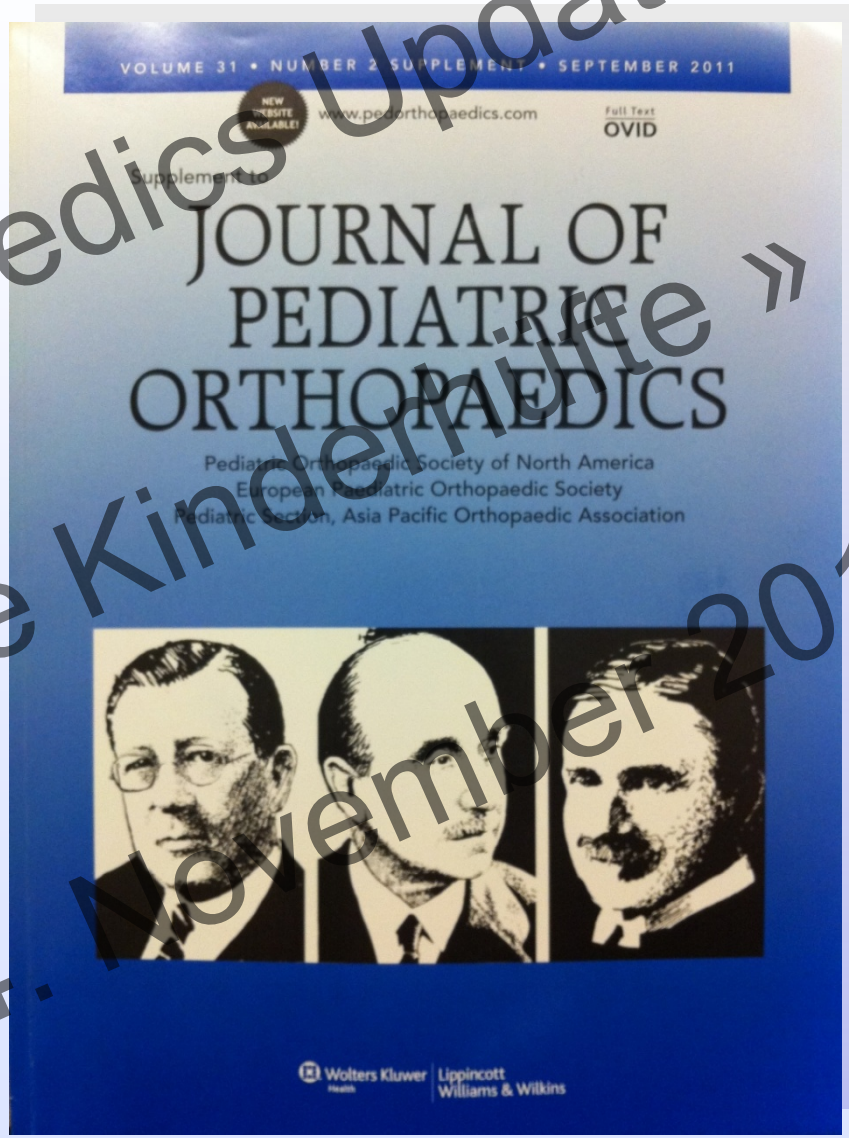
Current Concepts and Controversies in The Management of Legg Perthes' Disease

Arthur Legg –1910
“An Obscure Affliction of the Hip Joint”



We are faced with "Management" of an "obscure affliction" of the hip that is little less obscure than it was a century ago.

Survey

What significant advances to our understanding of management of Legg Perthes' have there been in the past 30 years?

