

Orthopedics Update
***Hip Dysplasia –
Current Concepts in
Europe***
« Die Kinderhüfte »

**Pediatric Orthopedic Department
University of Basel, Switzerland**

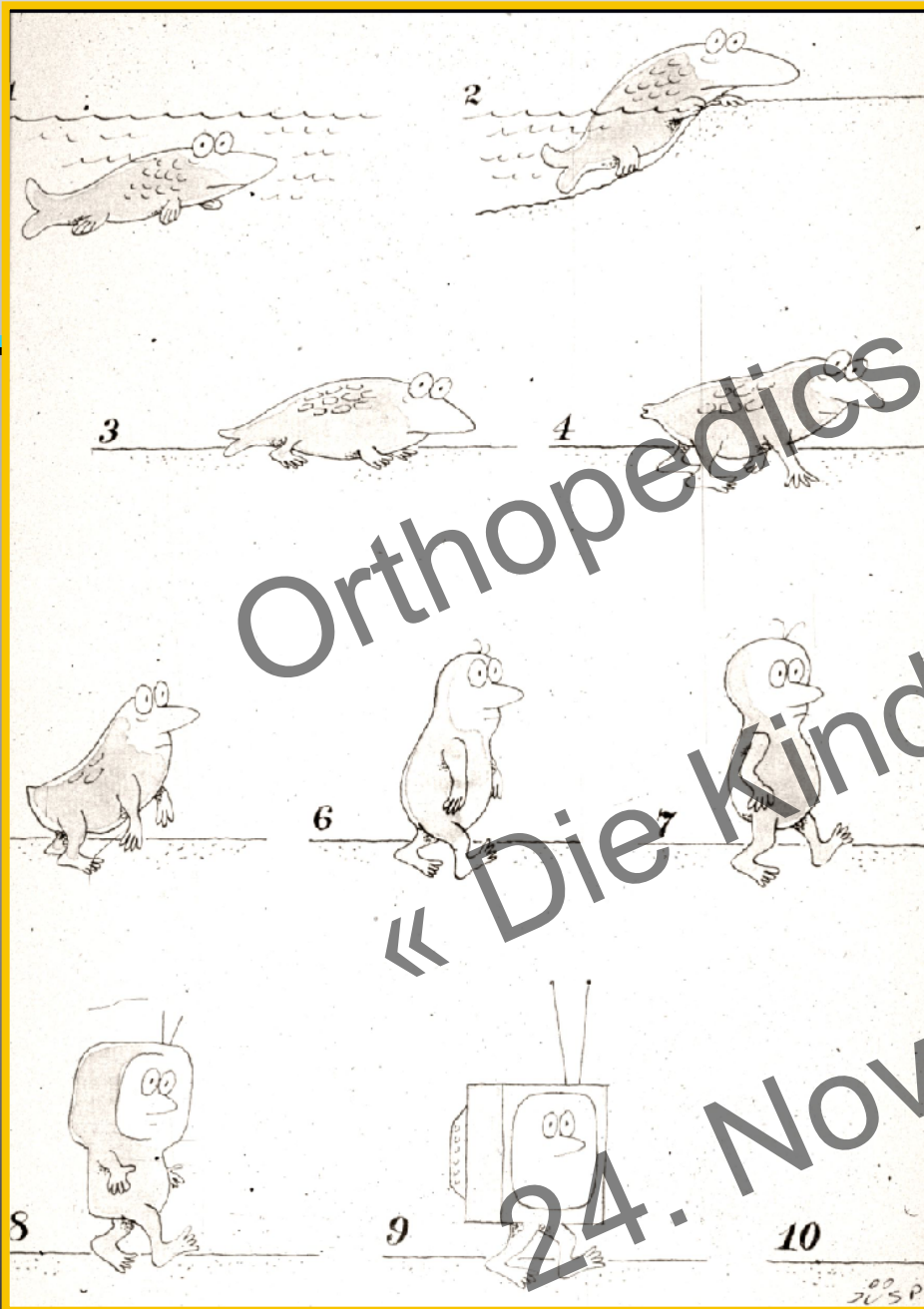


Why is hip dysplasia common in humans?



Evolution...

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Evolution...

