

33th



Annual Meeting, Bruges

Cannulated “pin-screw” fixation for slipped capital femoral epiphysis : an original concept to allow stabilisation and growth



With conflict of interest for this presentation

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Claude Bernard University / Lyon I



Should the stabilization be done by epiphysiodesis ? Three steps :

- ◆ Hip dysmorphism after screw fixation :
A plea for non epiphysidesis *SFCP 1997*
- ◆ The concept : proximally threaded screw
Lyon 1996
- ◆ Results & 18 years of experience

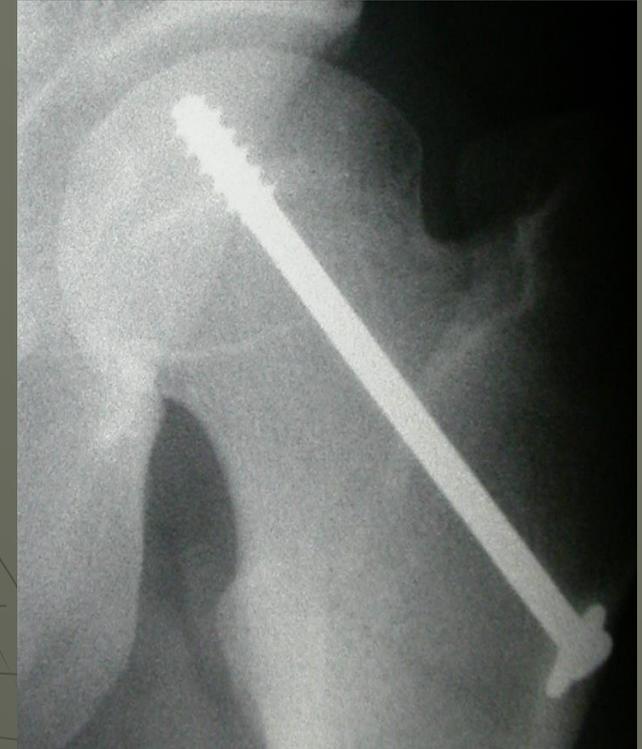
SOFCOT 2008

JCO 2011

Study 1 : What happen with traditional screw fixation ?

- ◆ Retrospective study
- ◆ SCFE percutaneously treated
- ◆ In situ fixation or careful reduction
- ◆ 27 patients / 35 hips fixations with cannulated screw

Aim of the study : **Hip morphology** after skeletal maturity



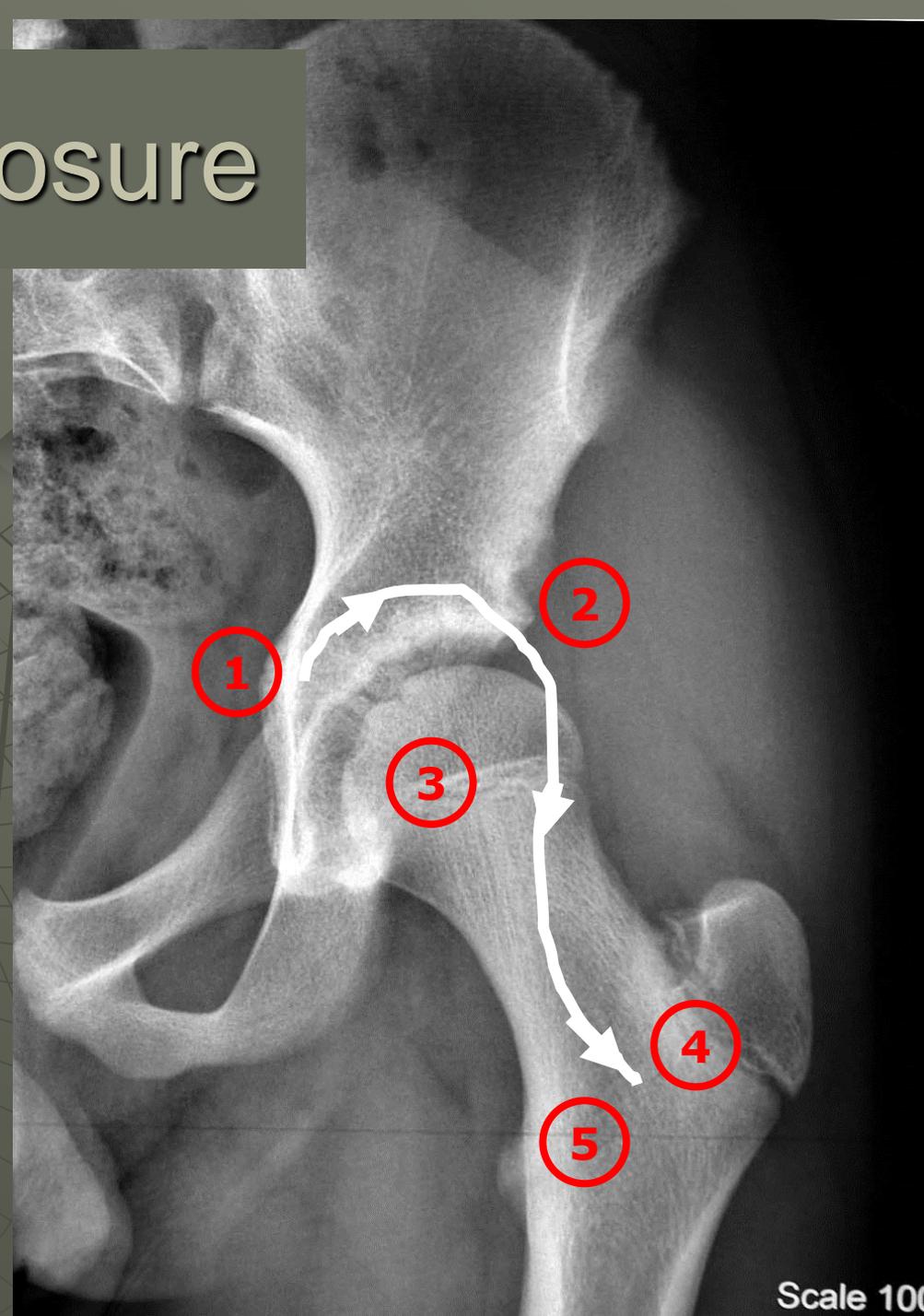
SFCP Sorrente 1997

Hip growth plates closure

First growth plate to close
= triradiate cartilage

Around one year before
femoral head growth plate

Chronology of closure to
respect !



Triradiate cartilage

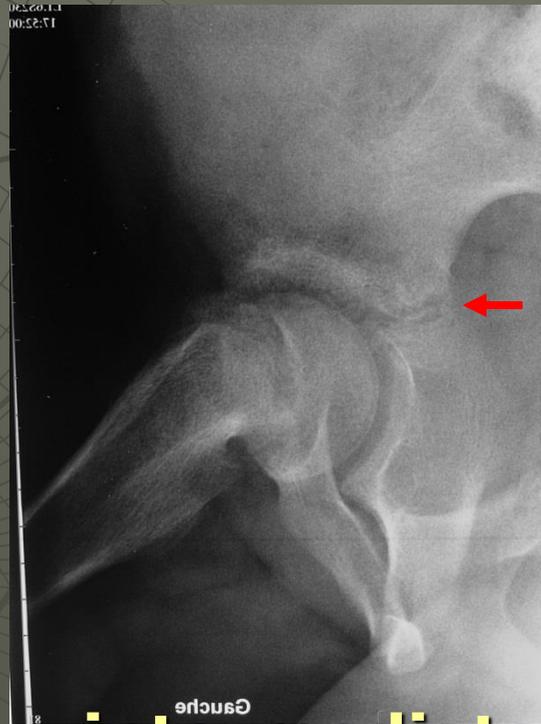
(at time of slipped capital epiphysis)