Etiology

- Susceptible child (genetic)
- Impaired circulation (venous, arterial or vasculopathy)
- Synovitis (inflammatory, viral)
- Dysplasia (delayed skeletal maturation, body habitus)

Etiology and Susceptibility Factors

- Male sex (?trauma, ADHD)
- Other hereditary factors (Coagulopathy/thrombophilia, I-LGF1 path abnormality, Type 2 collagen mutation)
- Socio-economic (passive tobacco smoke exposure) and geographic (rural/urban) factors

What *is* Known

- Prognosis is related to age at onset
- Prognosis is related to extent of disease
- Considerable benefit of surgery in certain children >6 years of age

Natural History

Study	No.of Hips	Mean Age	No.OA
Stulberg	171	47.3	66(33%)
Iowa	37	56.0	19(50%)

Prognostic Factors

- Age at onset
- Extent of involvement
- Height of lateral pillar
- Age when treatment began
- Stage of disease when treatment began
- Development of joint stiffness
- Congruity of hip at skeletal maturity
- Females have worse prognosis

Problems with Classification Systems

- Difficult to apply at all stages of the disease (accurate in late fragmentation phase)
- More helpful for population studies in retrospect than prognosis for individuals
- Not predictive of outcome at onset
- Category may change during disease
- Do not address effect of physeal arrest

Female 4.5 Years

Female 4.5 Years

Female 11 Years

Classification

- Salter (A,B)
- Catterall (1-4)
- Herring (A,B,B/C,C)

Lateral Pillar Classification

Early fragmentation stage, within 6 months of onset

A: No loss of height and no density change

B: <50% loss of height and lucency of lateral pillar

B/C: 50% loss of height, narrow lateral pillar little ossification or depressed relative to central pillar

C: >50% of height

Legg-Calvé-Perthes Disease

THE PROGNOSTIC SIGNIFICANCE OF THE SUBCHONDRAL FRACTURE AND THE TWO-GROUP CLASSIFICATION OF THE FEMORAL HEAD INVOLVEMENT*

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From The Hospital for Sick Children, Toronto

Thus, it became apparent that a major prognostic difference exists between Group II and Group III.

Radiographically, this difference between the two Groups consists of the presence (Group II) or absence (Group III) of an intact lateral margin of the capital femoral epiphysis (Figs. 6 and 8).

The intact lateral margin of the epiphysis appears to act as a supporting column that shields the epiphysis from stress and minimizes the possibility of its further collapse and subsequent deformity.

Stulberg Classification

I. Normal hip

II. Spherical head (coxa magna, short neck, matching acetabulum)

III. Non-spherical hip (congruent but not flat)

IV. Flat femoral head (congruent)

V. Flat femoral head (non-congruent, normal neck and no remodelling of acetabulum)

My Approach to Classification

- "Simple" is best
- Best estimate of extent of involvement at onset
- "Consensus?" = Salter B, Catterall 3 & 4, and Herring B & B/C benefit from surgery prior to femoral head collapse. Herring C not suitable because by definition femoral head has already collapsed beyond where containment surgery is of benefit.

Multicentre Perthes' Trial

- 438 patients with 451 hips
- 106 hips excluded
- 6-12 years of age
- No previous treatment

Multicentre Perthes Trial JBJS 86A p. 2121-2134

345 Hips in 337 Patients

- No treatment 19
- ROM treatment 77
- Atlanta brace 129
- Femoral osteotomy 52
- Innominate osteotomy 68

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Analysis

- Combined no treatment, ROM and brace
- Combined femoral and innominate osteotomy
- No difference in outcome in A and C group

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All Hips - Outcome

Grading	Operative	Non-operative
Good	61%	46%
Poor	10%	18%

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Group B >8 years (P=0.02)

- 73% Stulberg I or II operative group
- 44% Stulberg I or II non-operative group

Group B/C >8 years (P=0.05)

- >Frequency of Stulberg III in operative group
- >Frequency of Stulberg IV or V in non-operative group

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Overall – All Hips (345)

- 51% Stulberg I or II (good)
- 34% Stulberg III (fair)
- 15% Stulberg IV or V (poor)

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MCT vs. Wiig (Norway 2008)

- Comparison of Stulberg 1 and 2 results by age for all children
- MCT <8yrs. and Wiig <6yrs. vs. >
- Younger = 59% vs. 57%
- Older = 38% vs. 37%