Historical Data

for Diagnosis and Treatment of Hip Dysplasia

1847	C.G. Pravaz	Longitudinal Extension
1885	A. Lorenz	„Frog-Position“
1895	W. Röntgen	X-Ray
1937	M. Ortolani	„segno del scatto“
1955	W.A. Craig	„Overhead-Extension“
1957	A. Pavlik	Harness
1968	E. Fettweis	„Sitting“-Cast
1980	R. Graf	Ultrasound Examination



CDH

***(congenital dis-
location of the hip)***

#

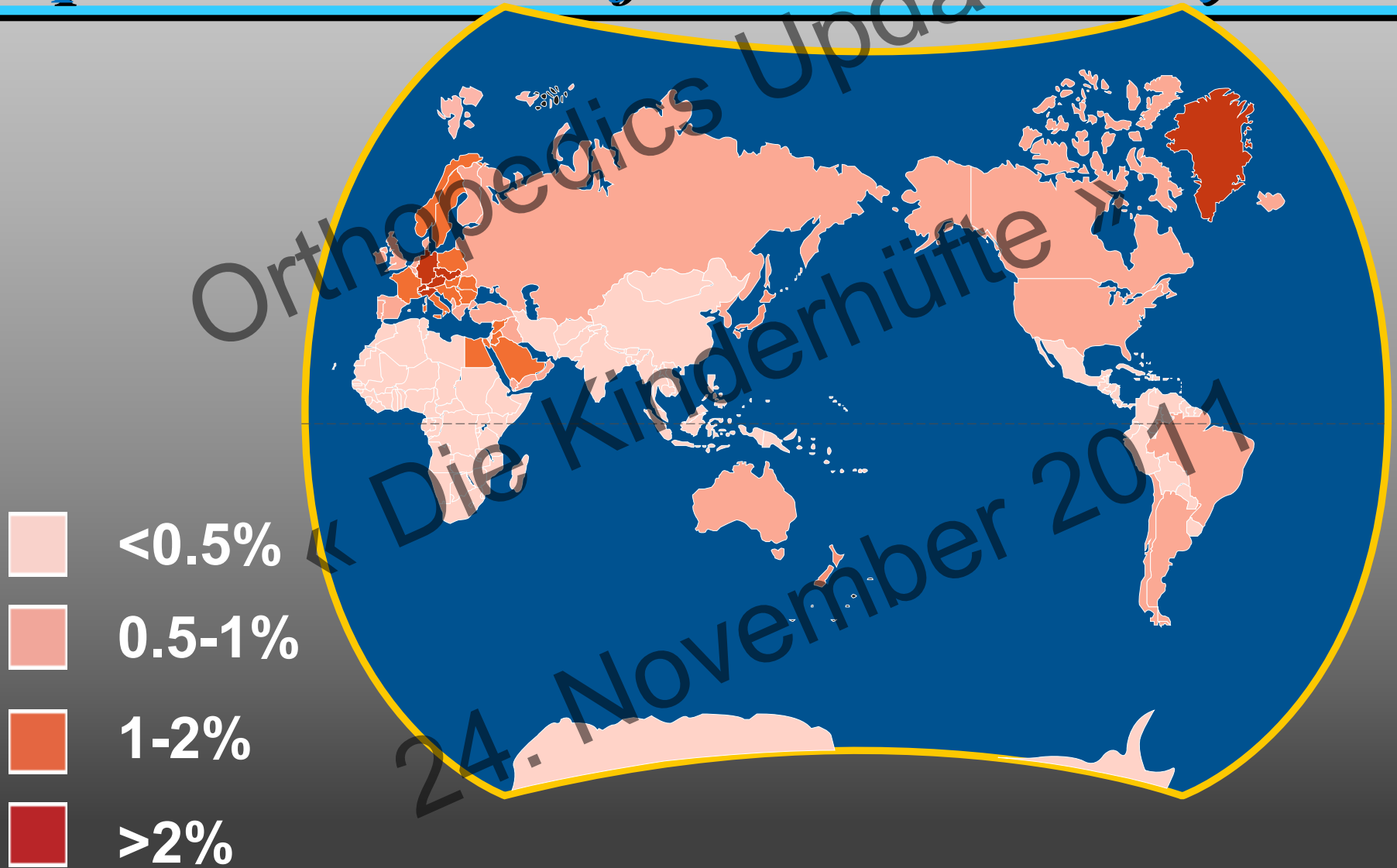
DDH

***(developmental dys-
plasia of the hip)****

*Kliscic P: Congenital dislocation of the hip: a misleading term.
J Bone Jt Surg 71-B (1989)

