POST SEPTIC HIP SEQUELAE

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Post septic sequelae

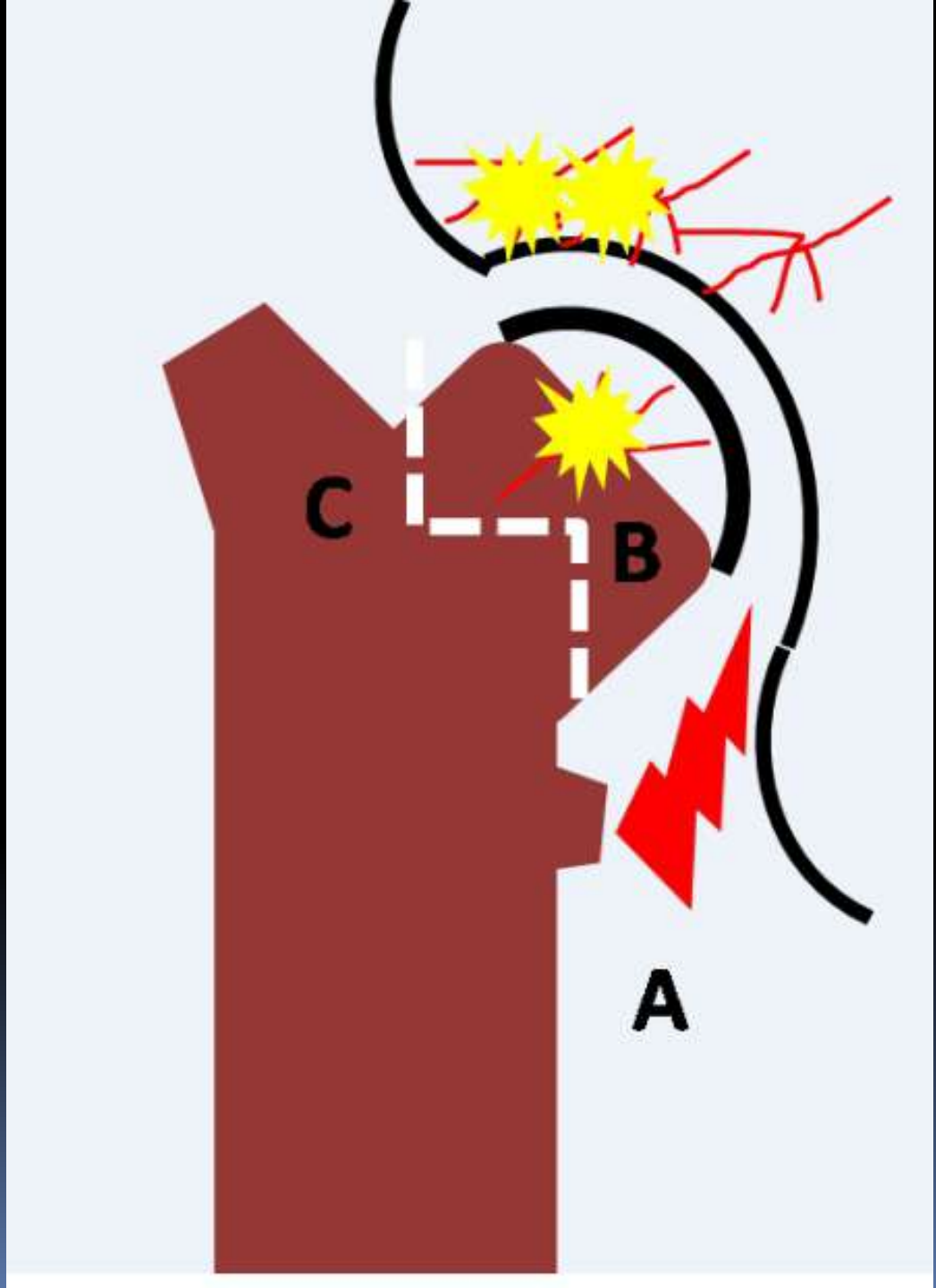
- The long-term effects of initial treatment for infantile septic arthritis of the hip may differ.
- depend on patient age,
- the infecting organism,
- and the timing and adequacy of surgical and pharmacologic treatment

- Formation of septic sequelae of hip.

A. Direct damage by infectious agent/ toxins/ body's response.

B. Tamponade (ischemic) effect.

C. Mechanical failure of pathological bone



Post septic sequelae

- Sequelae are diverse and include
  necrosis of the cartilage,
  ischemic necrosis of the femoral head,
  premature closure of the tri-radiate cartilage,
  acetabular dysplasia,
  premature or asymmetric closure of the proximal femoral physis,
  subluxation,
  dislocation,
- Pseudo-arthrosis of the femoral neck,
- Greater Trochanteric overriding,
- and complete destruction of the femoral head and neck.

- When severe destruction of the proximal femur with loss of physeal growth occurs, functional disabilities are enormous in affected children.

- When only a remnant of the femoral head and neck is present, maintaining a stable reduction is difficult,

- and if instability and dislocation persist,

- one is left with the decision to accept the deformity or to attempt reconstruction of a femoral–pelvic articulation

- Continued observation results in proximal iliac dislocation with a marked abductor lurch, a telescoping limp, and leg-length inequality.

- they are at risk for degenerative changes in the lumbosacral spine and hip.