open

triradiate cart

9 hips



intermediate

triradiate cart

9 hips



closed

triradiate cart

17 hips

Radiographic assessment



Distance GT top-
femoral head top
femoral head center

Neck length

Neck wide

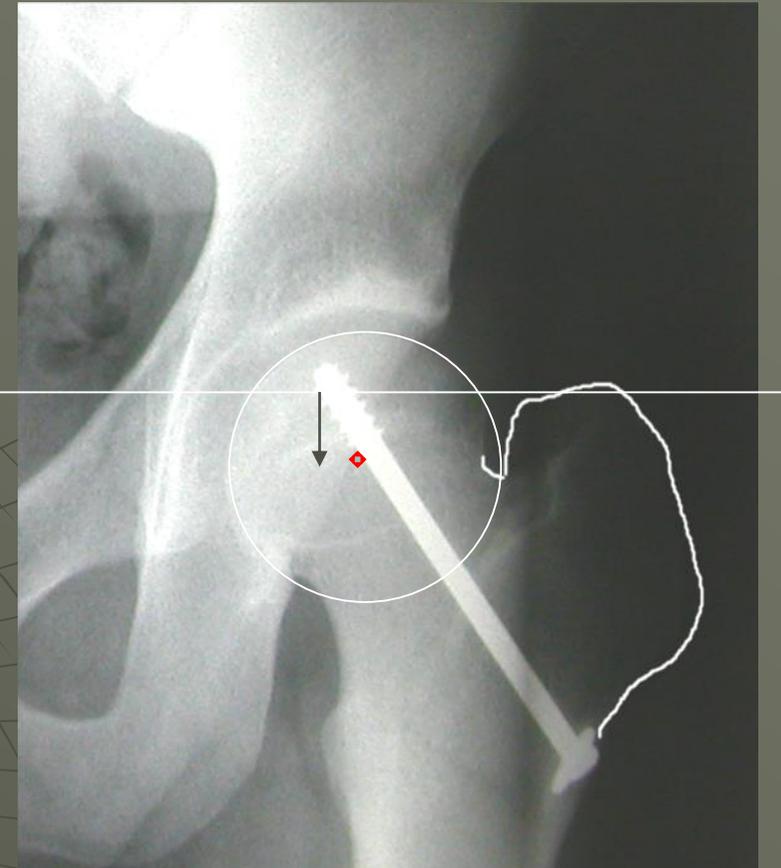
Epiphyseal heigh/
Up to klein lign

Dysmorphism = negative distance GT – Femoral head center

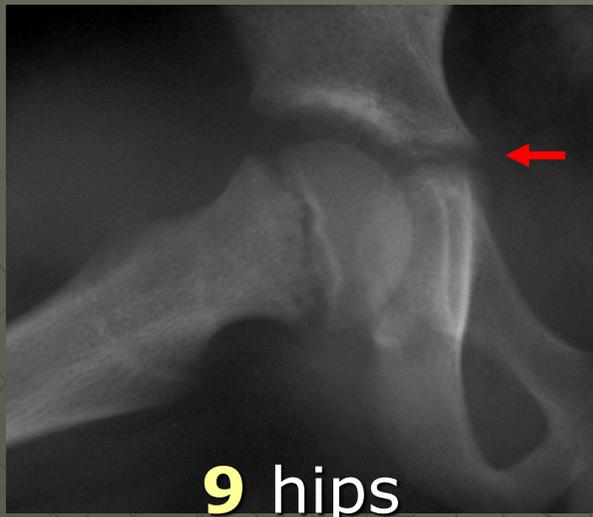
Abnormal hip morphology



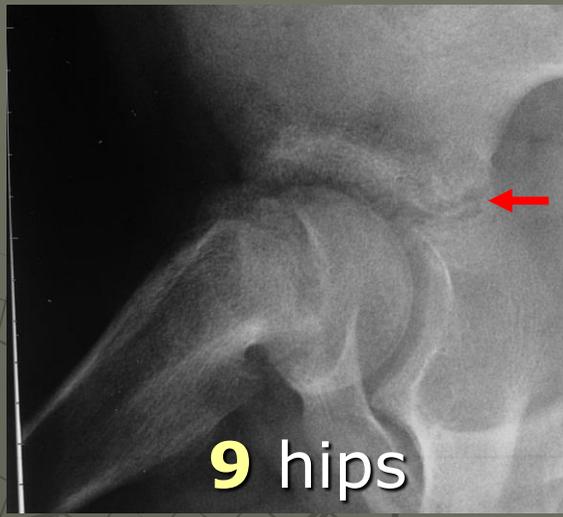
« **Primary dysmorphism** »
due to **femoral head slippage**
Neck length and wide normal
Klein +
Impingement ?



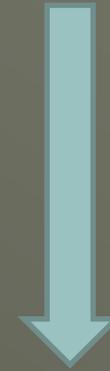
« **Secondary dysmorphism** »
due to TT / **growth arrest**
Neck length \searrow wide \nearrow
Klein -
Muscular leverage ?



- ◆ **All had severe hip dysmorphism** after maturity
- ◆ 6/9 **secondary** dysmorphism



- ◆ **3/9 hips Moderate** dysmorphism, primary and secondary dysmorphism
- ◆ Remodelage +/-



- ◆ **11/17 hips benign** dysmorphism
- ◆ **Primary** dysmorphism for all
- ◆ No remodelage

Conclusion of study 1 :

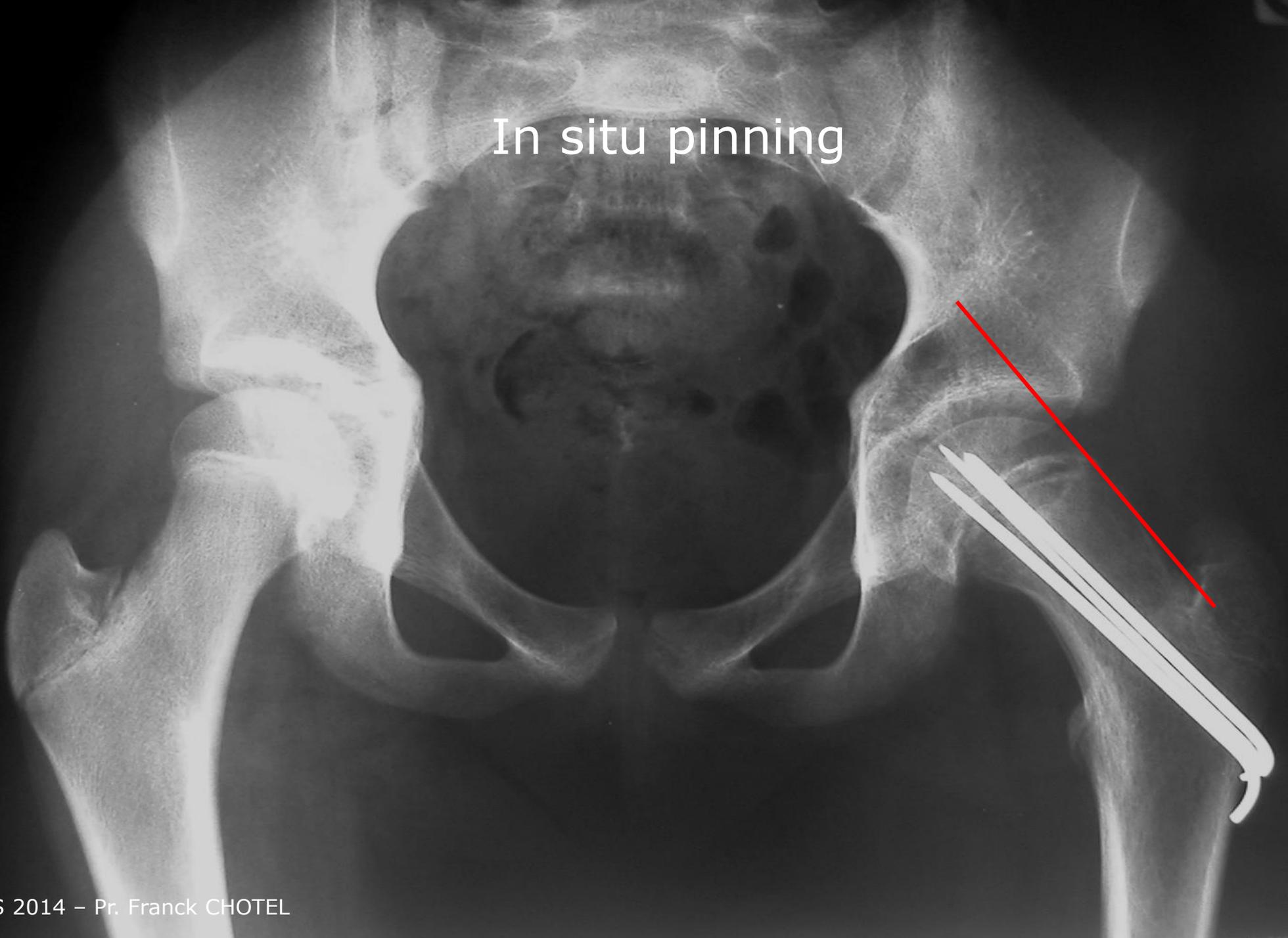
Triradiate cartilage is a good indicator of local residual growth and risk of secondary **dysmorphism (epiphysiodesis)**