Imaging

- Plain films
- Arthrography
- Computed tomography
- Magnetic resonance

Principles of Management

- Selection of patients for treatment
- Timing of intervention is important

Observations

- Negativism or pessimism is not constructive in managing a family with a child with Perthes'
- Parents will not readily accept therapeutic nihilism
- Approach should be to apply a method of treatment that:
  - Has the least risk of long-term harm to the child
  - Is the least disruptive to the child's life and family functioning
  - Restricts the child's normal activities for the briefest period of time

Early Management

- Maintain range of movement (PT)
- Treat synovitis – NSAIDS
- Soft tissue releases and abduction casts (Petrie)
- Containment procedures to obtain congruency

Management

- Prolonged bedrest, immobilization and bracing are obsolete
- Avoid osteotomy when hip is stiff and irritable
- « Osteotomy should be done prior to significant femoral head collapse

Options for Treatment

- Soft tissue release to maintain ROM
- Surgery to obtain containment
- Petrie abduction-internal rotation casts
- Abduction bracing
- Arthrodiastasis

Other Options

- Shelf arthroplasty
- Medical – bisphosphonates
- Core decompression


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I believe there is evidence for benefit of early surgery prior to fragmentation and collapse but very little evidence of benefit of surgical intervention thereafter.


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Children presenting with more than 50% epiphyseal collapse are treated symptomatically and activity is only restricted when the hip is stiff and painful.

Expectant ROM Treatment

- Rest
  - Anti-inflammation drugs
  - Crutches
  - Exercises
  - All have little effect

It is in this context that I have developed my biased approach to management:

1. **Manage hip stiffness aggressively whether intent is to manage child operatively or non-operatively.**
2. **Surgery is recommended only early in the course of the disease prior to significant femoral head collapse.**

Considerations in recommending early surgery before classification systems can be applied:

1. The MCT and a large Norwegian study (Wiig) have shown that 2/3rds of children will eventually prove to have LP-B or equivalent and an additional number will be LP-B/C.
2. Aim is to prevent LP-C hips from occurring.

3. Period of restricted activity is confined to 3 months.

4. Expectant "algorithmic" treatment is harmful to the sanity of the surgeon, the child, the parents, the teacher and the physical therapist.

5. Objective is to prevent Stulberg 4 and 5 outcomes.

Osteotomies

- Innominate osteotomy
- Combined Innominate and femoral osteotomies (15/20)
- Javid and Wedge, J Child Orthop, 2009 3: 229-234

My indications for Innominate Osteotomy:

1. Child > 6 years of age.
2. > 50% head involvement.
3. There must be no more than 50 % collapse of the lateral column of the femoral head.
4. At 9 years of age a concurrent femoral osteotomy is added.