Radiographic classification

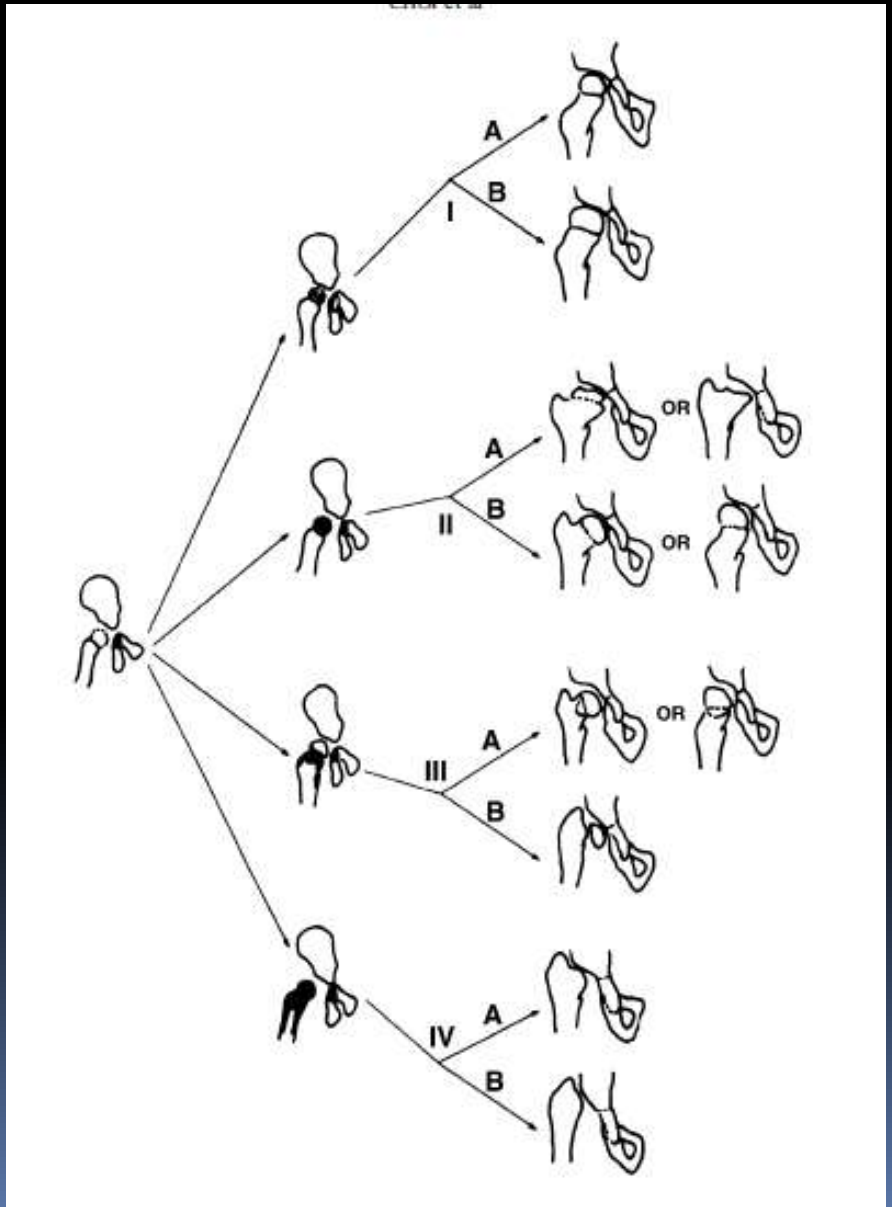
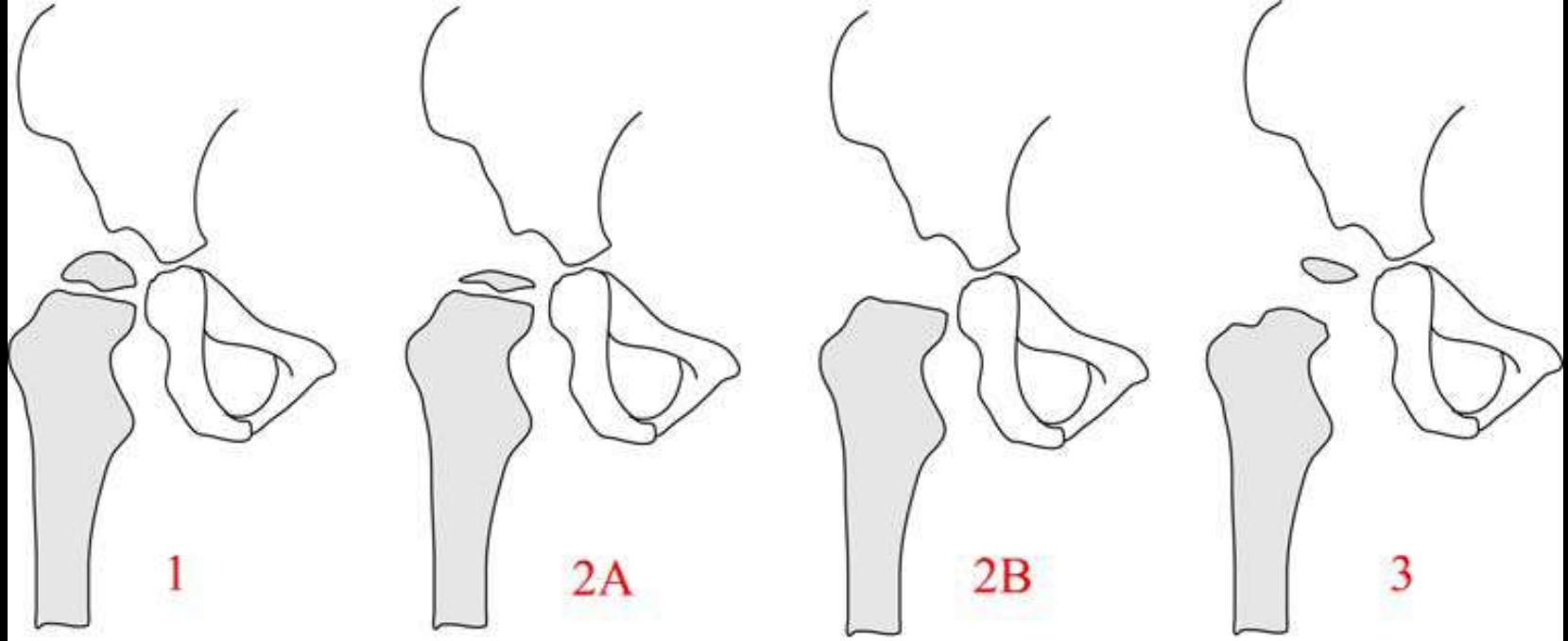
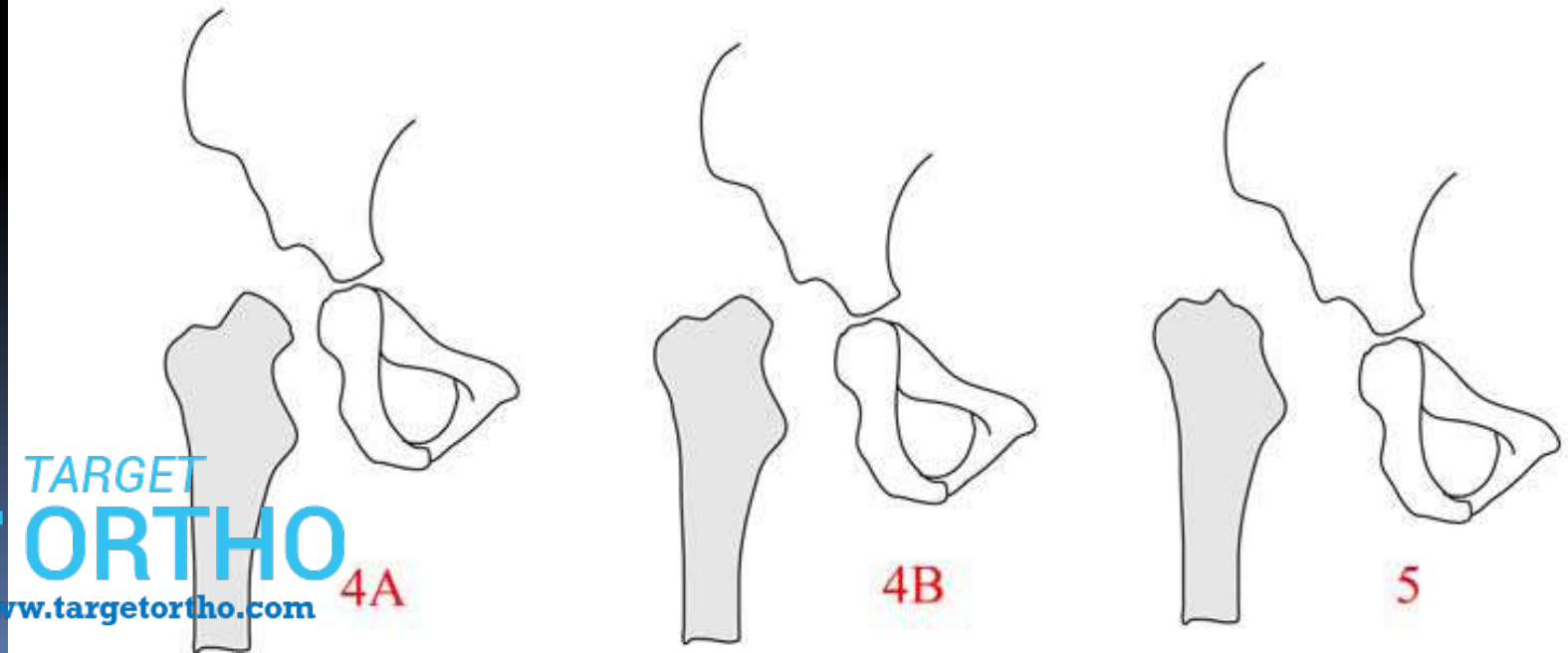


Table 2: Different classifications of sequelae of septic hip with reference to Choi's classification*

Hunka (1982)	Choi (2006)	Forlin and Milani (2008)	Johari (2011)
I	IA	-	-
Minimal or no femoral head changes	Almost normal hip		
IIA	IB	-	4
Deformity of the femoral head with an intact physis	Almost normal hip with mild coxa magna		Articular incongruity, avascular necrosis, coxa magna, physeal disturbance (coxa brevia/ vara/ valga and trochanteric overgrowth) (Stable)
IIB	IIA	1A Femoral head within acetabulum and total or part of femoral head present /	1
Deformity of the femoral head with premature fusion of the physis	Coxa breva, flattening and irregularity of the femoral head, femoral neck may be short and wide, relative overgrowth of trochanter	1B	Loss of capital femoral epiphysis/ neck, metaphyseal spike present (stable)
IVA		Femoral head within acetabulum and no femoral head present	3B
Complete destruction of the proximal femoral epiphysis with a stable neck fragment			Subluxation, capital femoral epiphysis present
IIB	IIB	1A	4
	Progressive coxa vara/valga,		
	flattening and irregularity of the femoral head, femoral neck may be short and wide, relative overgrowth of trochanter, coxa magna may be associated		
IIA	IIIA	1A	4
	Angular		
	deformity with severe anteversion or retroversion		
III	IIIB	1A	5
Femoral neck pseudarthrosis	Pseudarthrosis		Pseudarthrosis of femoral neck (stable/unstable)
IVB	IVA	2A	3A
Complete destruction of the proximal femoral epiphysis with a small unstable neck fragment	Unstable persistent remnant of the femoral neck	Hip dislocated and total or part of femoral head present	Dislocation, capital femoral epiphysis present (unstable)
			3B
			Subluxation, capital femoral epiphysis present (unstable)
V	IVB	2B	2
Complete destruction of the head and neck to intertrochanteric line with dislocation of hip	Complete loss of the femoral head with no vestige of an articulation	Hip dislocated and no femoral head present	Loss of capital femoral epiphysis and neck (unstable)

*Approximate, based on available descriptions from original text





Type I

- the growth of the proximal femoral ossification center results in an almost normal hip (type IA)
- or in mild coxa magna (type IB).
- For type I deformities, delay of ossification, mottling, or fragmentation of the proximal femoral ossific nucleus is followed by rapid and complete re-ossification,
- the proximal femoral physis remains viable with little or no shortening of the femoral neck, and acetabular development is adequate.

Type II

- The epiphysis, physis, and metaphysis are involved, with resulting coxa breva (type IIA) or progressive coxa vara or coxa valgus (type IIB).

- These hips usually have radiographic evidence of delayed ossification, flattening and irregularity of the femoral head and coxa magna.

Type II

- The femoral neck is short and wide, and there is relative overgrowth of the greater trochanter because of premature closure of the capital physis.
- When there is early symmetric closure of the proximal femoral physis (type IIA), coxa breva with overriding of the trochanter develops, which is associated with a resultant limp and considerable LLD.
- When premature physeal closure is asymmetric and incomplete, the femoral neck progressively grows into varus or valgus alignment with secondary acetabular dysplasia.