Incidence of DDH

up to the Sixties of the 20th Century





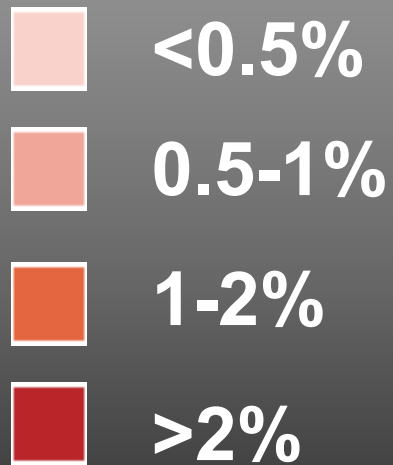
Greenland



Africa

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Incidence of DDH in Europe up to the Sixties of the 20th Century



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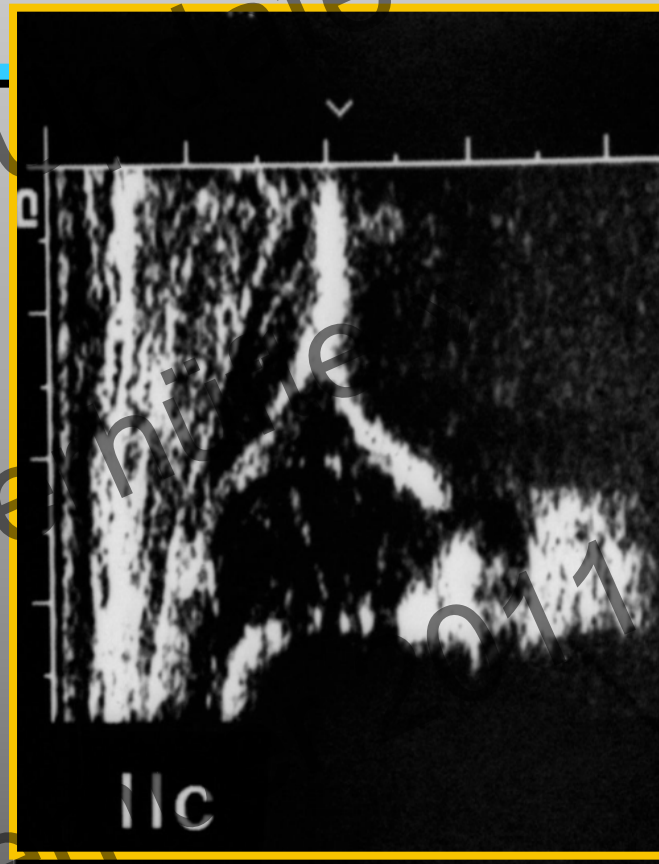


*Did this man
change the
incidence of DDH
in central
Europe?*

Prof. Reinhard Graf, Stolzalpe, Austria



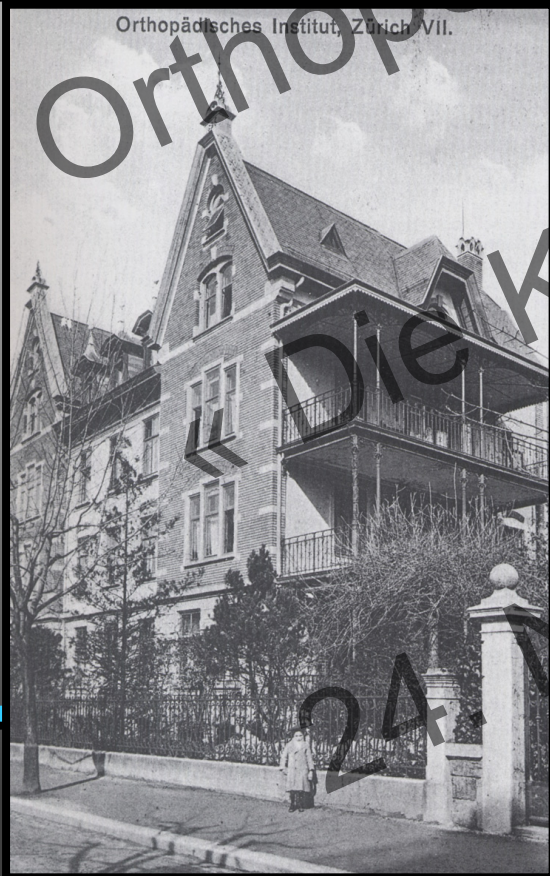
Prof. Reinhard Graf, Stolzalpe, Austria



*Ultrasound-screening for
DDH since approx. 1985*



Hospice Orthopédique de la Suisse Romande à Lausanne



Orthopädisches Institut, Zürich VII.