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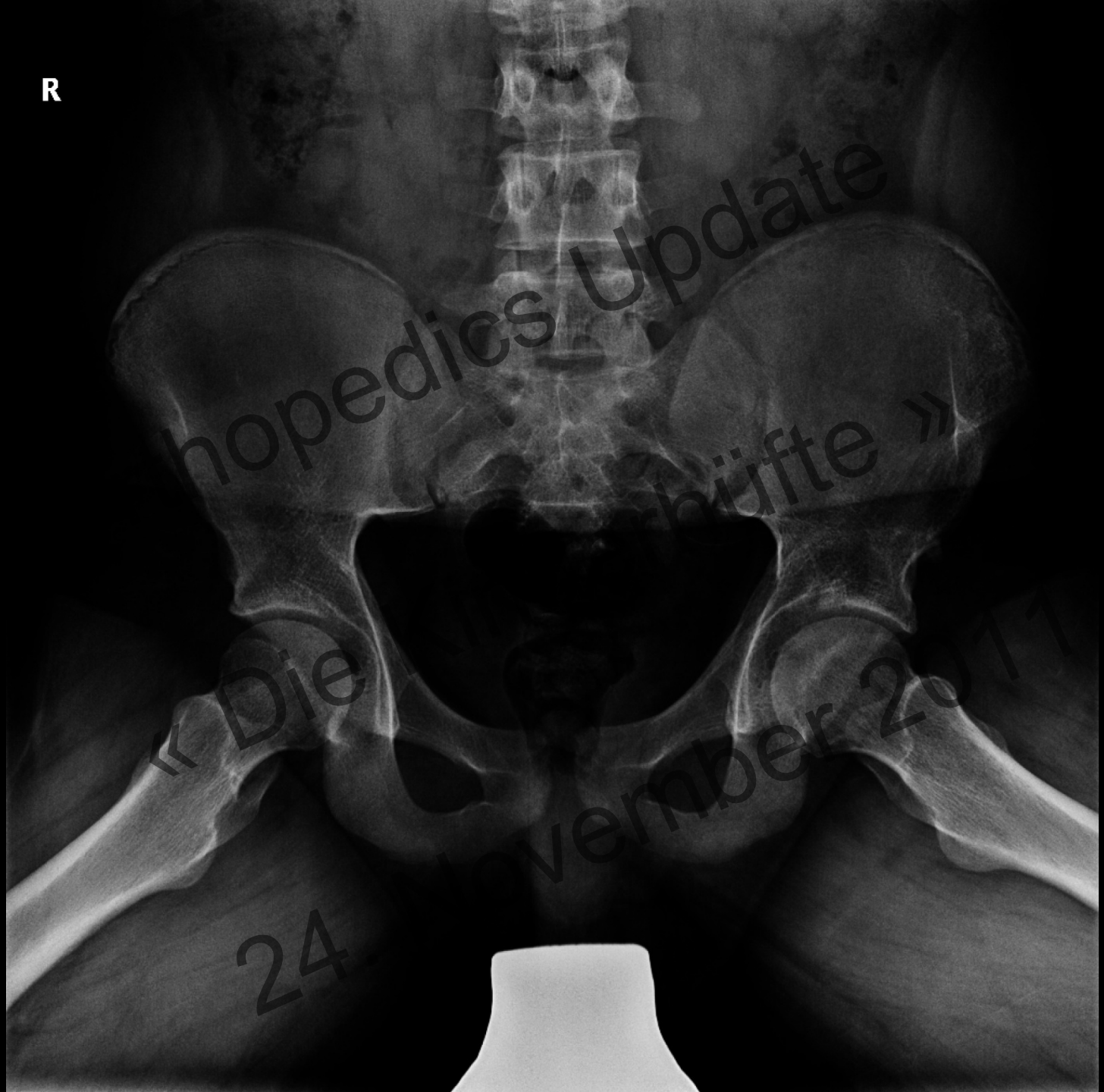