Type III

- In these hips, the deformity is secondary to injury of the femoral neck and results in angular deformity with severe anteversion or retroversion (type IIIA) or in pseudarthrosis (type IIIB).

- This deformity is reported infrequently and may be secondary to osteomyelitis of the femoral neck.

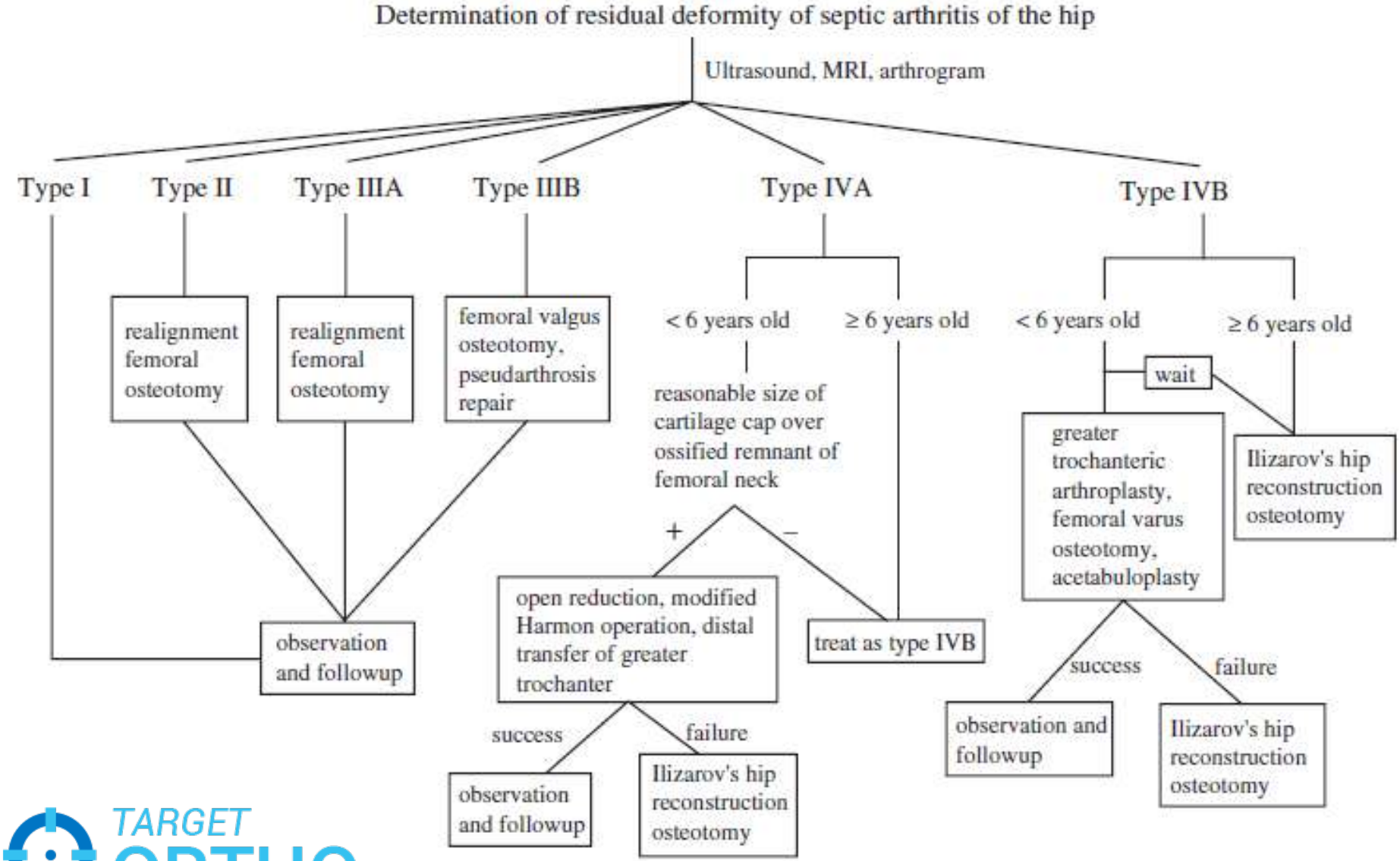
Type III

- Hips that have type-IIIA sequelae have severe coxa vara or coxa valga in association with extreme anteversion or retroversion, whereas those with type-IIIB sequelae have pseudarthrosis of the femoral neck with complete epiphyseal slipping.

- These changes result in an altered acetabular development, limb-length discrepancy, and relative trochanteric overgrowth.

Type IV

- Complete destruction of femoral head and neck.
- Only remnant present



Management

- Various treatment modalities have been described to manage post-septic hip sequelae.

- The principal objectives of treatment and common ways of achieving them include:

- Improving head coverage - Abduction cast or brace, open reduction, femoral and/or pelvic osteotomy, osteochondroplasty.

- Limb length equalization – Shoe raise, contralateral epiphysiodesis, ipsilateral limb lengthening.

- Providing stable hip - Closed/ open reduction, femoral and pelvic osteotomies

Improving abductor insufficiency

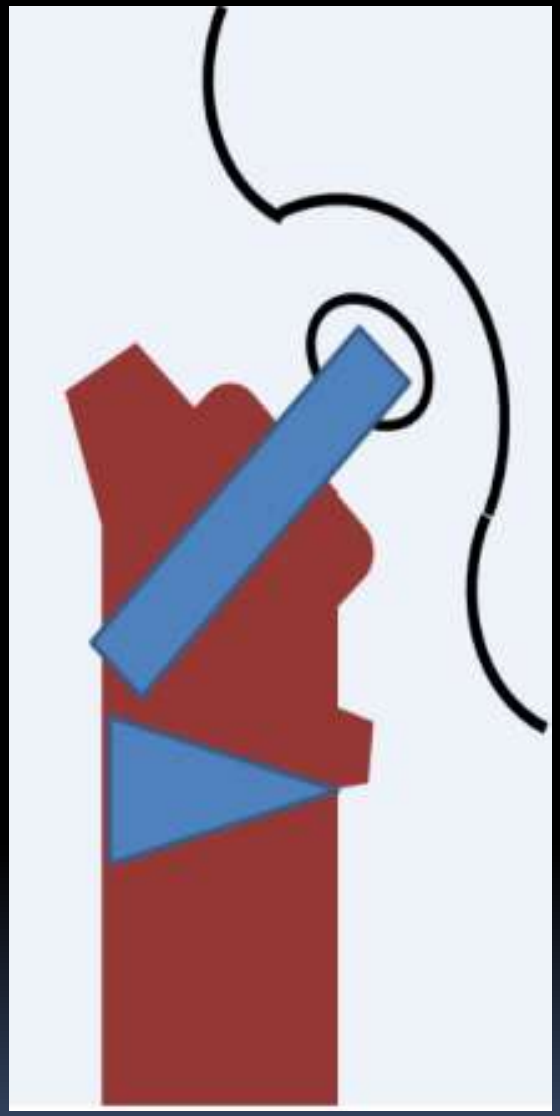
- Trochanteric arthroplasty,
- neck lengthening procedures (Wagner femoral neck lengthening, Hasler and Morscher's modification of Wagner's osteotomy, Papavasiliou technique, Kruminis modified Illizarov technique etc.),
- distal lateral transfer of greater trochanter,
- femoral and/or pelvic osteotomies

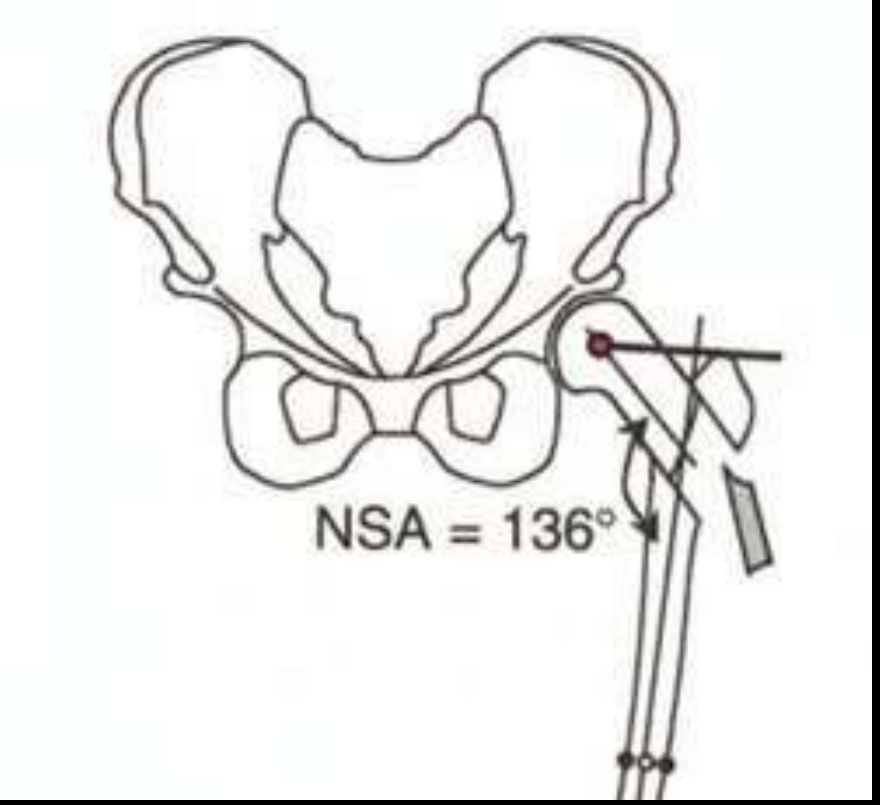
- Restoring alignment - Femoral and/or pelvic osteotomies.
- Salvage procedures- arthroplasty, fusion.
- Special procedures for loss of head and neck (Choi type IV A and B).
- Albee, L'Episcopo and Harmon described similar procedures in younger children with severe sequelae of suppurative arthritis

