenotomy
- Petrie cast/ Abduction brace

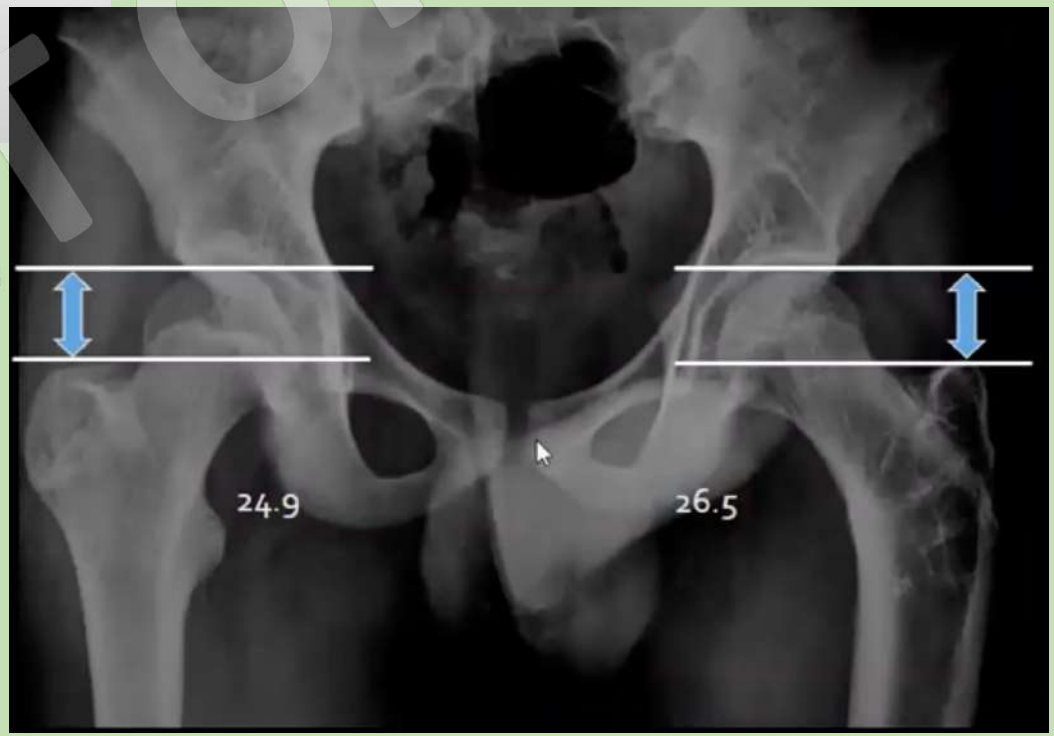
Principle of VDRO



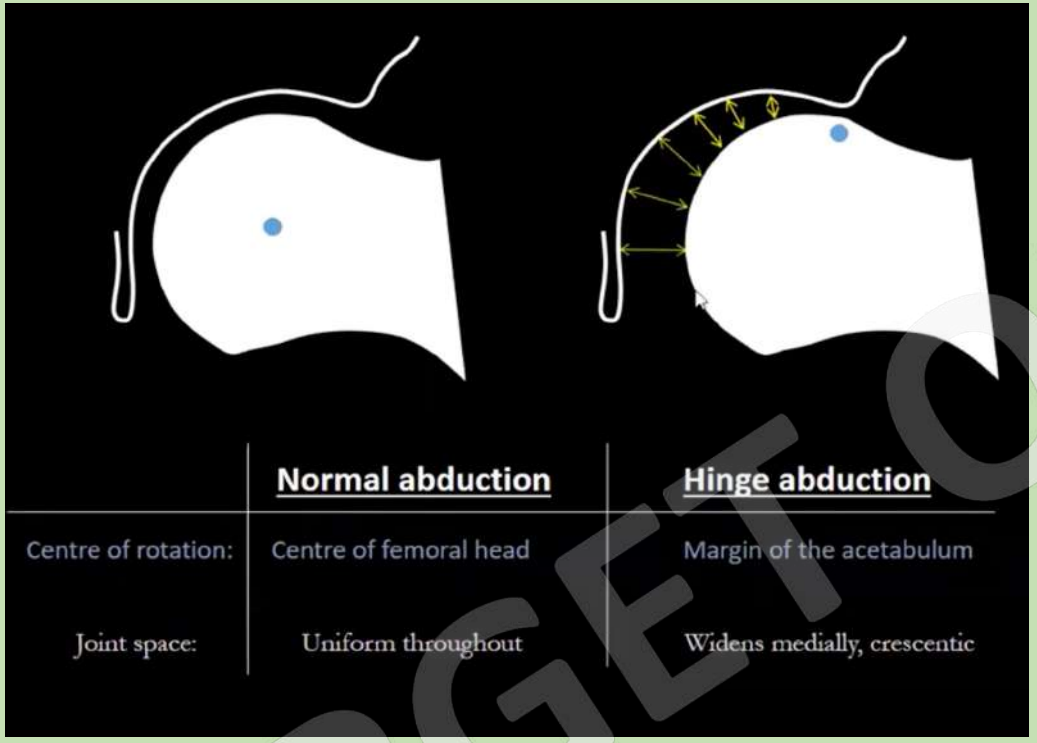




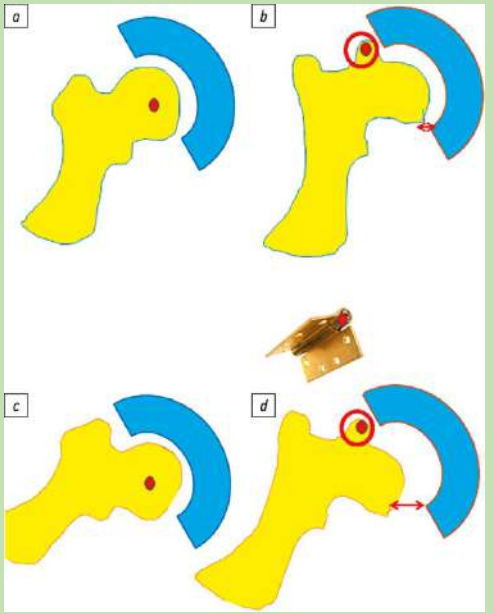
- Not >20* Varus
- Final NSA Not<105*
- GT Epiphysiodesis is important to prevent Trochanteric overgrowth