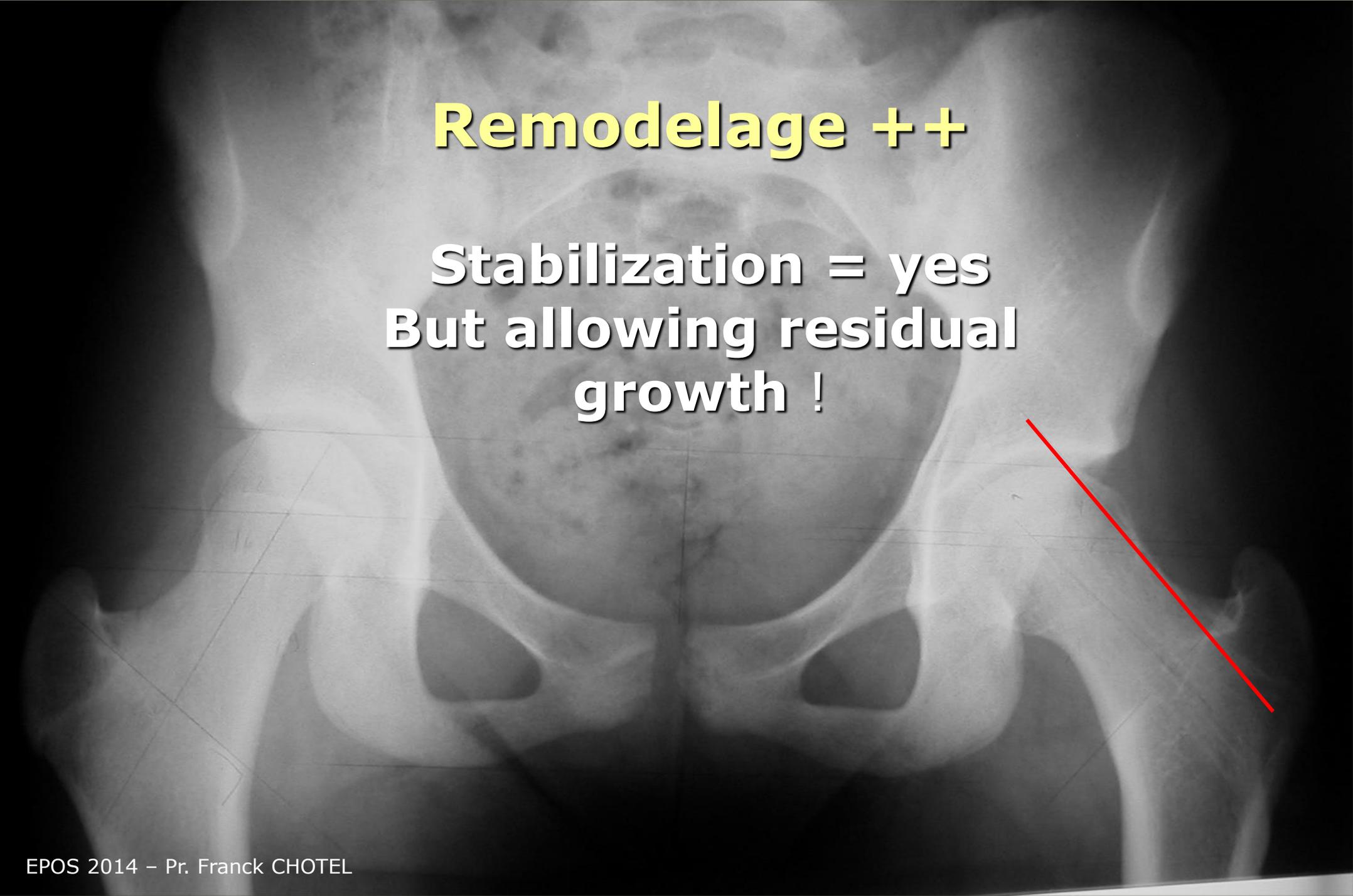
Lyon 1996

When triradiate cartilage is open,
an **other device** should be used
in order to limit the dysmorphism
Pinning ?

Unstable SCFE
Triradiate cartilage « intermediate »

In situ pinning





Remodelage ++

**Stabilization = yes
But allowing residual
growth !**

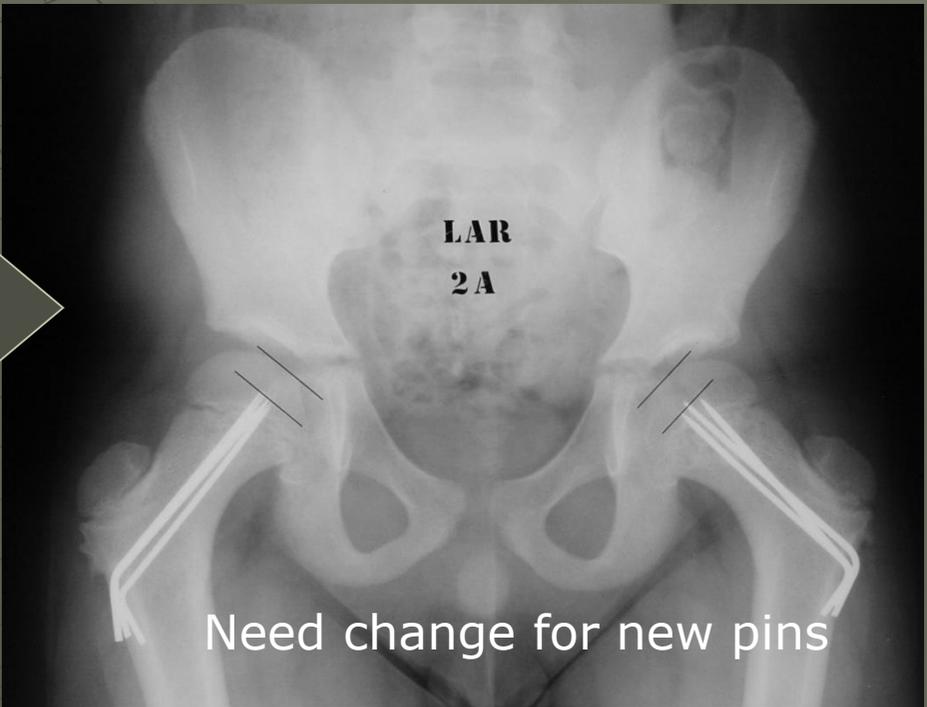
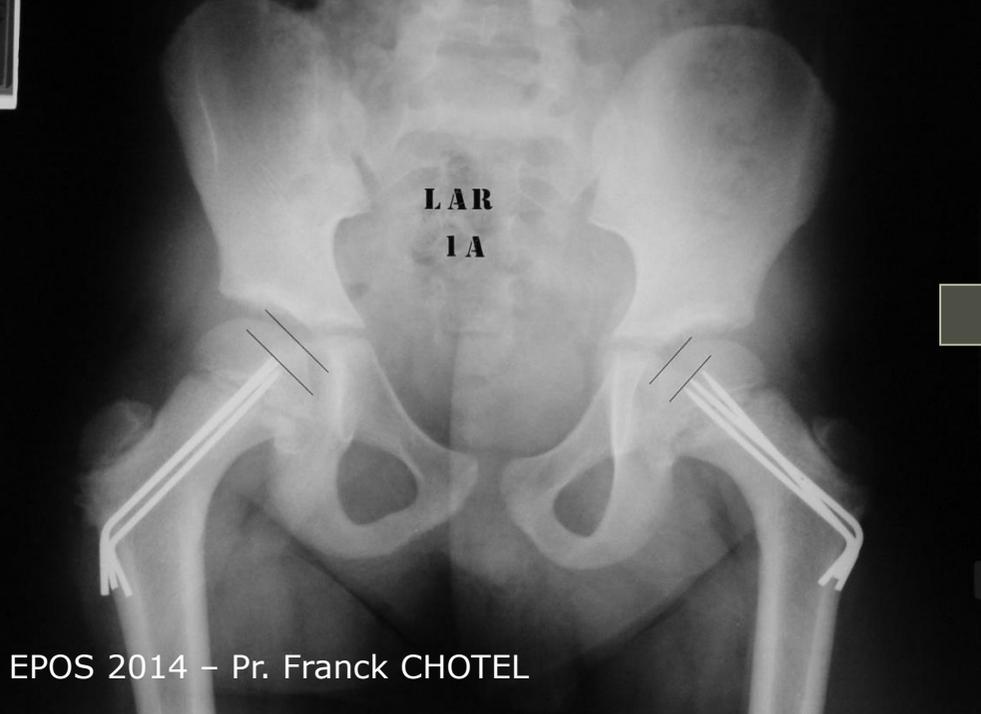
But disadvantage of pinning

- ◆ If not under periosteal :
migration
- ◆ If percutaneous :
discomfort
- ◆ **Pins removal** can
sometime be difficult



Damien 10 y old

chronic stable SCFE



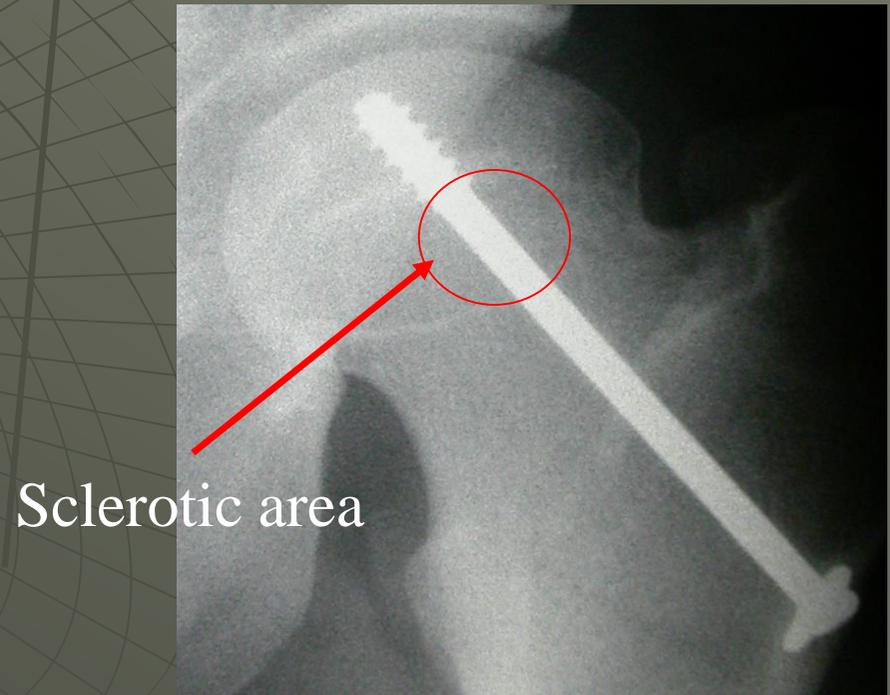
Good hip morphology
but bone migration of pins
not removable



Problem of material removal !

- ◆ With screw the thread area is locked in the strong cancellous bone of the head
- ◆ Reverse thread do not make better in this indication !
- ◆ Extensive approach
- ◆ Material broken
- ◆ Fracture

Do not remove ?



Step 2 : What do we need ?

- ◆ A good and stable fixation
- ◆ Allowing residual growth
- ◆ Percutaneous approach
- ◆ Easy to remove

☞ A sort of « pin-screw » ?