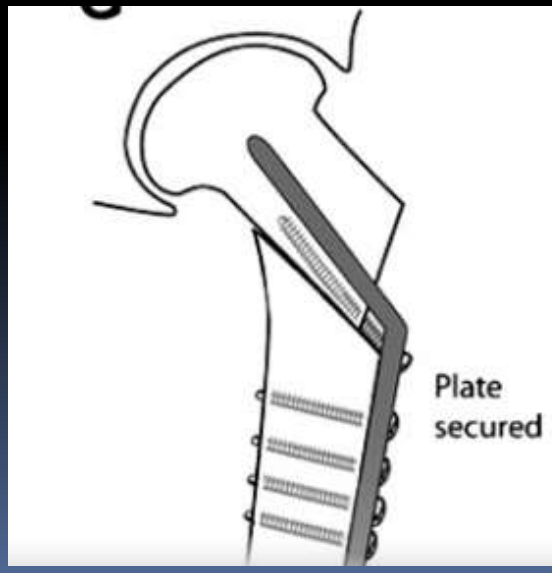
- Albee arthroplasty was originally described for non-union neck femur by excising the head of femur and placing the denuded portion of greater trochanter into the acetabulum, thus creating a longer neck for better abductor function.

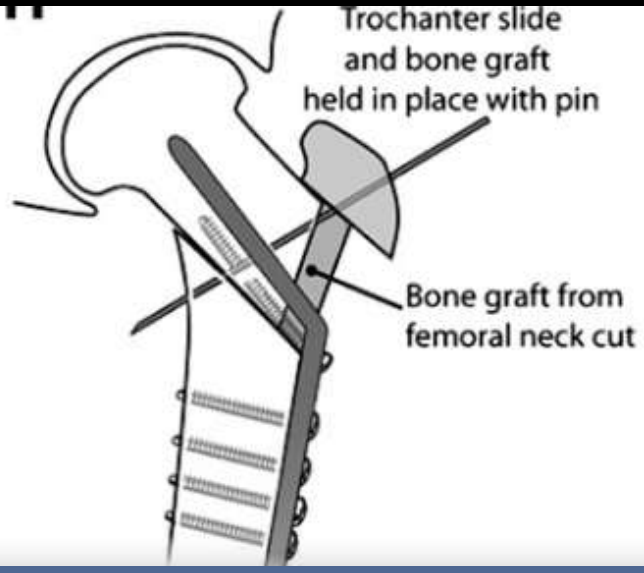
- Modified Albee arthroplasty involves removal of greater trochanter and creating an incomplete greenstick fracture at base of medial fragment while maintaining the normal neck shaft angle between medial fragment and proximal femoral shaft

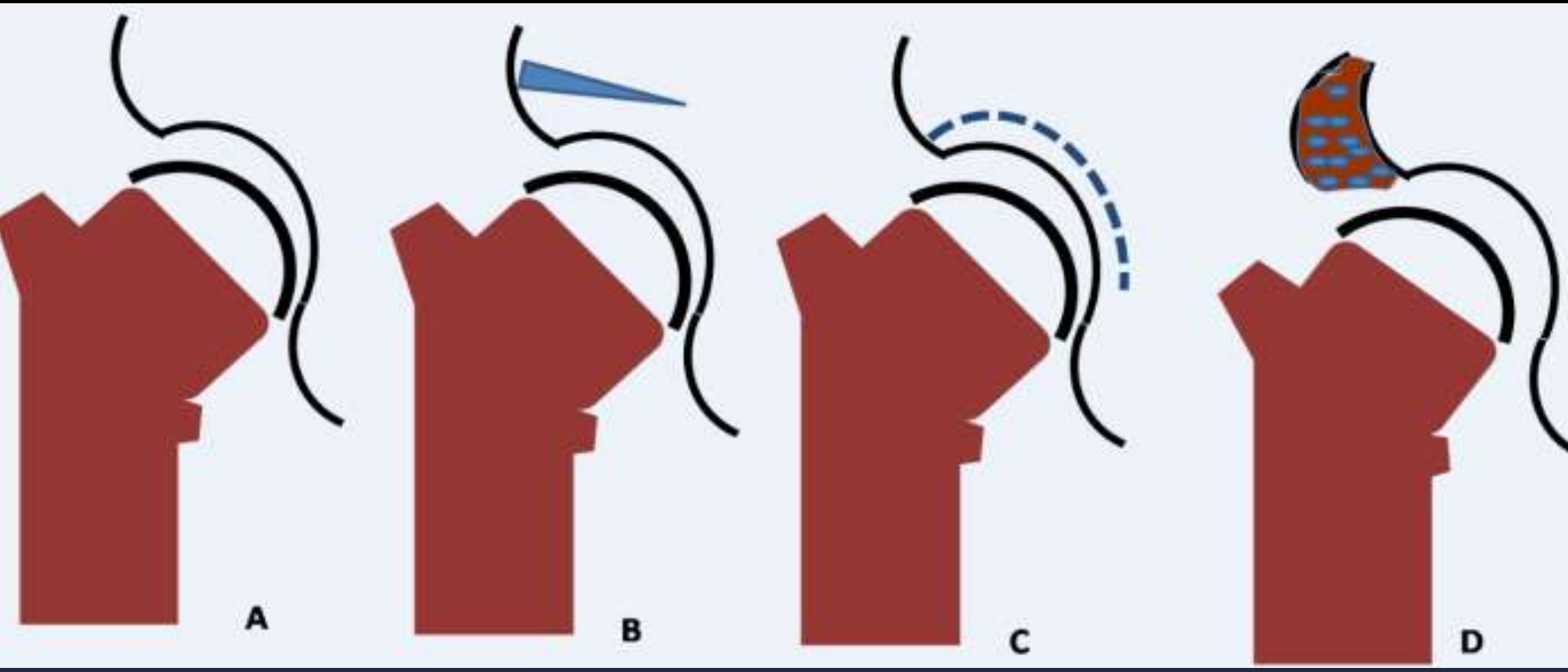
- L'Episcopo (1936) slit the proximal remnant end of the femur and directed the medial half into the acetabulum .
- Choi et al used modified Harman procedure to produce neck lengthening effect in hips with a preserved cartilage cap.
- An incomplete, open wedged osteotomy was made at the base of the proximal femoral remnant adjoining the greater trochanter.
- Open wedge defect was filled with cartilaginous bone graft from the iliac crest.