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Potential for Remodelling

10 Years

18 Years


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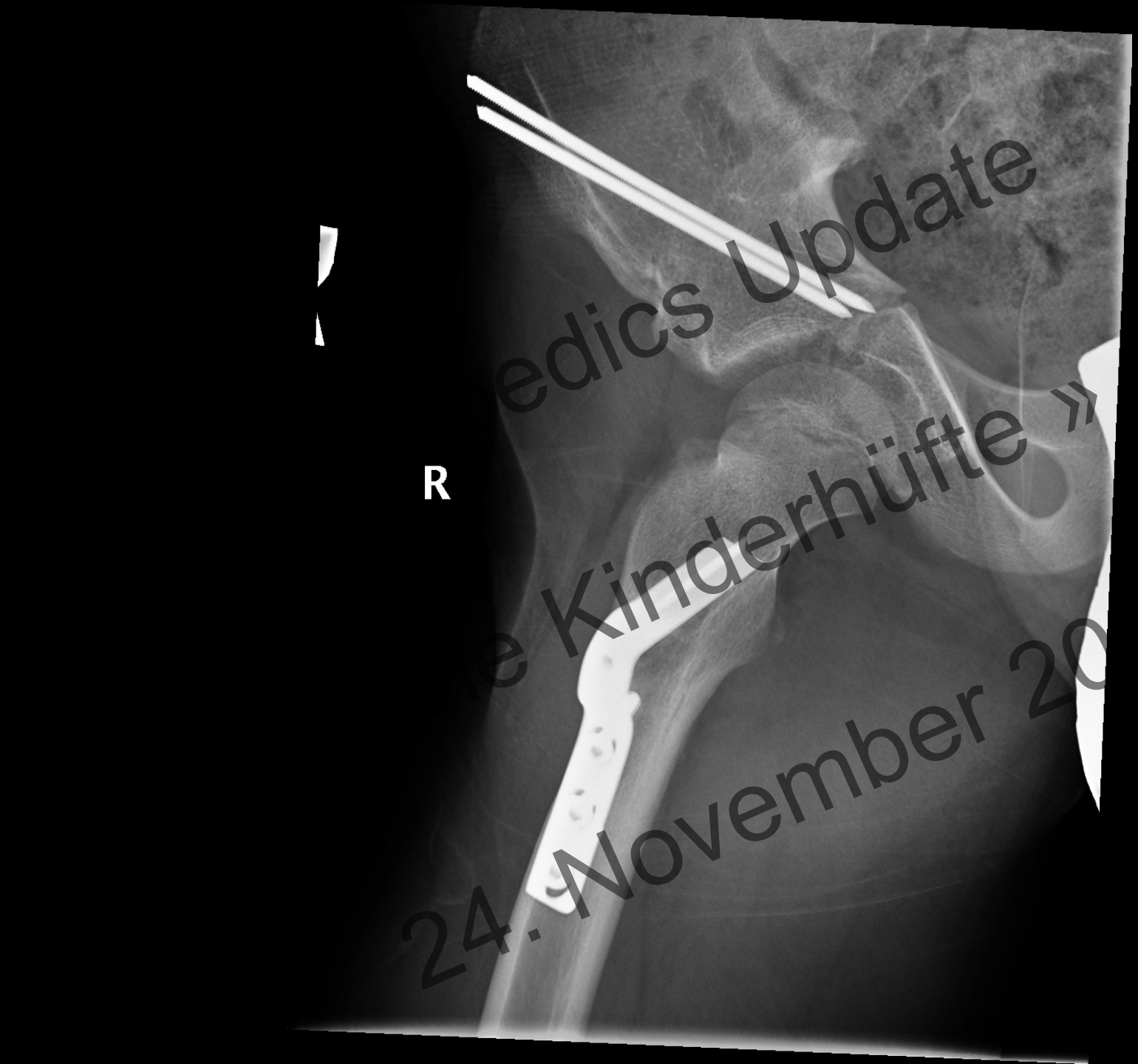


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L hip at 7.5 years


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R hip at 9.5 Years
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PT. UNABLE TO STAND
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After Petrie Casts
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9 Years post-op
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Summary

- Aim is to prevent LP C hips from occurring and thus Stulberg IV and V outcomes
- Mobilize hip prior to surgery
- Return to unrestricted activity within 3 months
- After 9 years add a varus osteotomy of femur but maximum of 15 degrees of varus

Late Management

- Shelf Arthroplasty
- Arthrodiastasis
- Osteochondroplasty (surgical dislocation vs. arthroscopic surgery)
- Femoral head reduction
- Valgus osteotomy (esp. Wagner double osteotomy)
- Arthroplasty and surface replacement
- Arthrodesis