Debrousse
Children
Hospital (HDB)
Pr J. Bérard
1996



A new device : HDB Pr Bérard screw



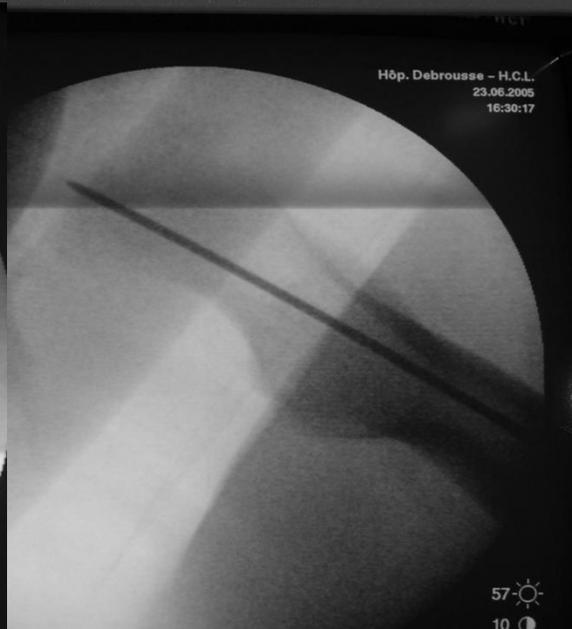
Concept :

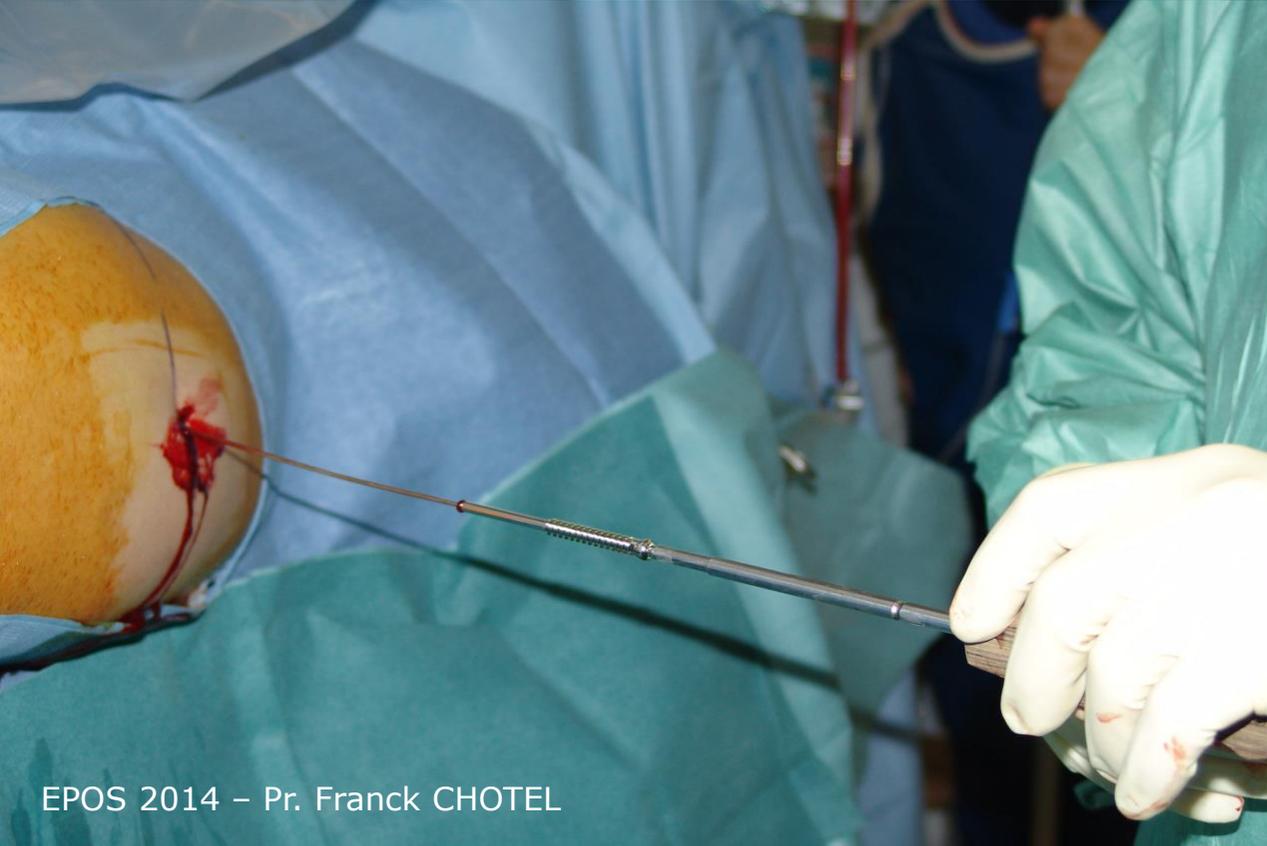
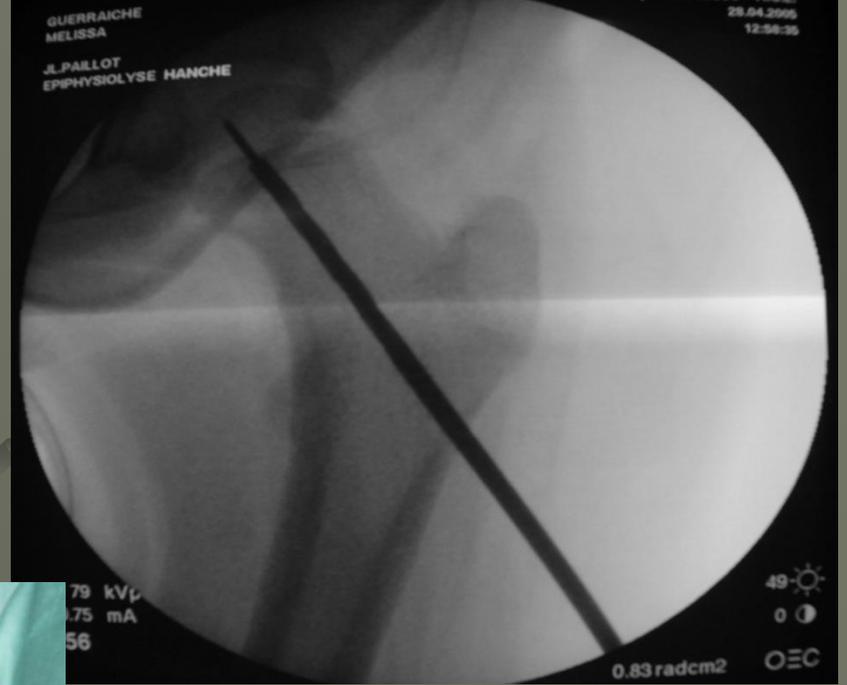
- ◆ Smooth distal to allow residual growth
- ◆ Proximal thread for screw stability and removal
- ◆ Cannulated for percutaneous insertion

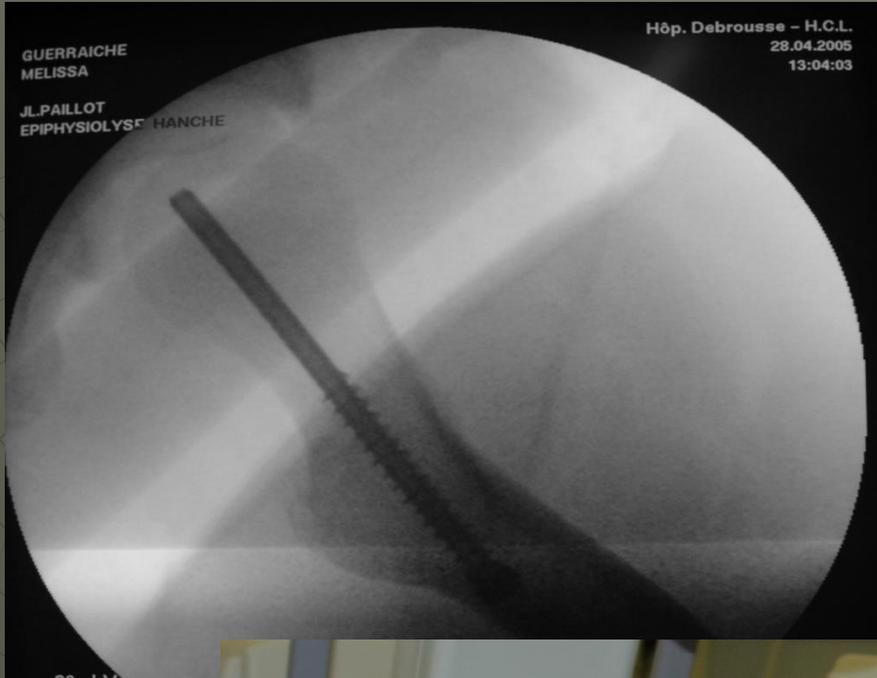
Material : Cannulated proximally threaded screws