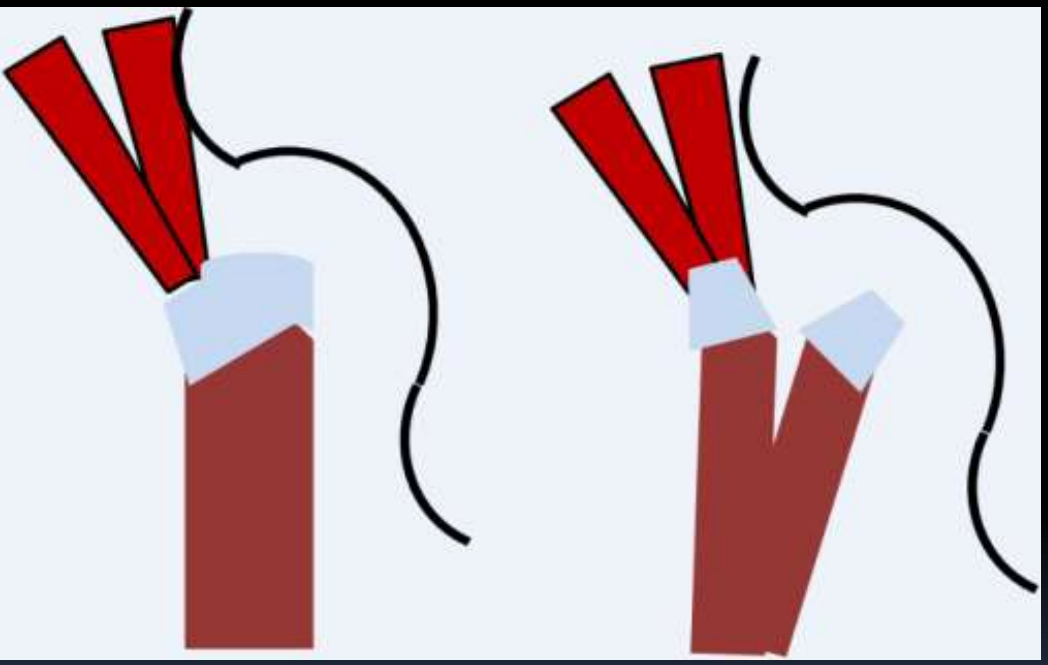








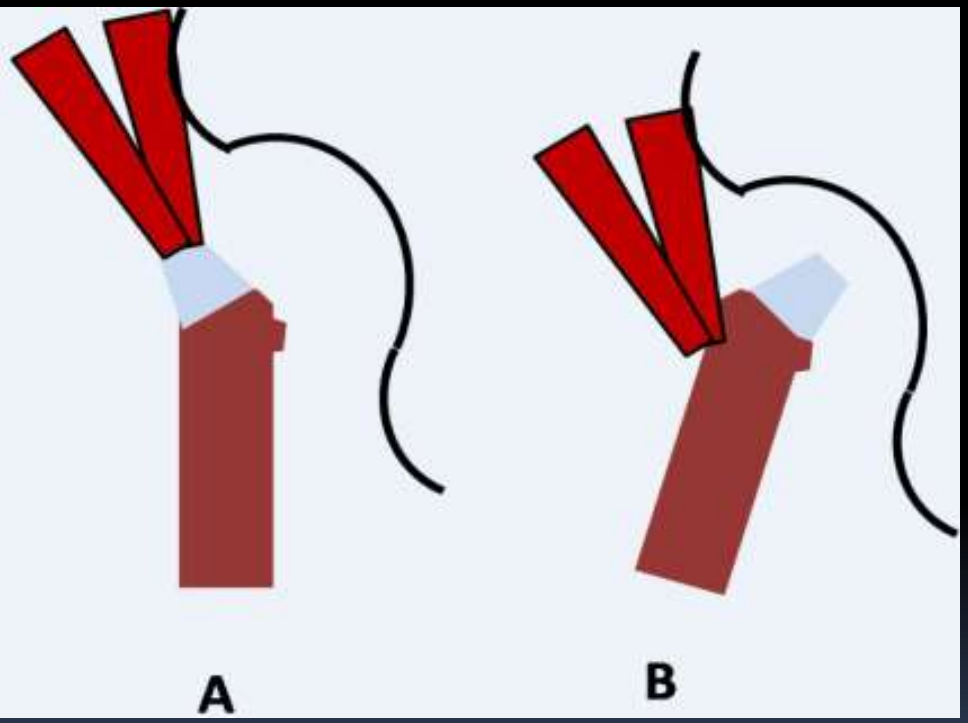




- Choi IV sequelae. Diagrammatic representation of basic principle in Albee, L'Episcopo and Harmon procedure.

- The proximal available portion of femur is split and medial part is inserted into acetabulum for formation of a femoro-pelvic articulation.

Trochanteric arthroplasty



- The trochanter is freed of all attachments and placed deeply within the acetabulum.
- Abductor muscles are transferred distally.
- Often proximal femoral varus osteotomy and/ or acetabular procedure is added.

- Osteochondroplasty
- Head reduction

Pelvic support osteotomy/

Ilizarov hip reconstruction

Introduction

- Subtrochanteric Osteotomy
- restores hip stability,
- reduces the Trendelenburg's gait,
- and achieves a pain-free hip.

Introduction

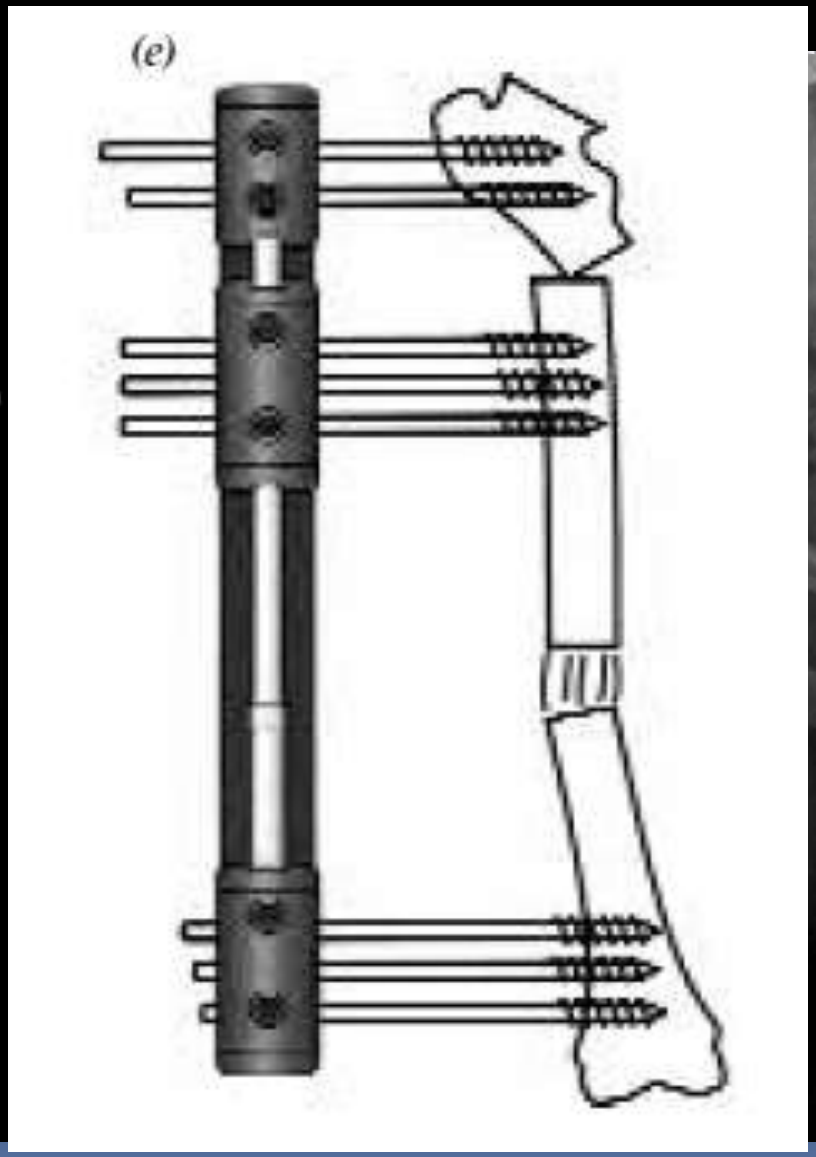
- The first PSO description is attributed to Bavoier in 1838.

- Lance in 1936, was the first to use the term 'pelvic support' in reference to subtrochanteric osteotomies for the treatment of congenital dislocation of the hip

Introduction

- Subtrochanteric osteotomy :

  - Lorenz Bifurcation
  - Milch Osteotomy
  - Hass Modification
  - Schanz Osteotomy
  - Ilizarov's Hip reconstruction



Salvage procedure

- Indications:

  - Infantile and early Childhood Septic Arthritis or Osteomyelitis of Proximal Femur

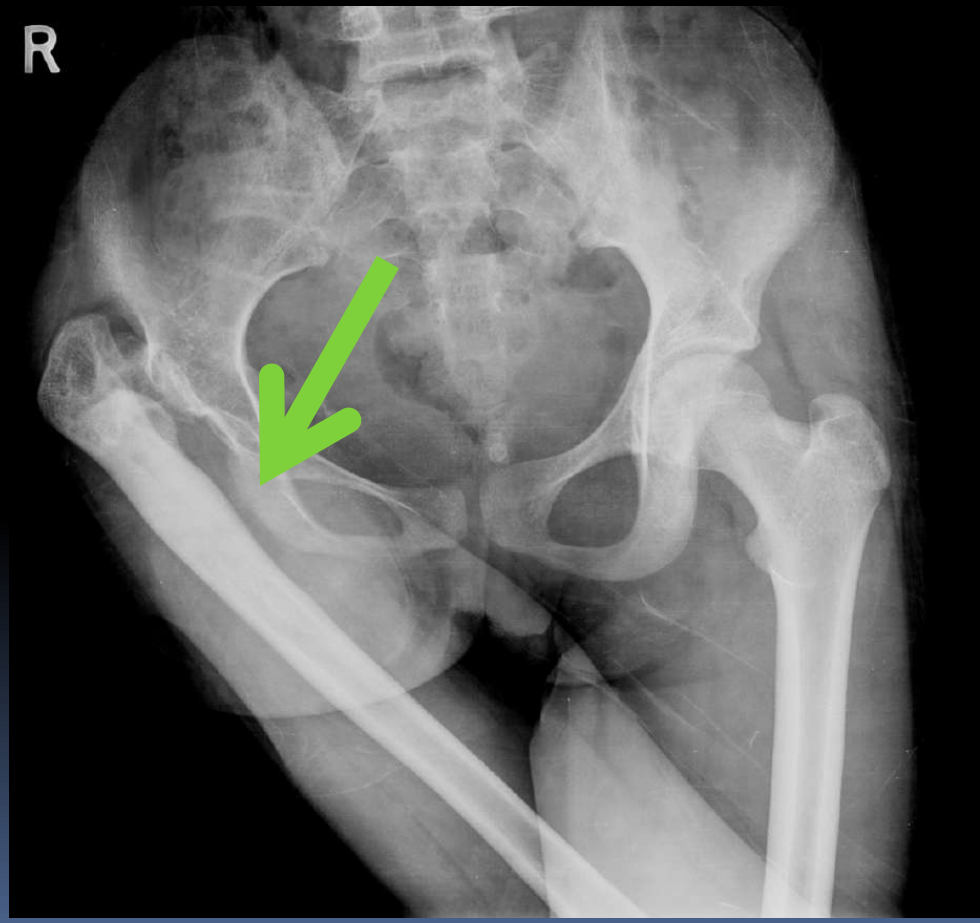
  - Femoral Neck Pseudoarthrosis

Age

- Minimum age : controversial
- Most of the authors recommend PSO after skeletal maturity.
- Choi et al advocated early operation.