Male 10 Years


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Male 14 Years
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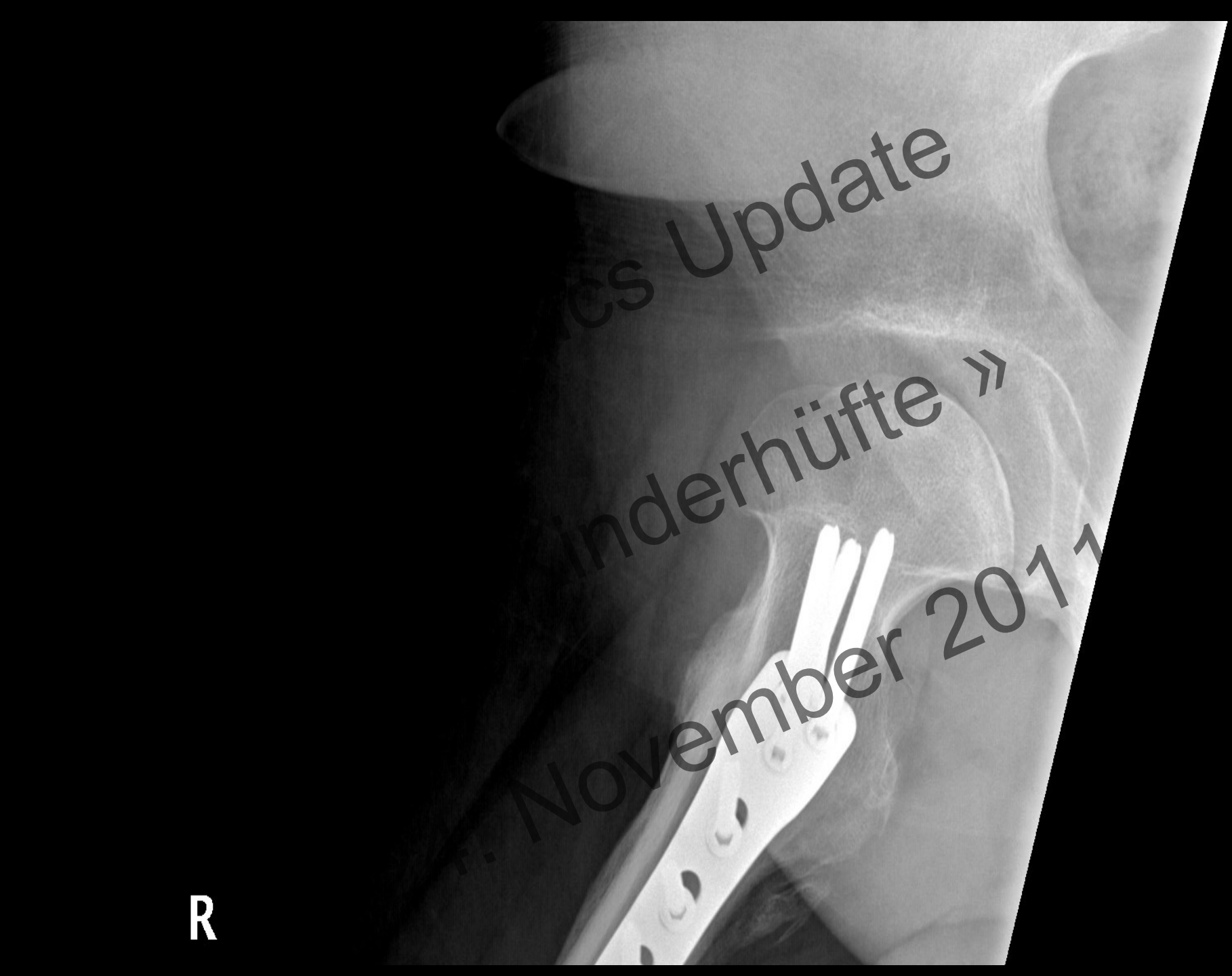
Position reproduces pain from impingement



Male 17 Years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Conclusions

- Children >6 years prior to head collapse should have containment surgery (73% V vs. 44% Stulberg I or II)
- Groups LP A and C would not benefit but this makes up only 13% of those affected after age 8
- This is important because 63% of all hips involved with Perthes' will be LP B