Ancillary same as AO screws with **guide wire distally threaded**







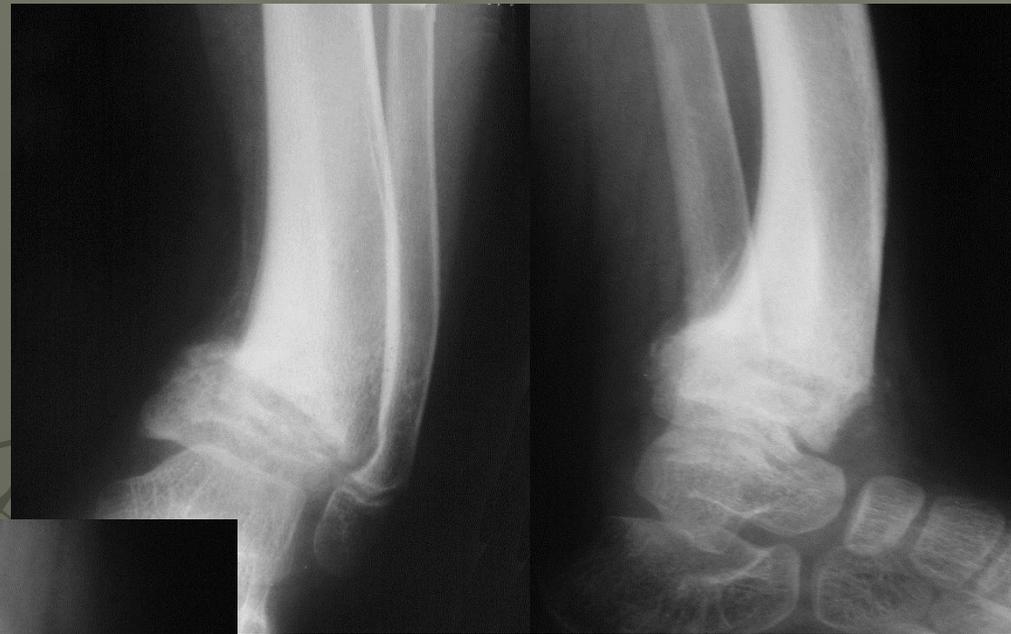
Percutaneous
Very quick and
simple procedure