Level of osteotomy

- Lorentz , Hass, Milch and Schanz had performed osteotomy at the subtrochanteric level.
- Dimitrios and Nayagam description.
- 1 FIRE – ischial tuberosity



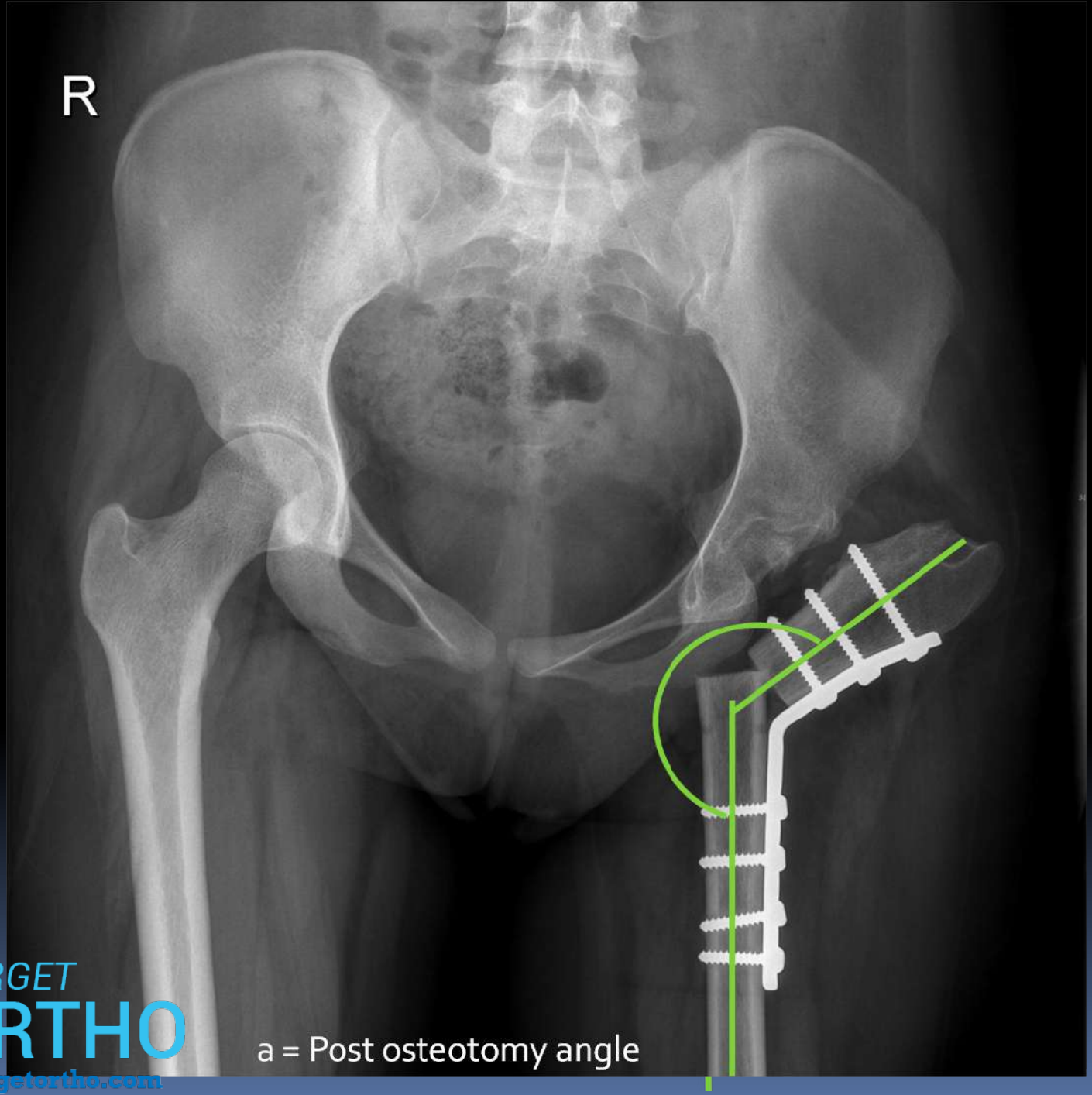
Valgus angle

- The optimum extent of angulations is necessary for a good outcome.
- If the angle is too small, the hip biomechanics will not be sufficiently improved.
- if it is too large, there will be excessive knee valgus, fixed pelvic obliquity, and an impingement pain when the patient adducts the lower limb to a neutral position.

Valgus angle

- Maximum adduction possible + adduction contracture + overcorrection factor 15-30°.

1. Pafilas D, Nayagam S. The pelvic support osteotomy: indications and preoperative planning. Strategies Trauma Limb Reconstr. 2008 Sep;3(2):83–92.
2. Rozbruch SR, Paley D, Bhave A, Herzenberg JE. Ilizarov hip reconstruction for the late sequelae of infantile hip infection. J Bone Joint Surg Am. 2005 May;87(5):1007–18.