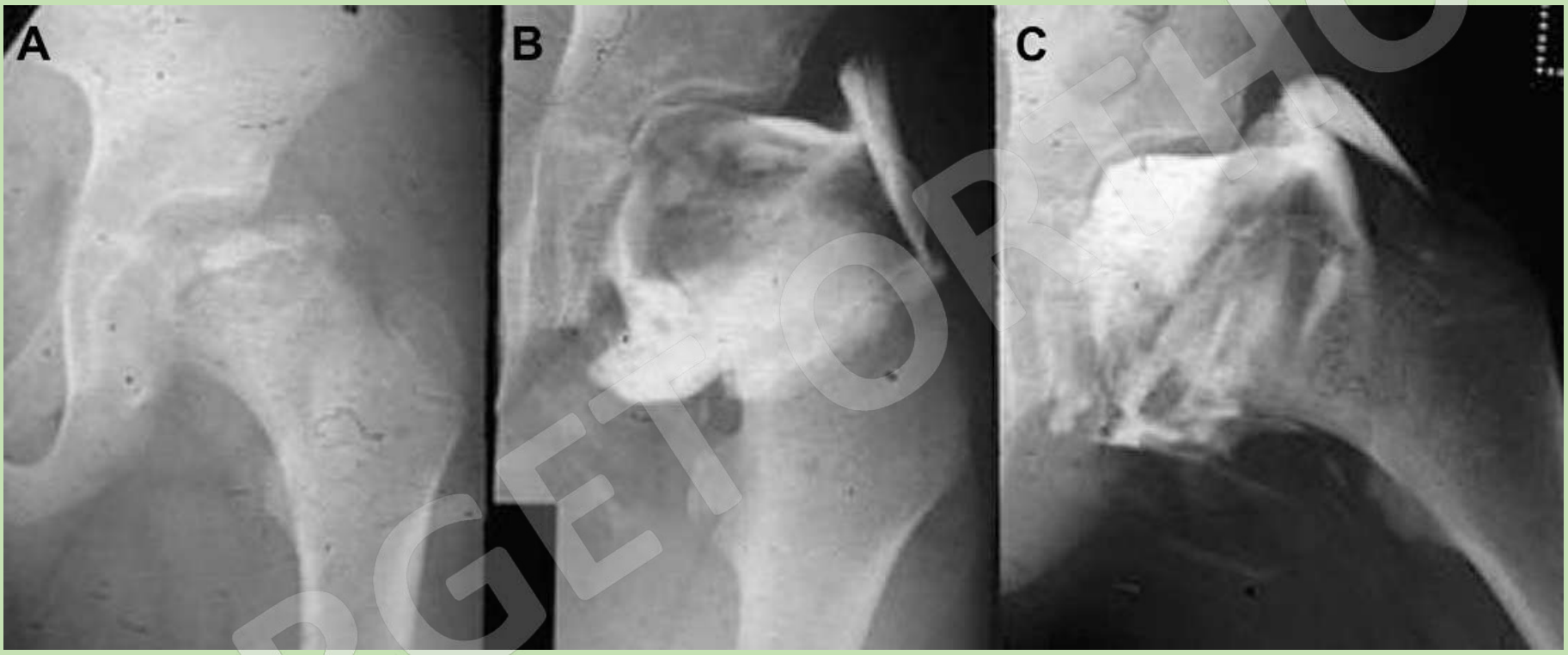
Hinge Abduction: In AIR views

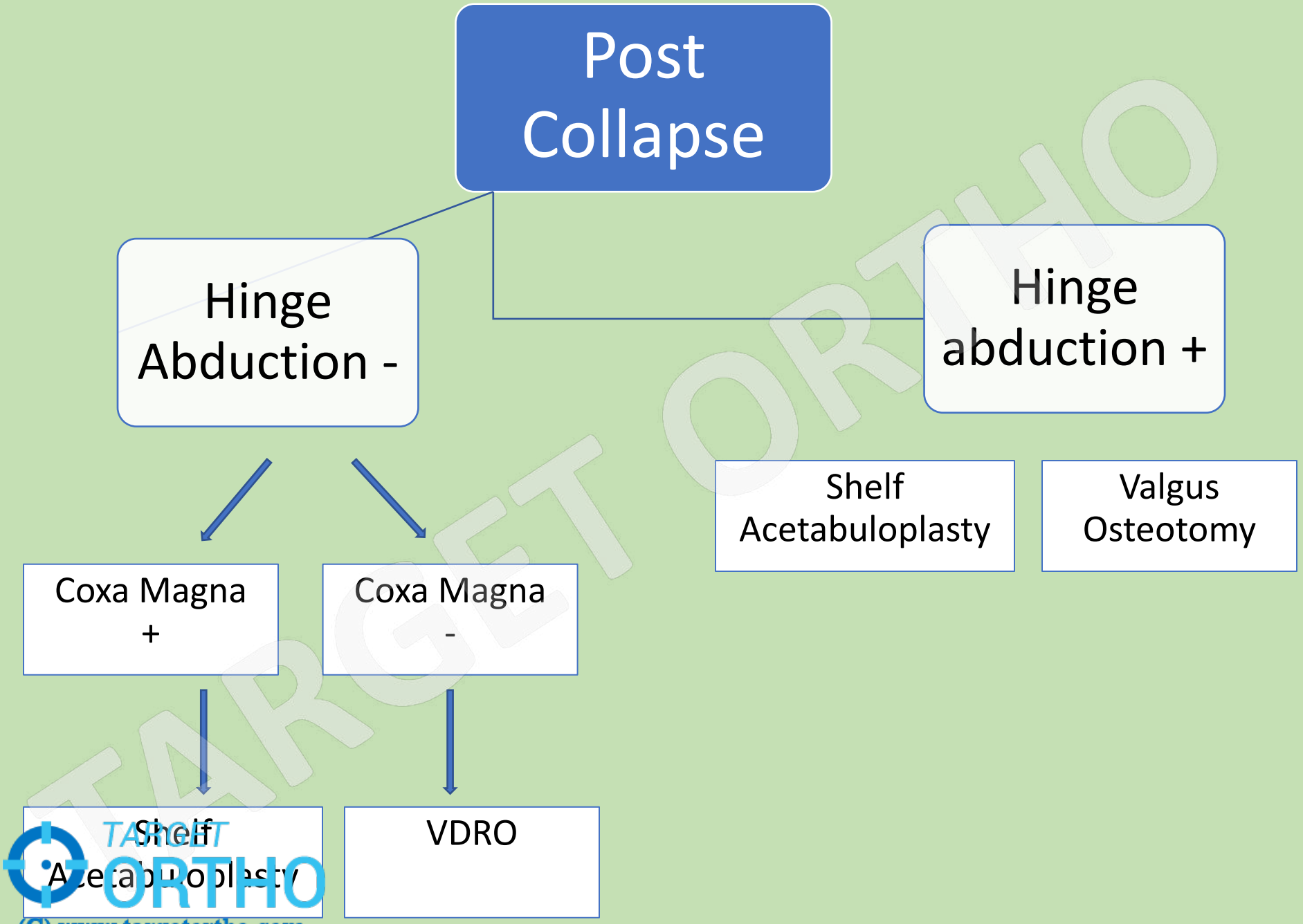


- Advanced stage
- Stiff hip
- CI to VDRO

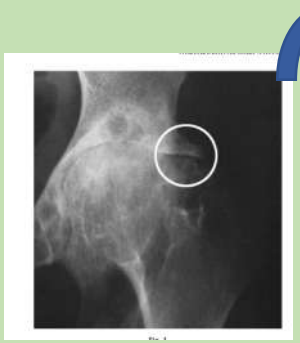


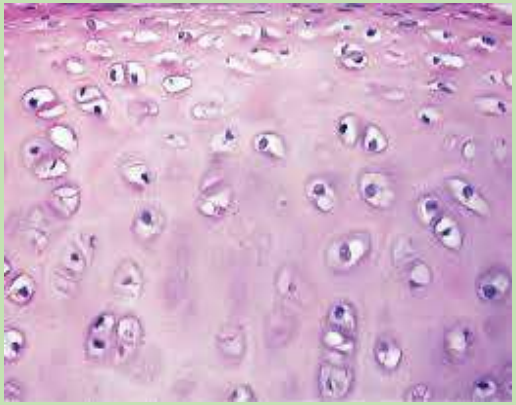
	Normal Abduction	Hinged Abduction
Centre of Rotation	Centre of femoral head	Margin of acetabulum
Joint space	Uniform	Widens medially



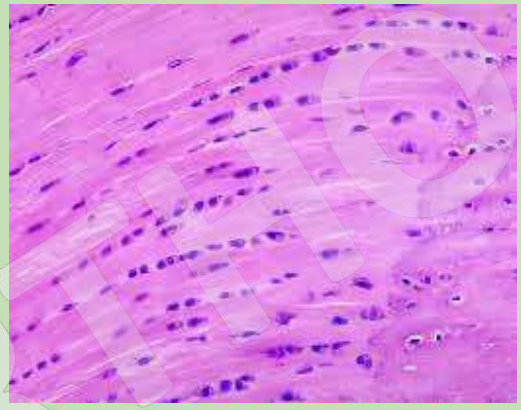


Pathophysiology of shelf acetabuloplasty vs Other pelvic osteotomies:

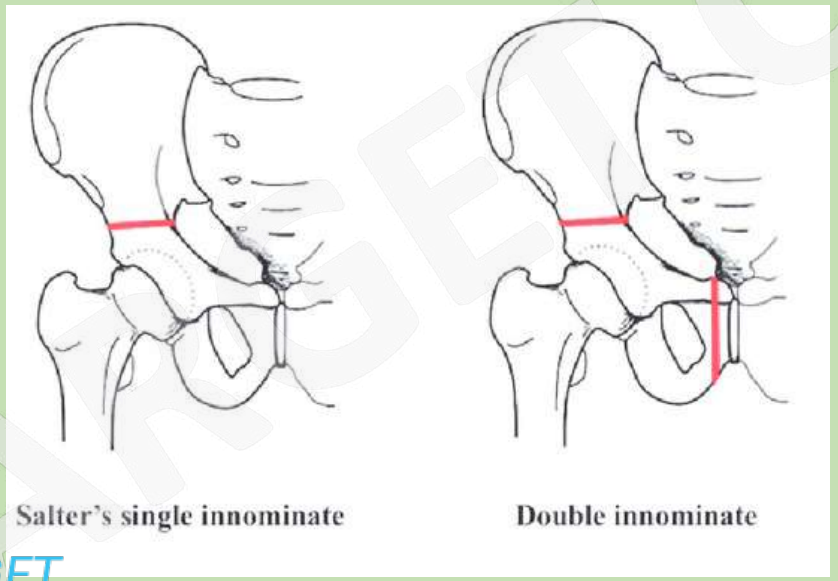


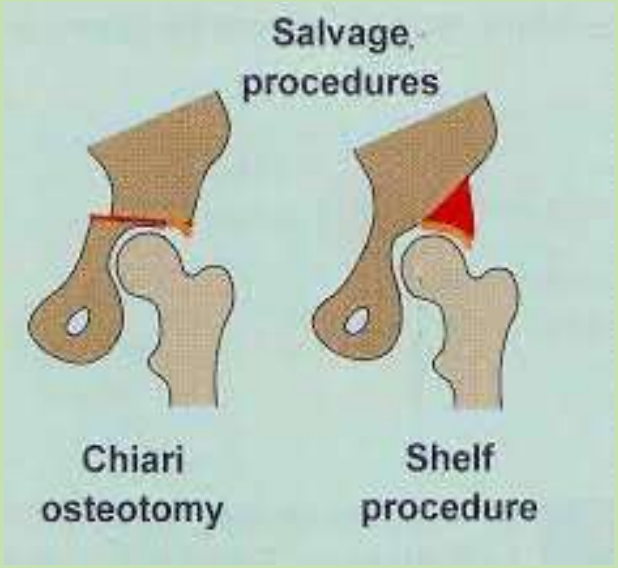


Hyaline Cartilage



Fibro Cartilage





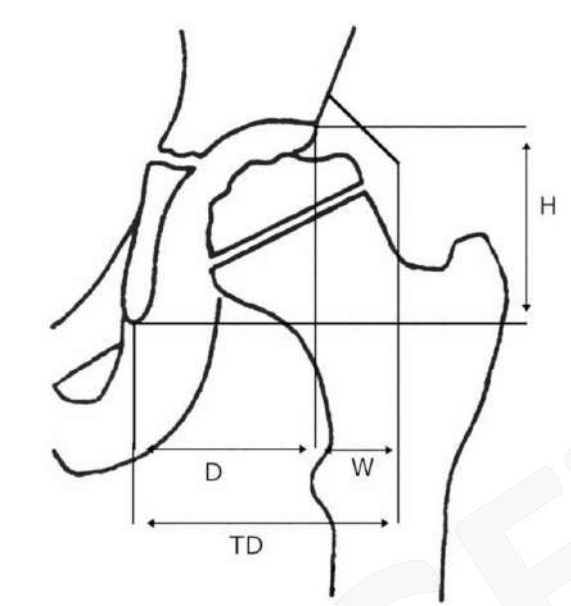
Acetabular augmentation at six- to 30-year follow-up