Conclusions

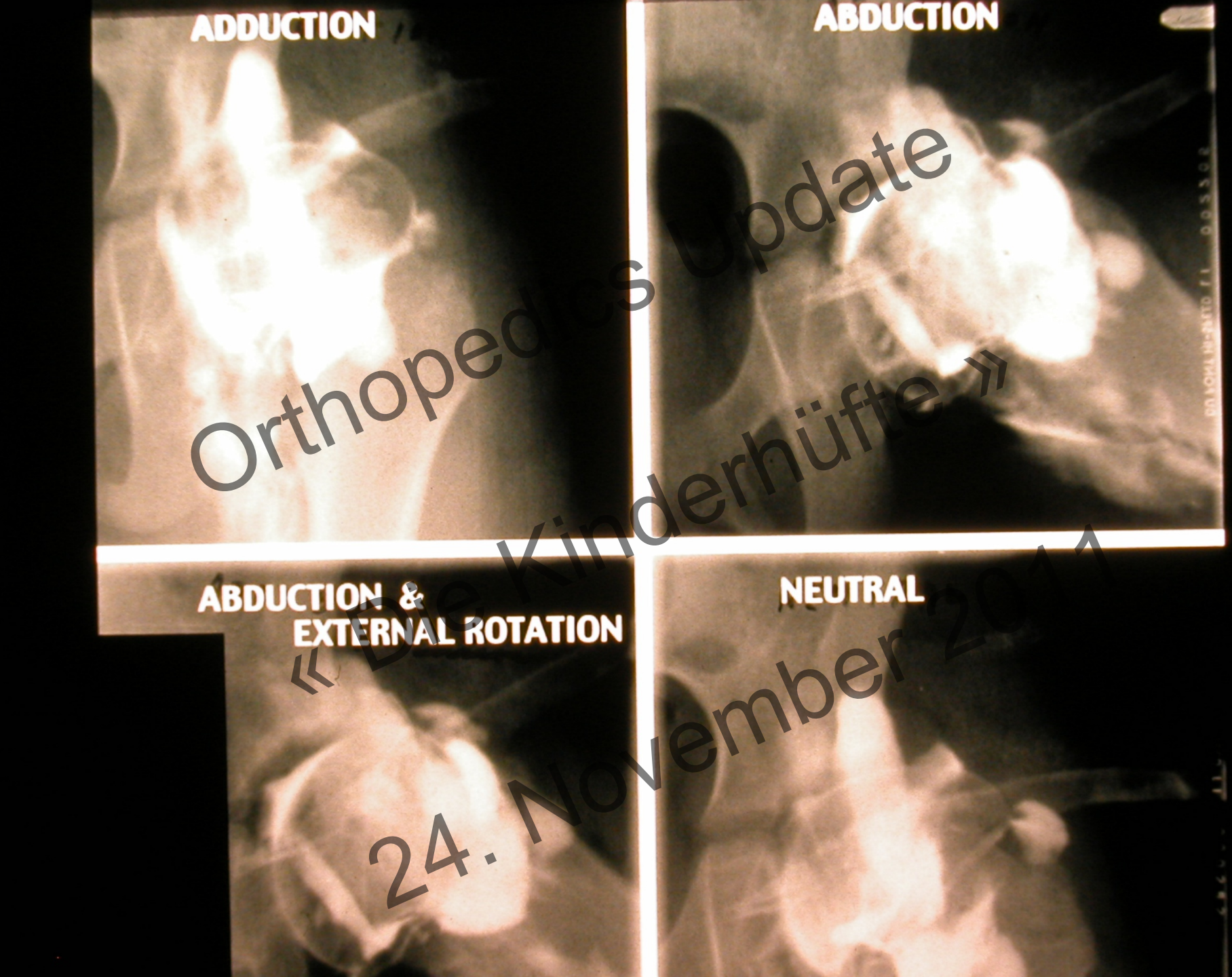
- Salvage procedures include valgus osteotomy for late deformity
- ? role in future for arthrodiastasis (hinge distraction)
- ? value of tenotomies and Petrie abduction casts for stiff and irritable hip with flat and extruded head prior to re-ossification

Current Status of Innominate Osteotomy for Legg Perthes'

- Insufficient evidence to support any specific treatment being conclusively effective
- Statistical significance does not equate to proof of effectiveness
- No two studies showing effectiveness of a particular treatment have had the same design, selection criteria or patient population

The late deformity leads to:

- Pain – extra vs. intra-articular
- Coxa breva - Abductor weakness - limp
- Limb Shortening
- Stiffness
- Secondary Osteoarthritis

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Does Legg-Perthes Disease require treatment?


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Conclusions

- Marginal benefit in operative group >8 years of age or >6 years of bone age; P=0.04
- Reduction from 18% Stulberg IV and V to 10% in operative group, or
- <8 years of age group B no benefit of surgery with 75% Stulberg I or II

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