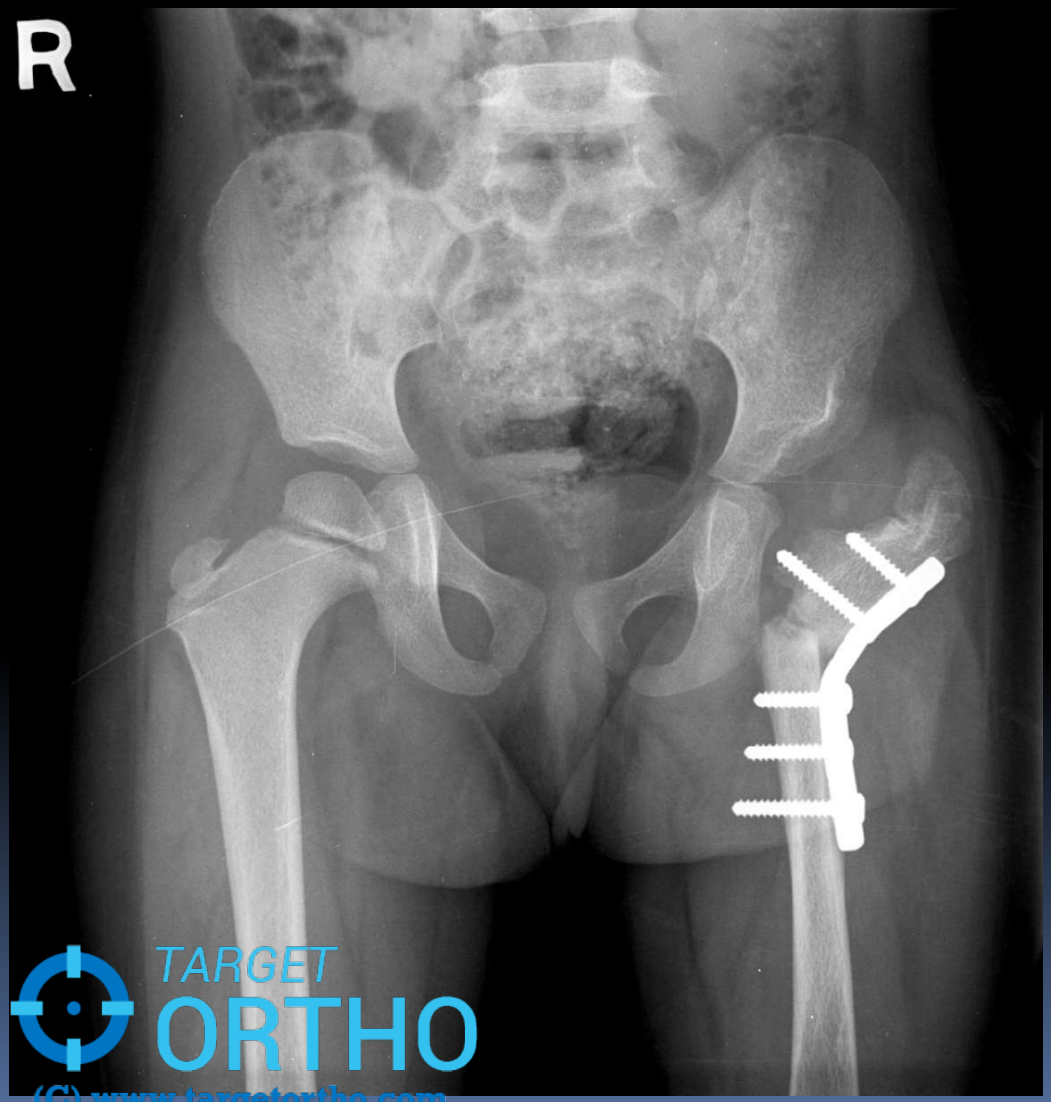


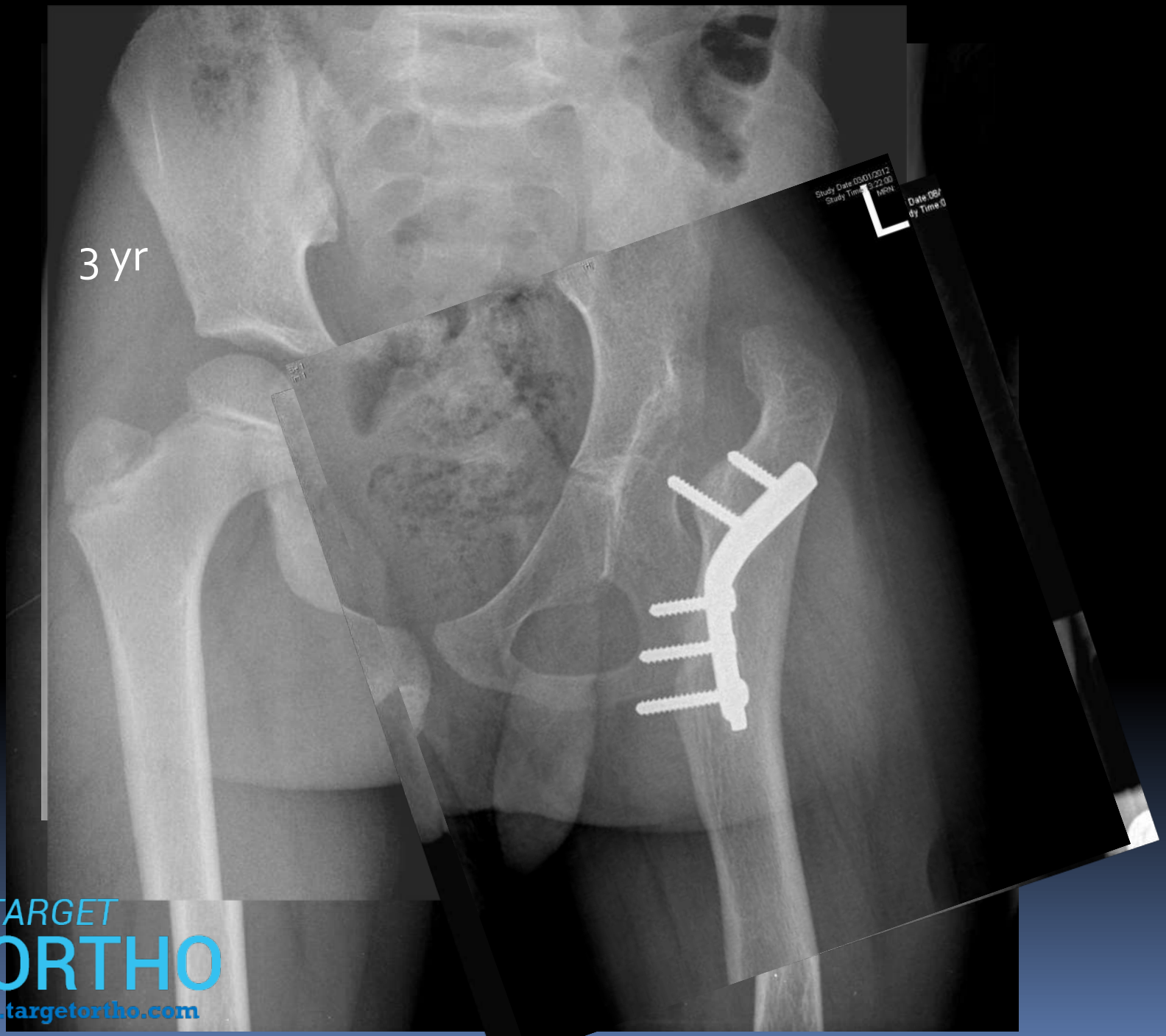
Surgical procedure

- Supine position, lateral position in 3 patients with severe adduction contracture.
- Through direct lateral approach proximal femur exposed.
- Level of osteotomy checked and marked under II.