A BIOCHEMICAL AND HISTOLOGICAL ANALYSIS

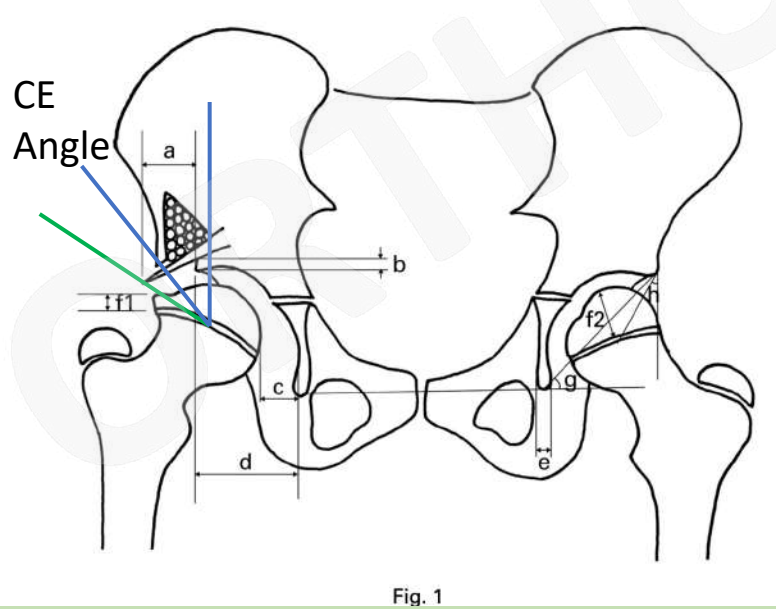
Biomechanics

Lateral acetabular growth stimulation following a labral support procedure in Legg-Calve-Perthes disease

Marcin E Domzalski [1], Joe Glutting, J Richard Bowen, Aaron G Littleton



Total Depth: Depth of Acetabulum + Shelf Width Increases in *labral support procedure* (Shelf)



Decrease in Sharp angle (g)
Increase in Centre Edge angle (CE)

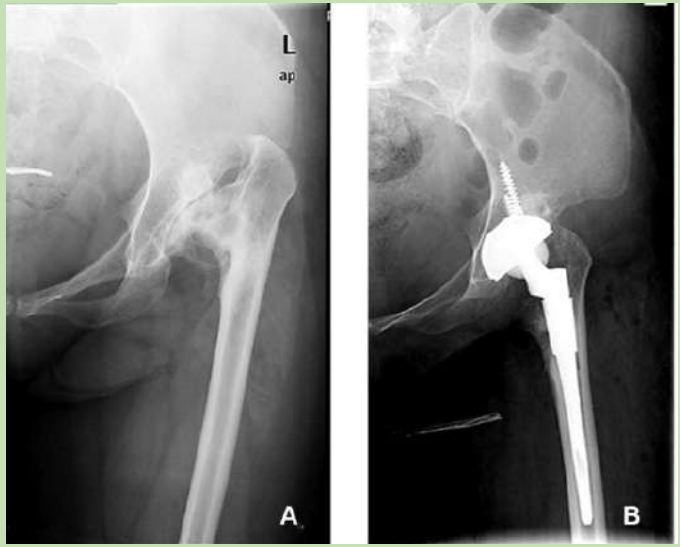
Shelf :

- Prevents lateral subluxation
- Increases containment with acetabular growth stimulation and coverage
- Redirects growth of Proximal femur towards a well reduced hip

Van Der Haven et al, Acta Ortho, 2003; Domzaski et al, JBJS 2006

Benefits

- Limited chance of **malunion/ Non-union**
- No risk of **nerve injury**
- Does **not alter anatomy** to affect future Replacement if needed
- Does not **change shape of femur/ Acetabulum**