- ◆ Percutaneous
- ◆ Comfortable



Marina 5 y old girl

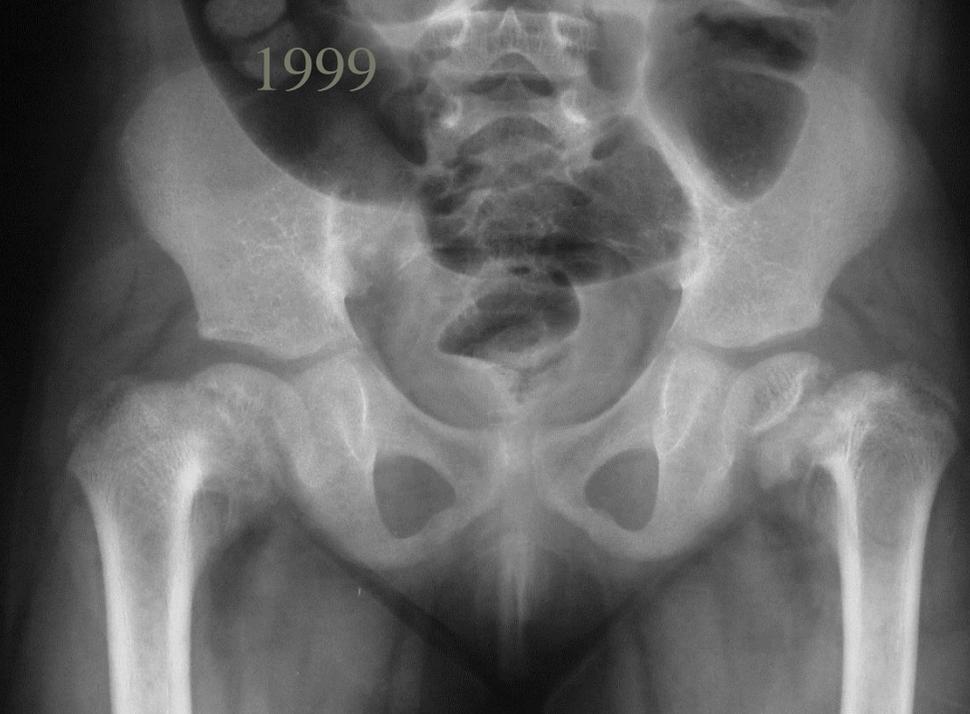
- ◆ Multiple SCFE
- ◆ Stable Chronic



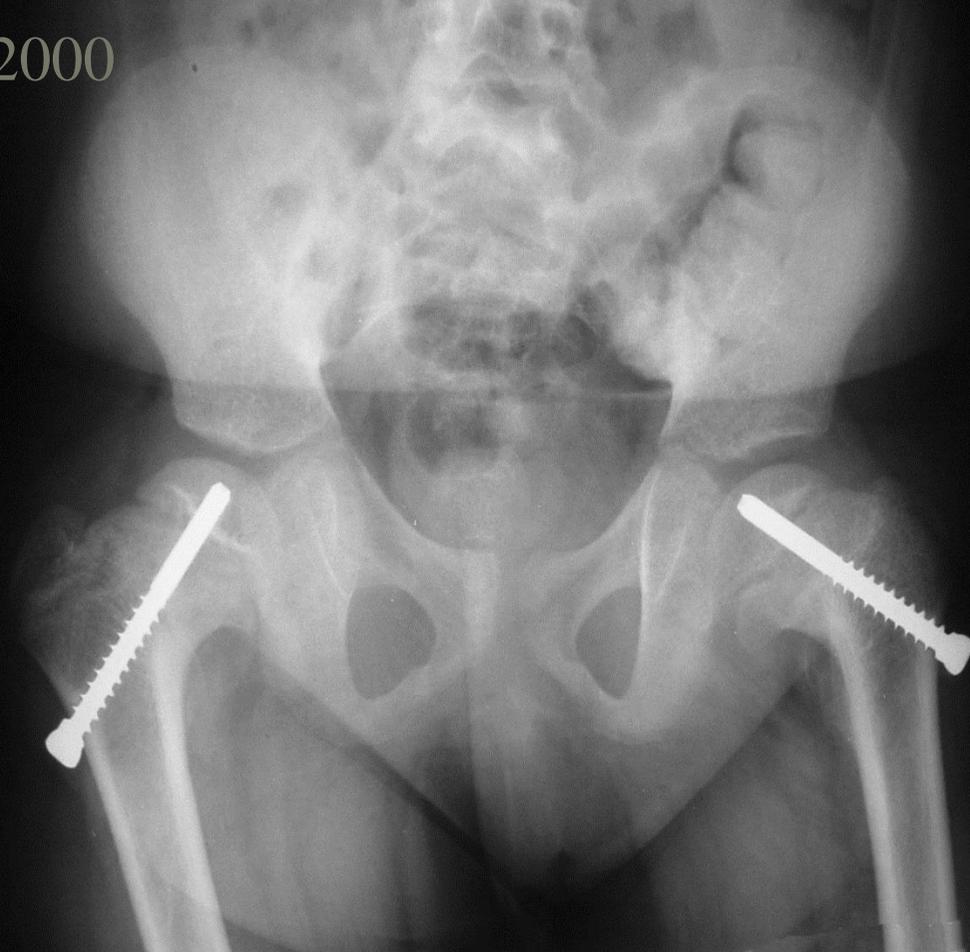
Pseudohyperparathyroidism



1999



2000

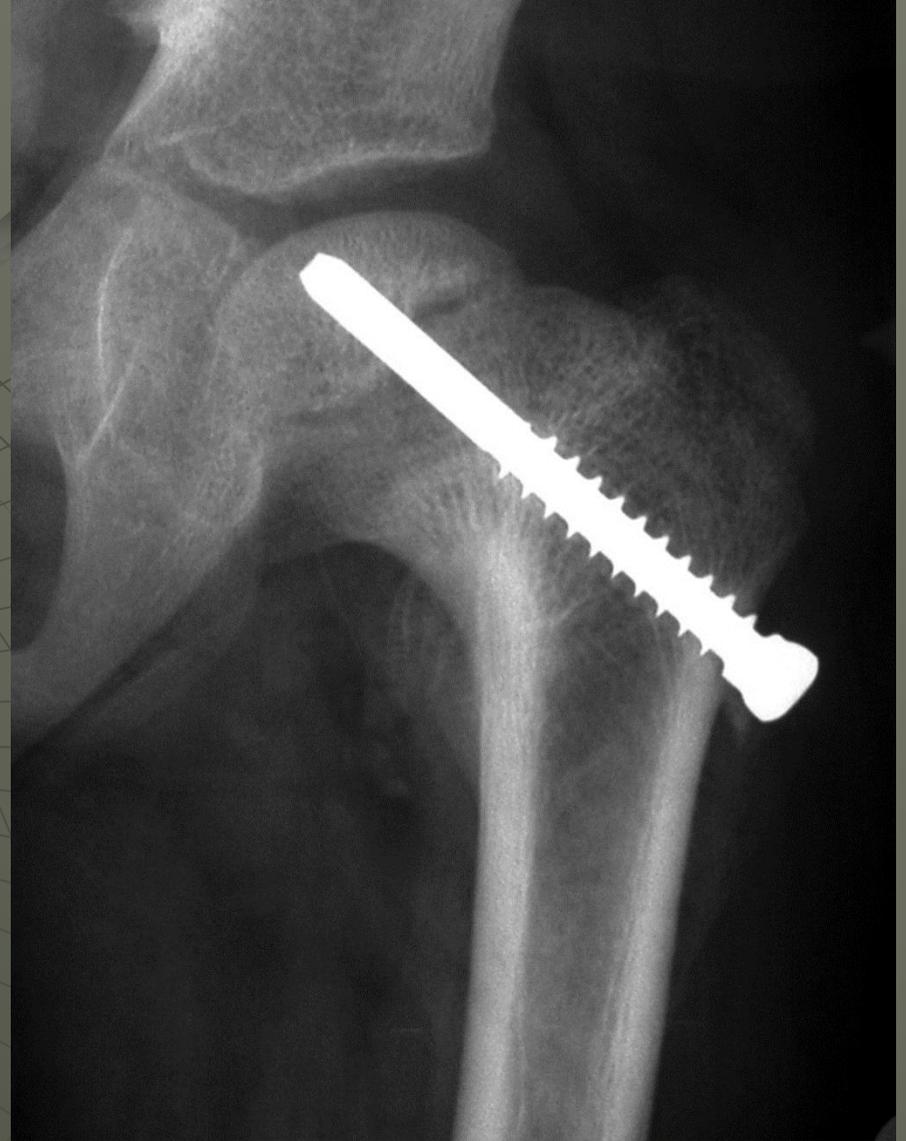


2002

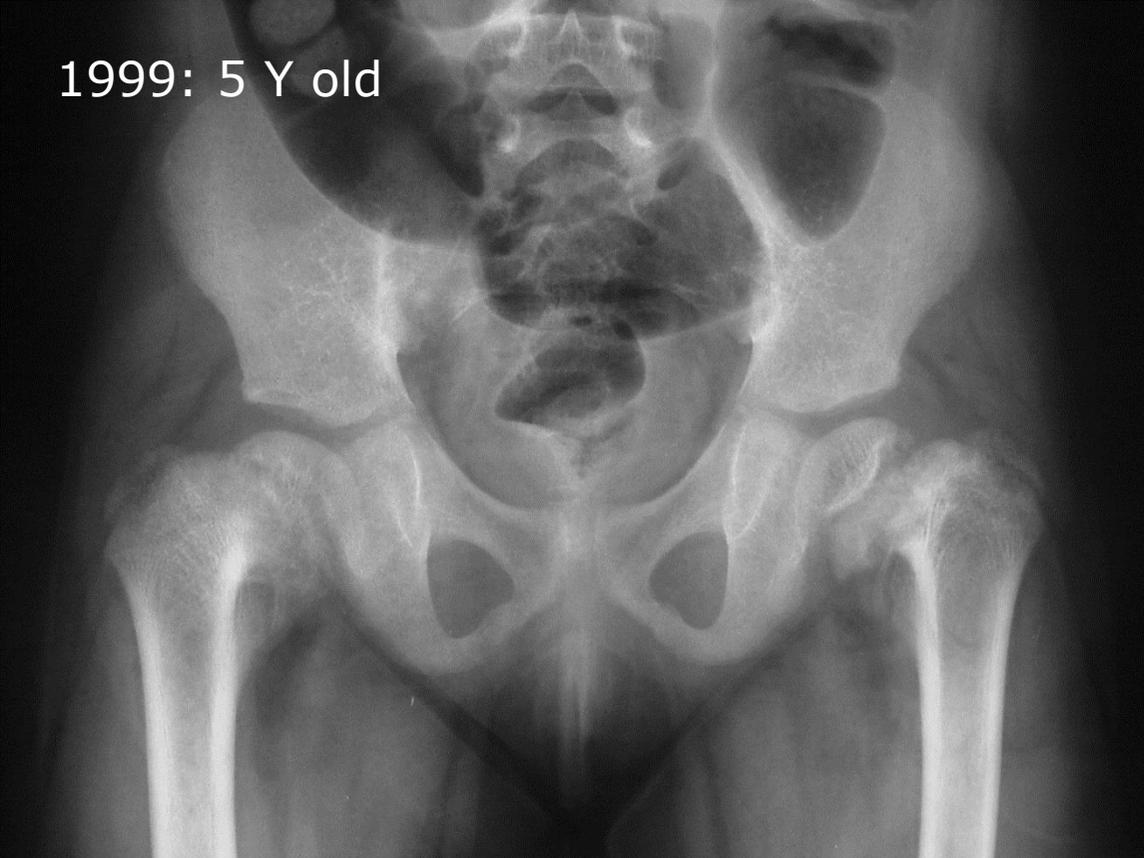


Need to change
screws **3 times**

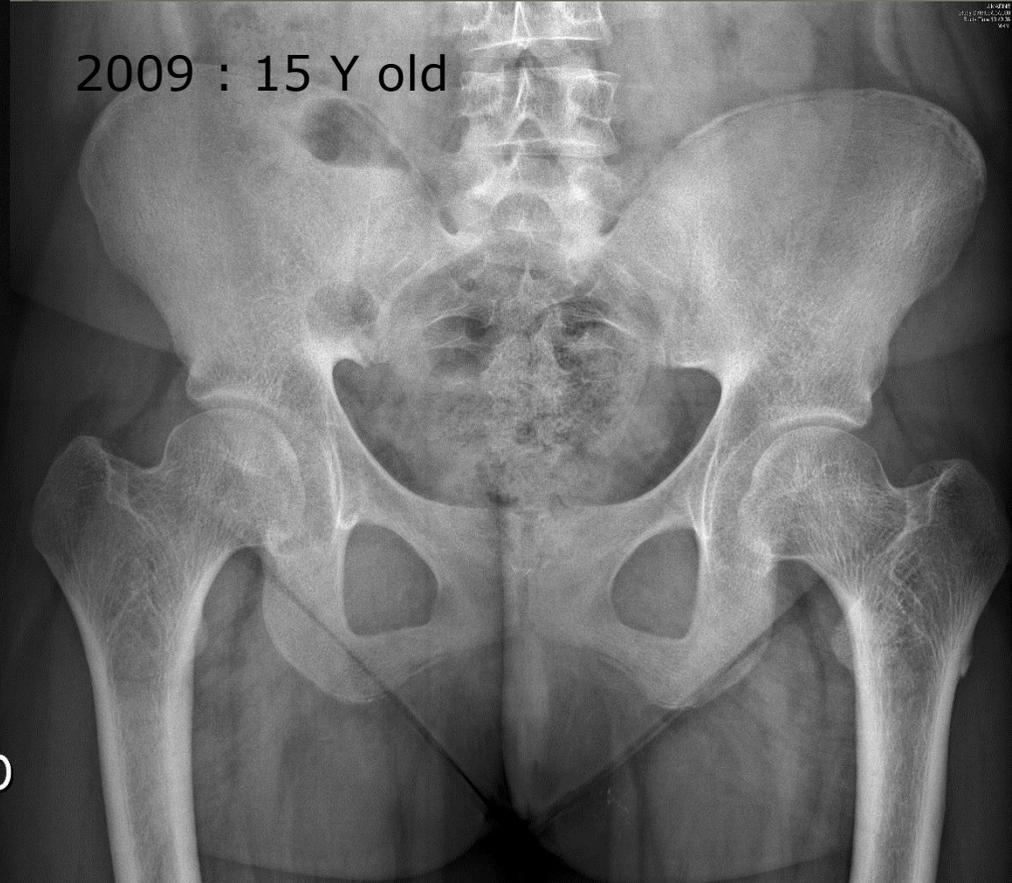
Remodelage after only 14 months ...