5 yr old girl PSS

Immediate post-op



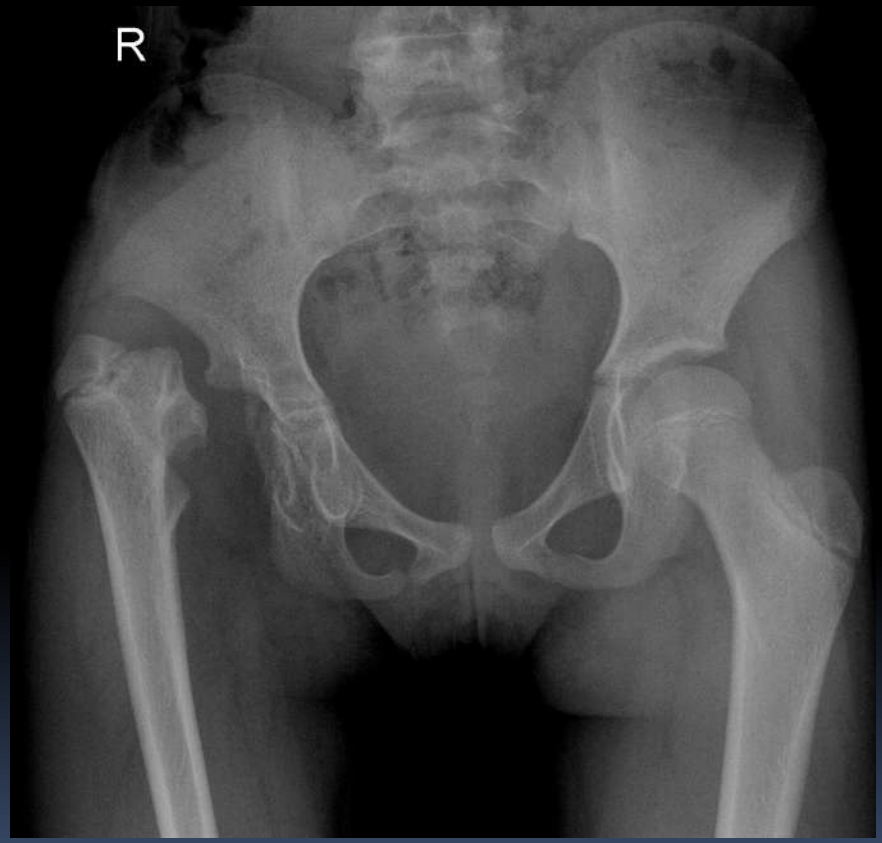


4 yr

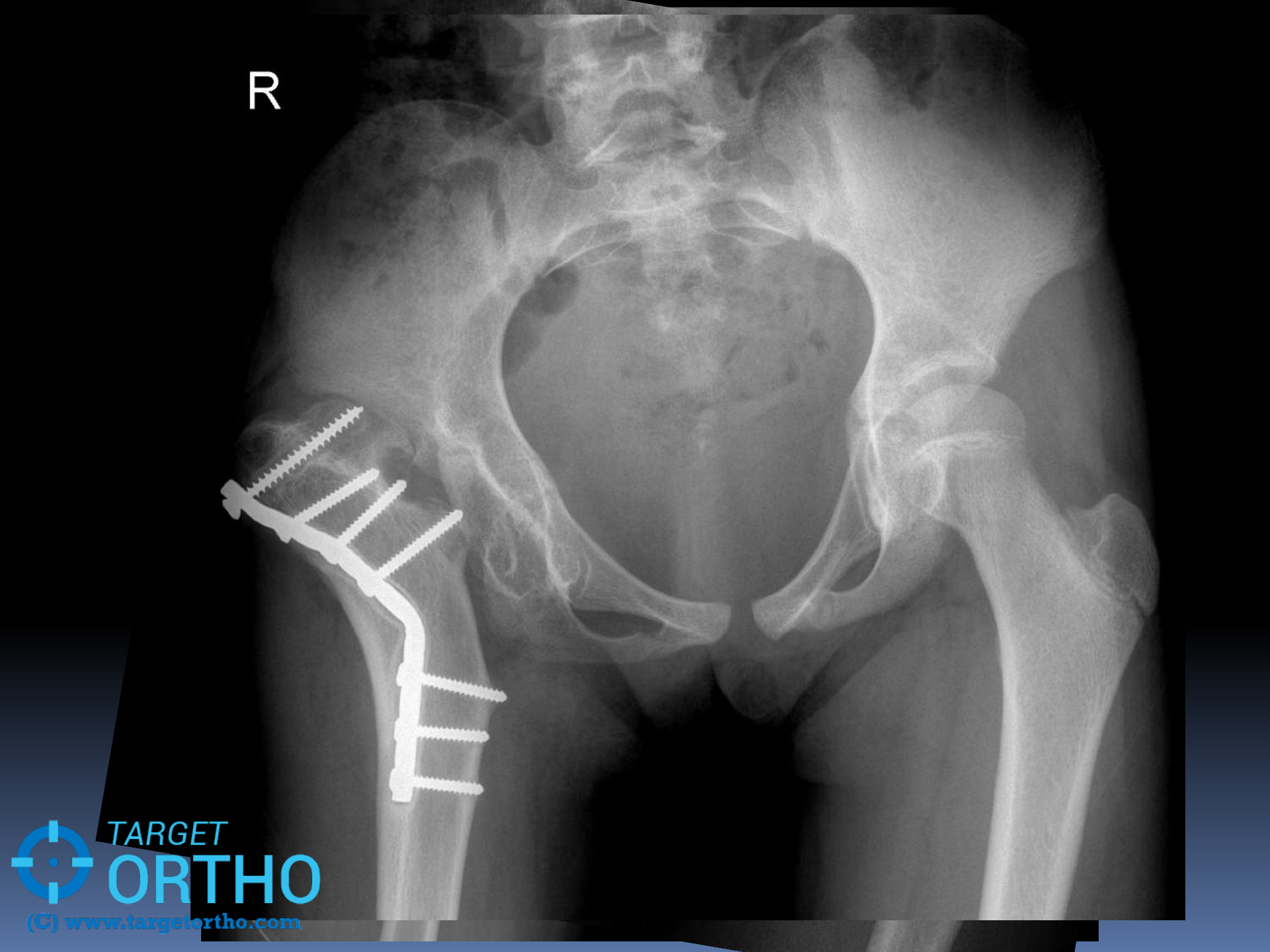
6 yr

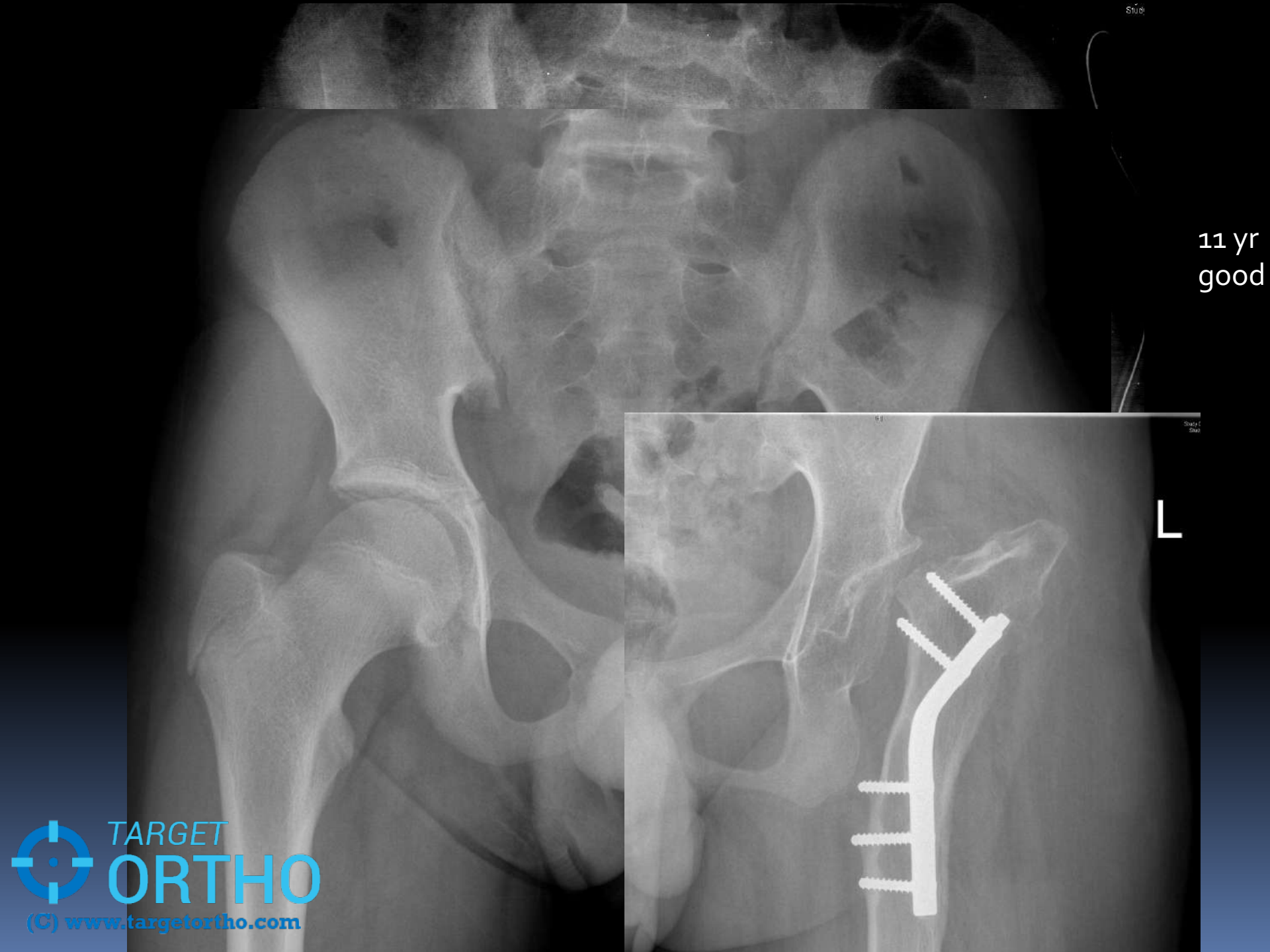
16 yr old girl
Good outcom

8 year old girl a case of post septic hip arthritis sequalae

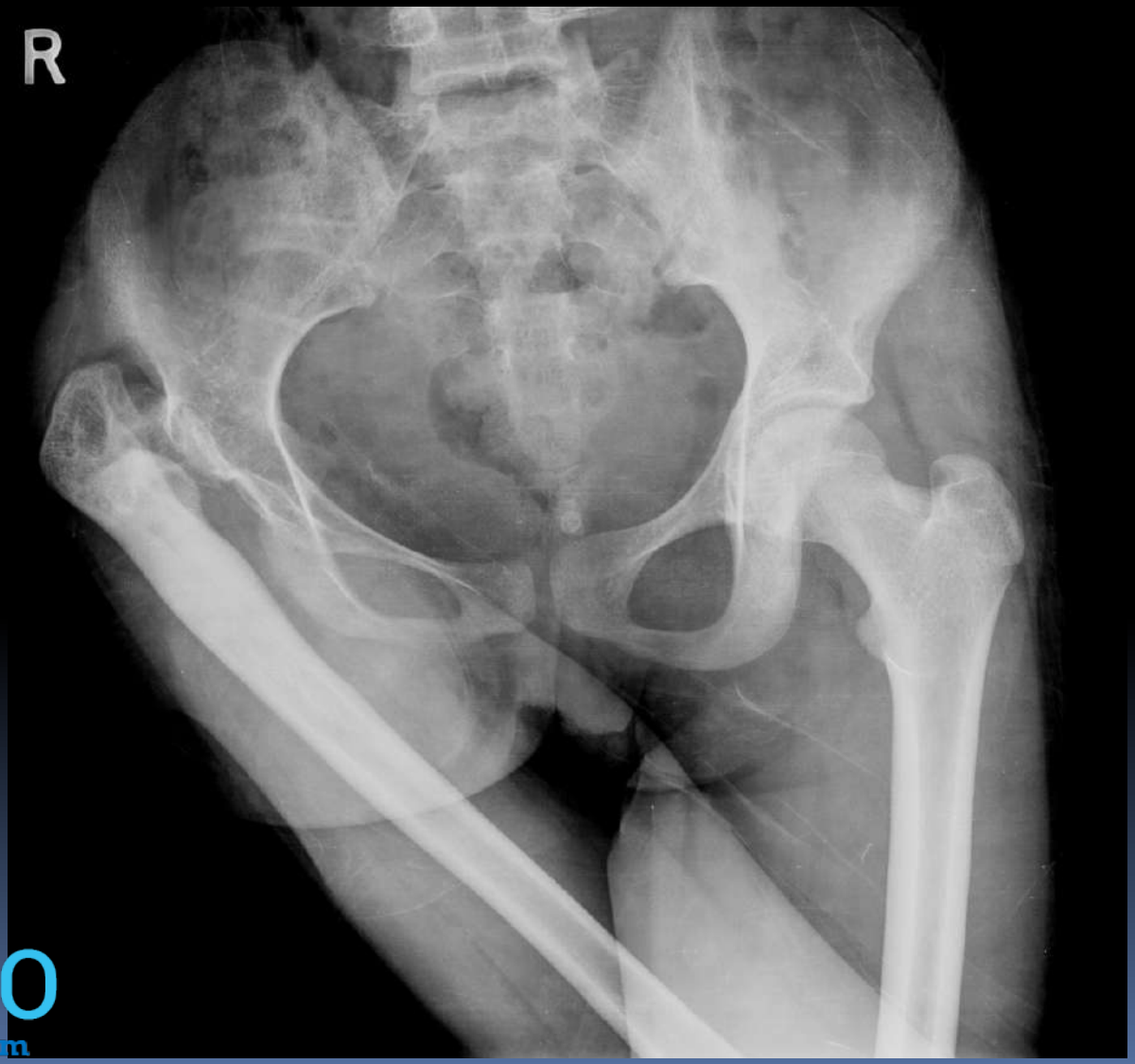


Hunka type IV b





Level of osteotomy and valgus angle



True neck lengthening osteotomy