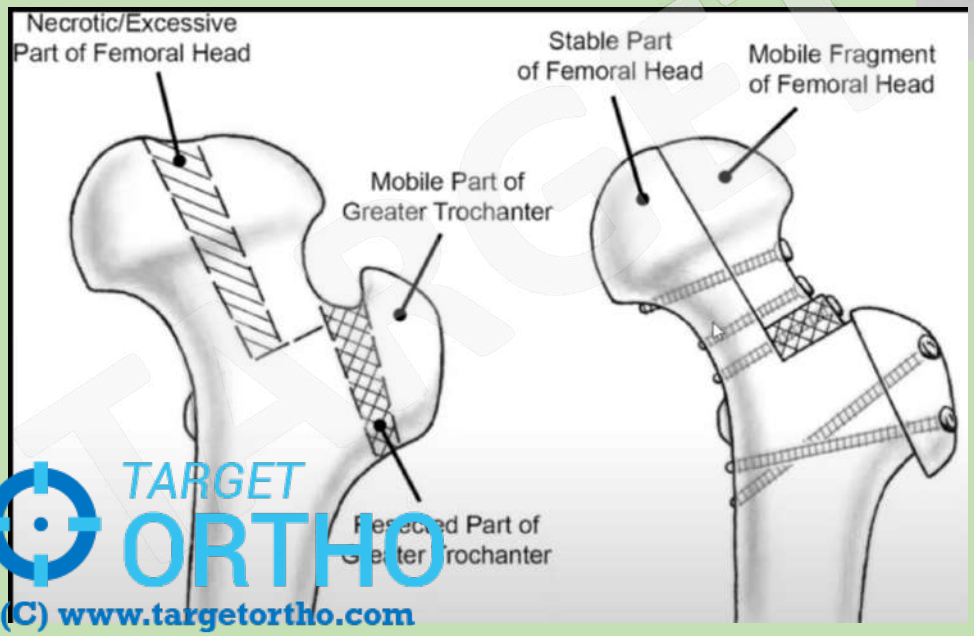


Coxa Breva Management

- Distal GT Transfer
- Relative Neck lengthening
- Absolute neck lengthening

Coxa magna management

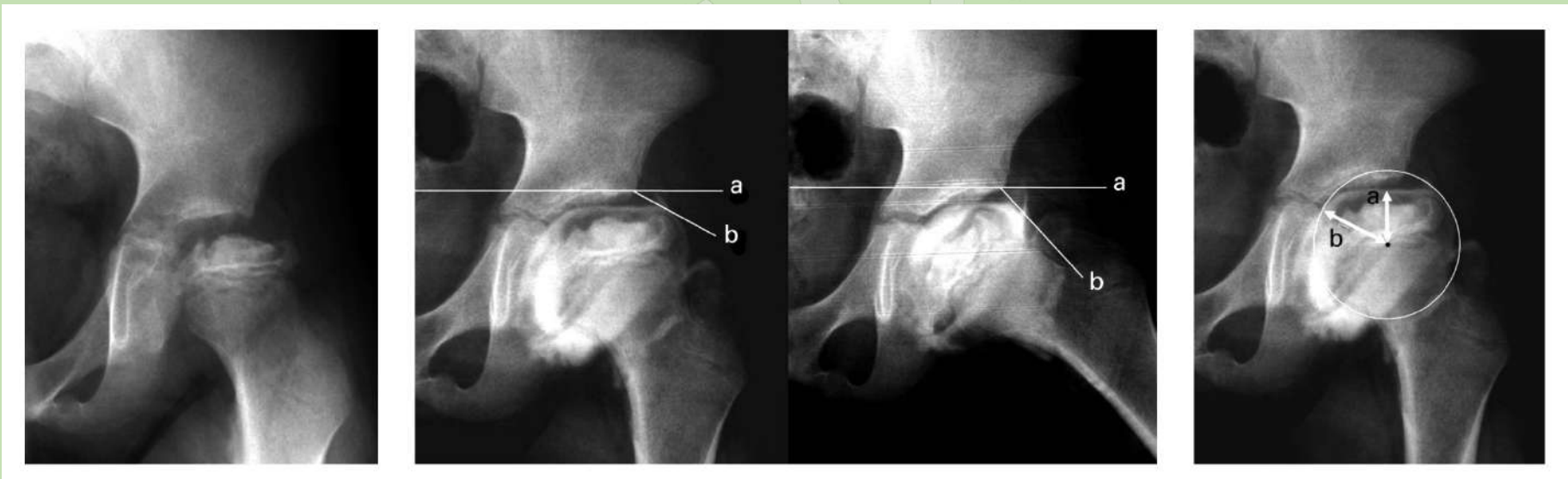
- Acetabuloplasty
- Ganz Head reduction
- Osteochondroplasty