1999: 5 Y old



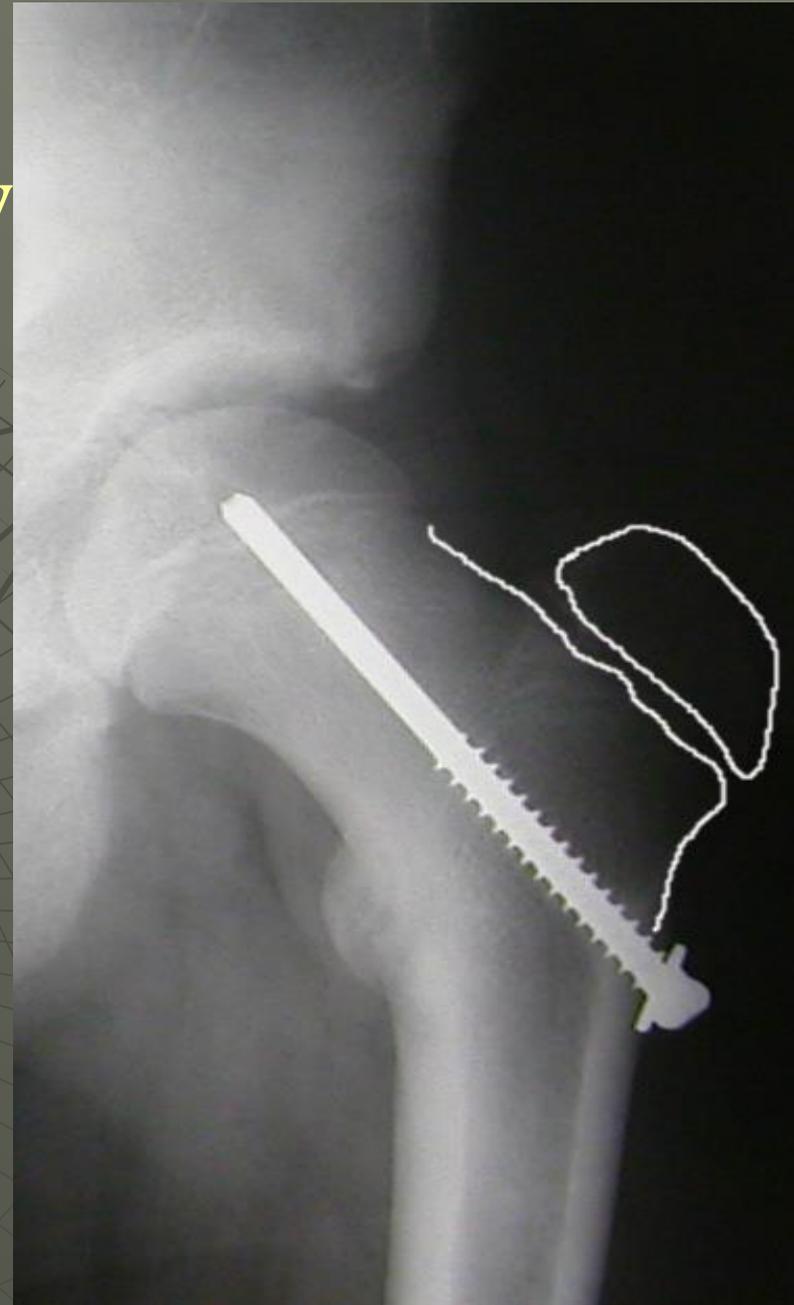
2009 : 15 Y old



Final result

Residual growth

Need to change screw



9 Y Old boy



FIRST SCREW



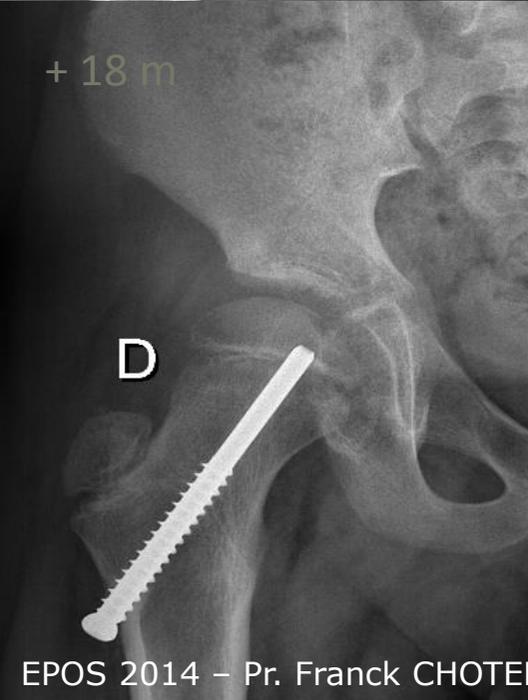
+ 6 m



+ 14 m

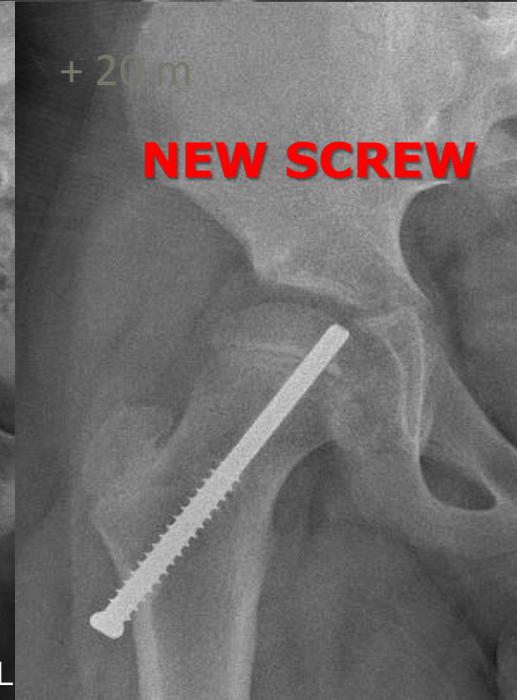


+ 18 m



+ 20 m

NEW SCREW



+ 33 m



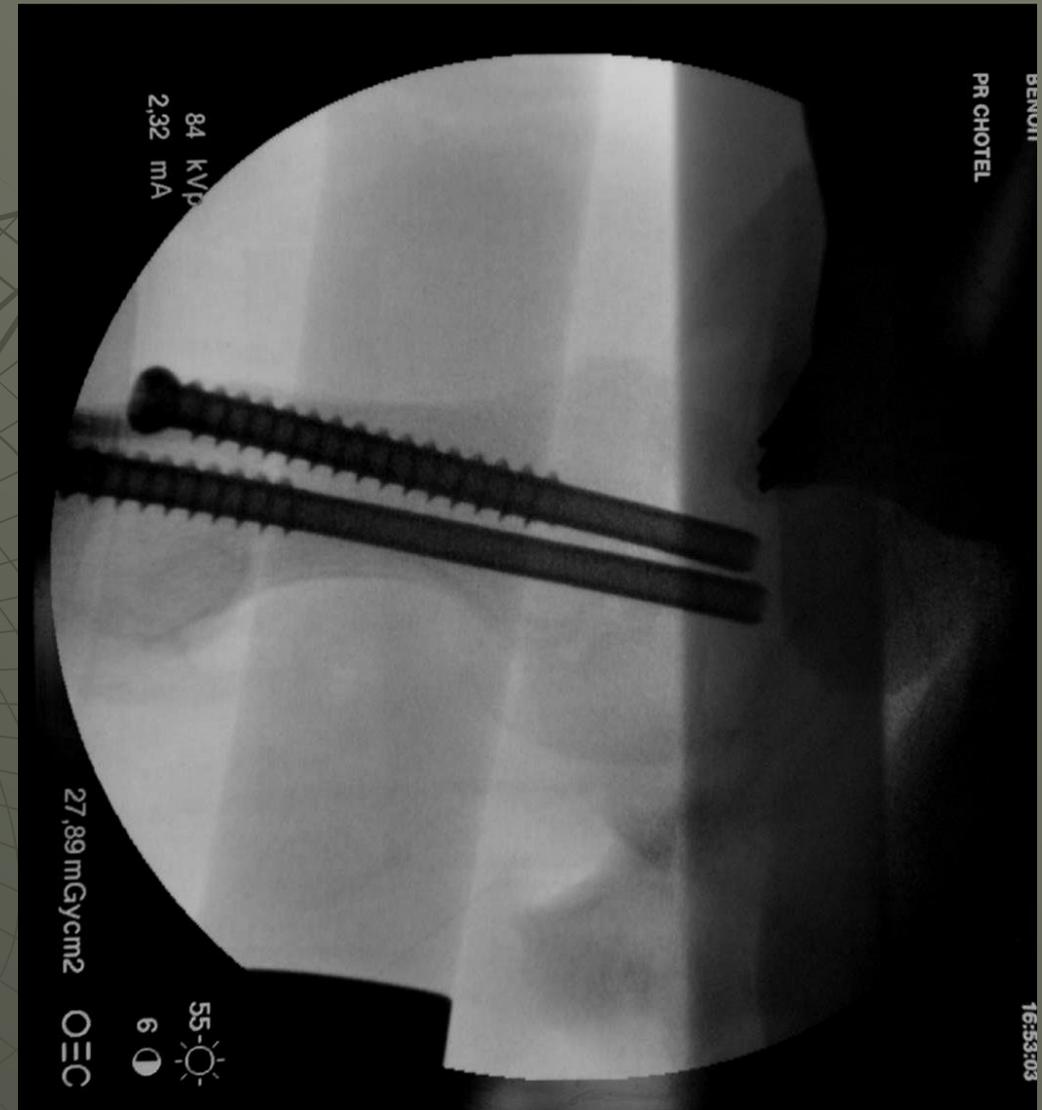
+ 41 m



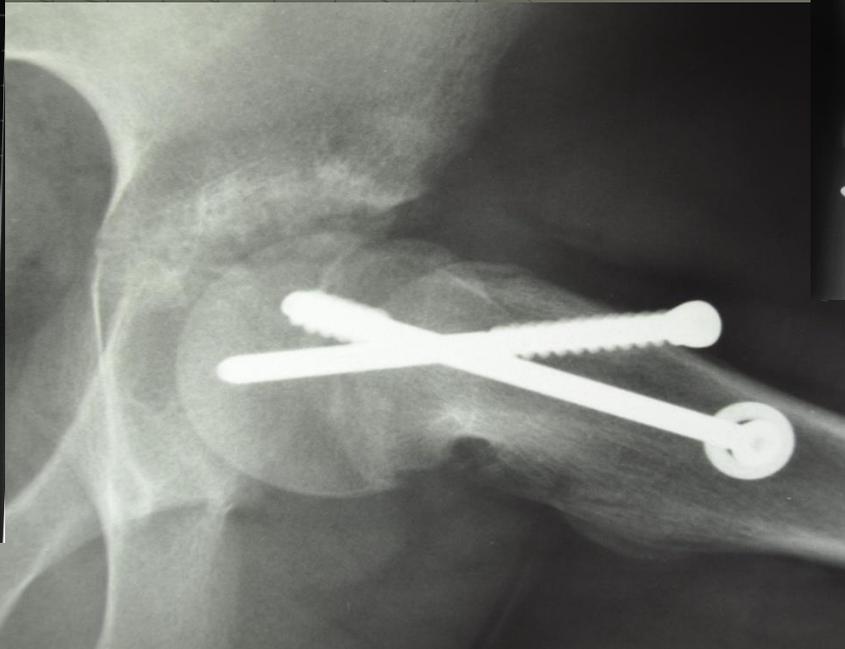
Acute or unstable SCFE ?