Shelf Acetabuloplasty

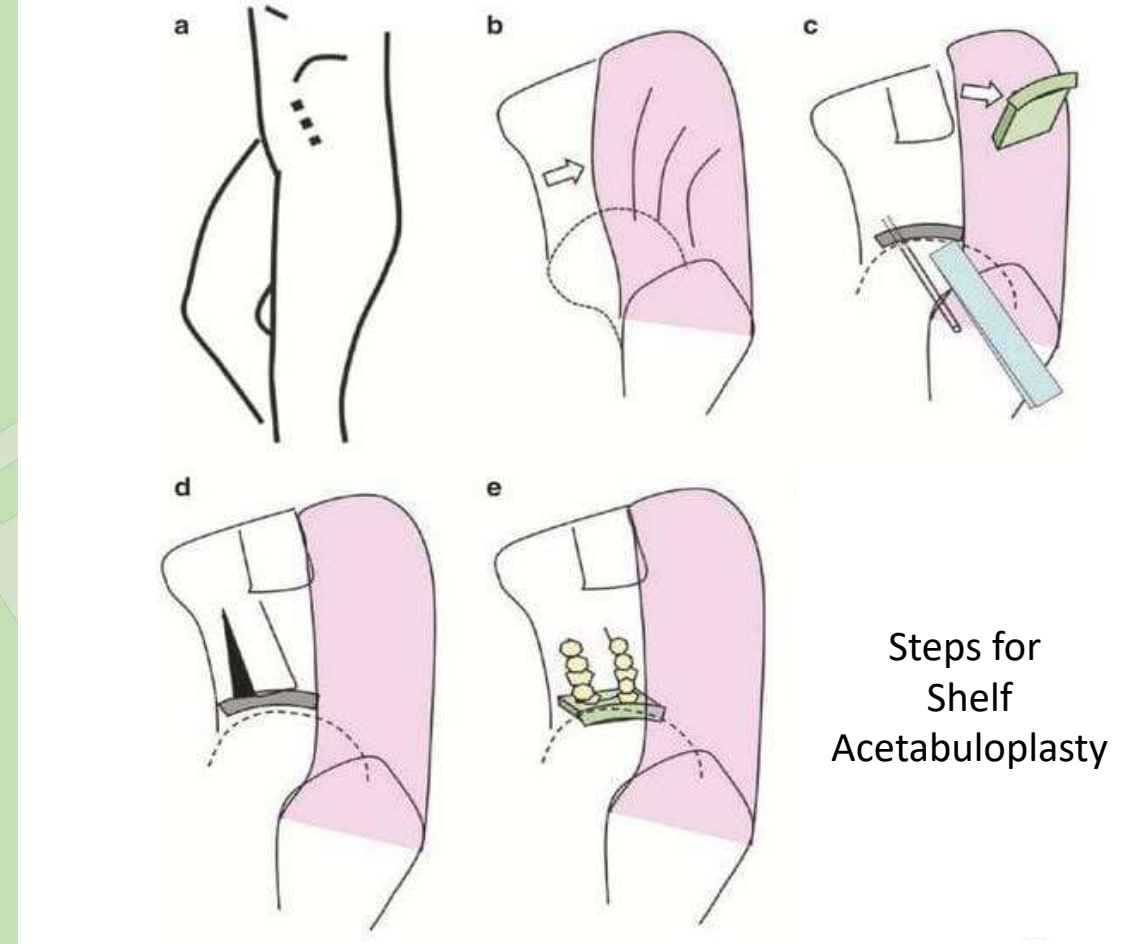
Technique: Step 1

- To assess Reducibility of the subluxation by an intra-operative arthrogram
- If the Hilgenreiner- Labral angle improves to comfortable, consideration for a Shelf is made
- Adductor +/- Psoas tenotomy if needed



Technique: Surgical Steps

- A: Anatomy
- B: detach Rectus reflected head
- C: Create Slot
- D. Develop graft from ilium
- E: Entrap graft in slot
- F: Fill back tendon over graft



Steps for Shelf Acetabuloplasty

Shelf acetabuloplasty

Similarly Treated Case

Immediate Post OP

1 Year Follow up