Need more stability
According to triradiate
cartilage :

- ◆ 2 HDB screws
- ◆ Combine different
type of screw



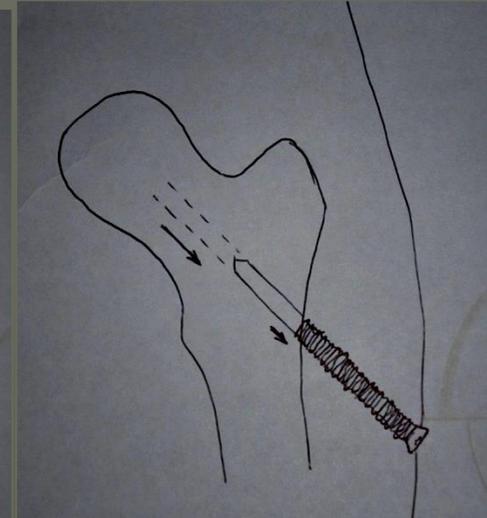
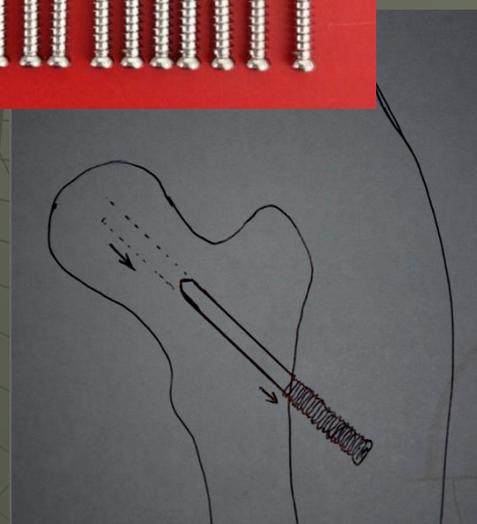
Use residual growth to obtain remodelage ? Asymmetrical epiphysiodesesis ?



Evolution : second and third screw generation



- ◆ Diametre 6.5 mm initially become **7.3 mm**
more rigide guide wire
- ◆ **Longer thread part**
for easy removal



One broken screw : 13Y Old boy



Preventive contro-lateral fixation ?

Controversial discussion / Still debated:

- ◆ No !
- ◆ Only for at risk population !
endocrinopathy, renal disease, obesity
Under 10 Y old : 50 % bilateral
- ◆ Yes ! Contro-lateral prevalence : 36% (82/226)
18 / 82 moderate to severe severity
5 / 18 poor prognosis

*Lim Ann acad med
singapore 2008*

*Azzopardi JPO B 2010
Seller JPO B 2001*

Yildirim JBJS Am 2008



If very low morbidity of the fixation

☞ Preventive contralateral fixation

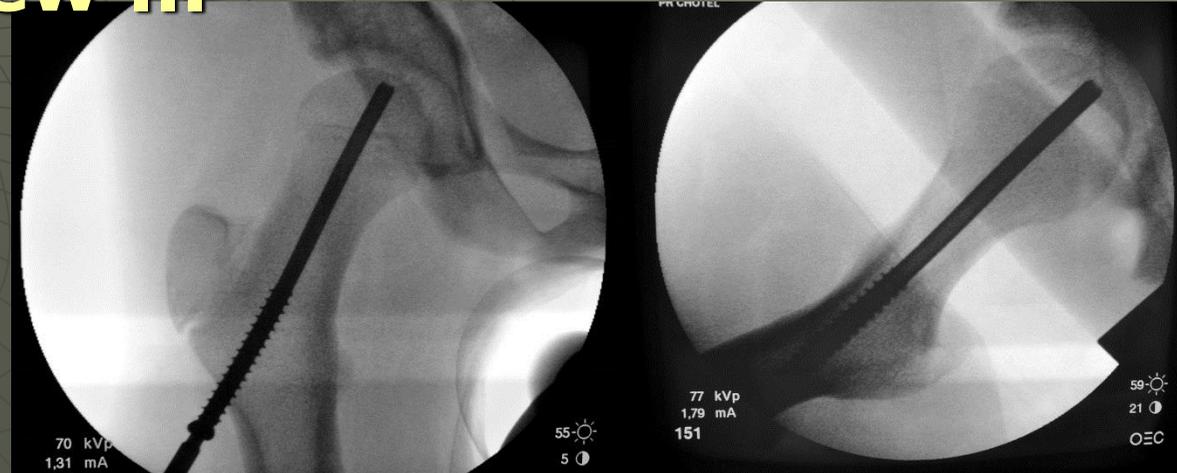
Benefit

Risk

Preventive contro-lateral fixation

- ◆ A philosophy **since 1996 in our unit**
- ◆ For all patients
- ◆ Remove the screw after maturity

No morbidity
few non removal screw ...



Study 2 : does it works ?

- ◆ Retrospective study
- ◆ **23 patients**
- ◆ Stable and unilateral SCFE
- ◆ Bilateral in situ fixation with single HDB screw
- ◆ 9 girls (mean age 10,25 Y) / 14 boys (mean age 12,6 Y)
- ◆ Epiphyseal slippage
 - ◆ <30° (stade 1) 17 cases
 - ◆ <60° (stade 2) 6 cases
- ◆ Mean F-Up : 30 months (> 12 months)



SOFCOT 2008
Sailhan JCO 2011

J Child Orthop (2011) 5:83–88
DOI 10.1007/s11832-010-0324-0

ORIGINAL CLINICAL ARTICLE

Continued growth of the hip after fixation of slipped capital femoral epiphysis using a single cannulated screw with a proximal threading

Frédéric Sailhan · Aurélien Courvoisier ·
Océane Brunet · Franck Chotel · Jérôme Berard

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Abstract

Background The most commonly used method for unstable slipped capital femoral epiphysis (SCFE) remains in situ fixation. Depending on the surgeon's preference, screws or Kirschner wires are used for stabilizing the slipped upper femoral epiphysis. The purpose of this study was to evaluate the ability of a single cannulated screw with a proximal threading to ensure stabilization, growth, and remodeling of the slipped epiphysis.

Methods A retrospective study was performed identifying 23 children treated for unstable SCFE under 50° by means of a single cannulated screw with proximal threading. All patients attended a radiological evaluation immediately

seems to be a safe and relevant implant to help to restore a close-to-normal hip at skeletal maturity.

Keywords Slipped capital femoral epiphysis · Fixation · Proximal threading cannulated screw · Growth

Introduction

Slipped capital femoral epiphysis (SCFE) is a common disorder of the adolescent hip. It is characterized by a displacement of the upper femoral epiphysis in a dorsal, medial, and caudal direction. Although a number of non-

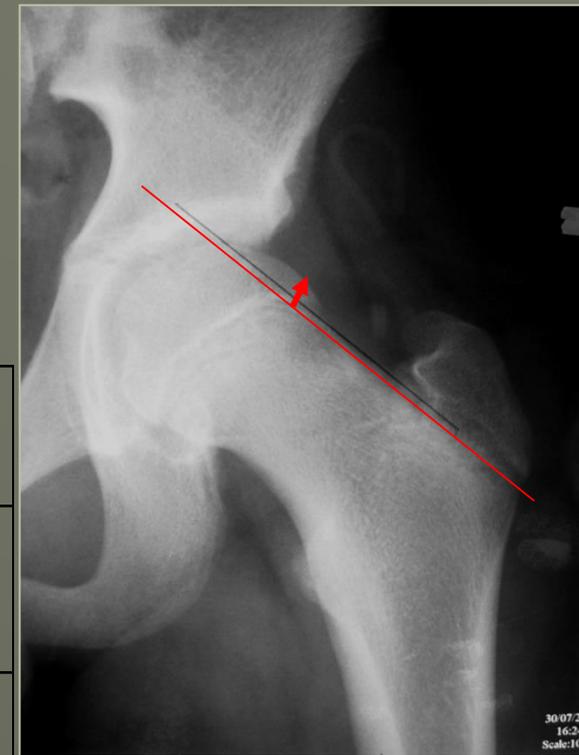
Results

- ◆ **Increase neck length** (from preoperative to F-Up) :
 - Non pathologic fixed hip : **+ 7,9 mm**
 - SCFE side : **+ 4,66 mm** (p=0,0016)
- ◆ **Increase wide**
 - Non pathologic fixed hip : **+ 4,76 mm**
 - SCFE side : **+ 7,05 mm** (p=0,0016)
- ◆ No secondary dysmorphism
- ◆ **8/23 patients (35%) : new surgery to implant a longer screw**



Klein lign / Remodelage

| | SCFE | Controlateral Non pathol | P (Test T de STudent) |
|---------------------|------------------------------|-----------------------------|--------------------------|
| Preoperative | 1,2 mm (+/-4,96mm) | 5,4 mm (+/-2,89 mm) | P=0.0003 |
| Last F-Up | 5,7 mm (+/-3,14mm) | 7,2 mm (+/-2,09 mm) | P=0.02 |
| Differential | + 4,5 (+/-3,83mm) | + 1,9 (+/-2,57mm) | P=0.004 |



👉 **Significant remodelage on SCFE side !**

Conclusion

- ◆ Best indication is stable SCFE with open or intermediate triradiate cartilage
- ◆ **Avantages**
 - Good stabilization
 - Concept of guided growth
Allow residual growth
Avoid severe dysmorphty
 - Remodelage +
 - Easy to implant and to remove
- ◆ **Disadvantage**
 - Need further surgery in case of important residual growth