Hôpital orthopédique de la Suisse romande, Lausanne

*Statistics
from yearly
reports
from:*

Orthopaedic
Institute
Balgrist,
Zurich

1920

1940

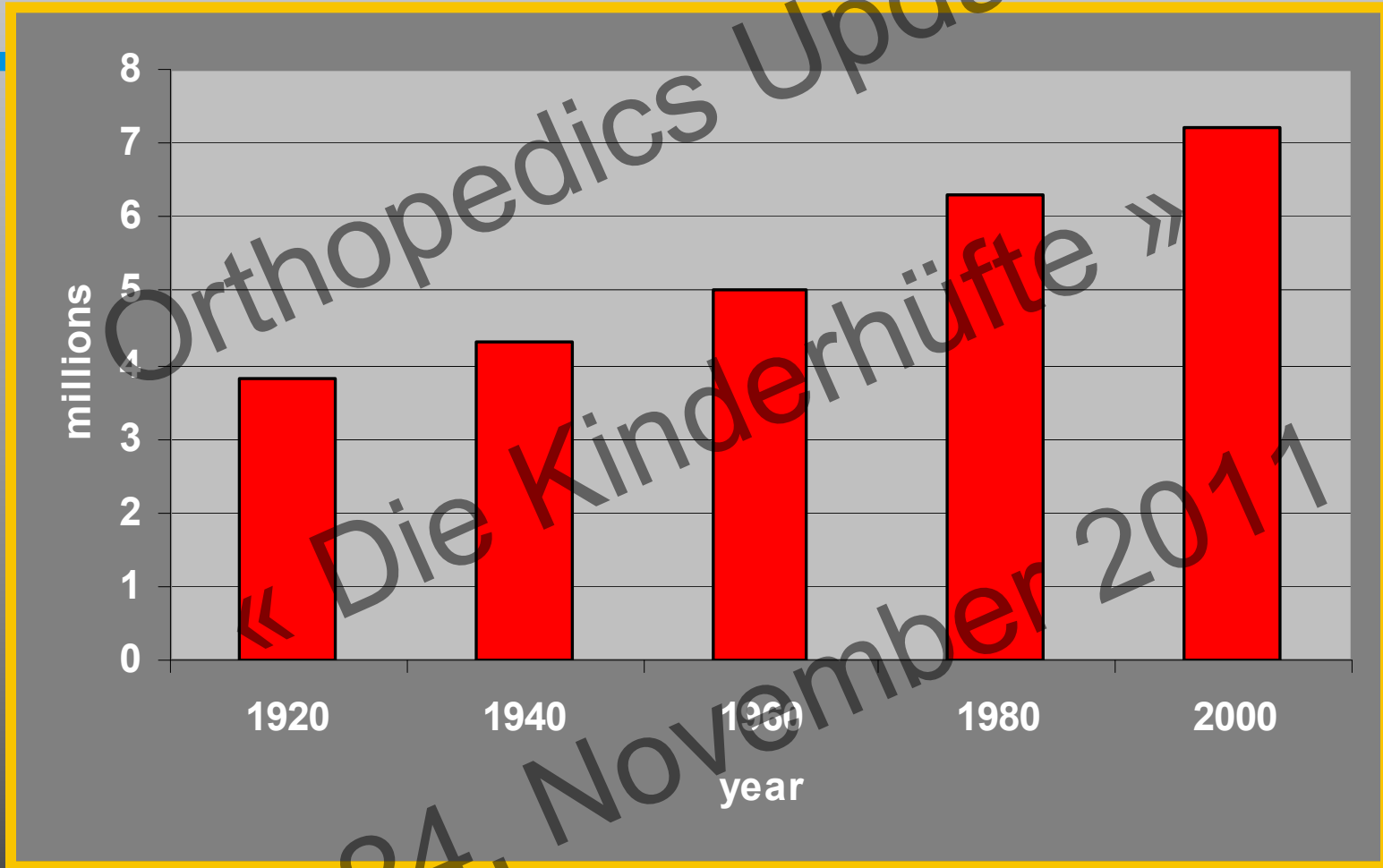
1960

1980

2000

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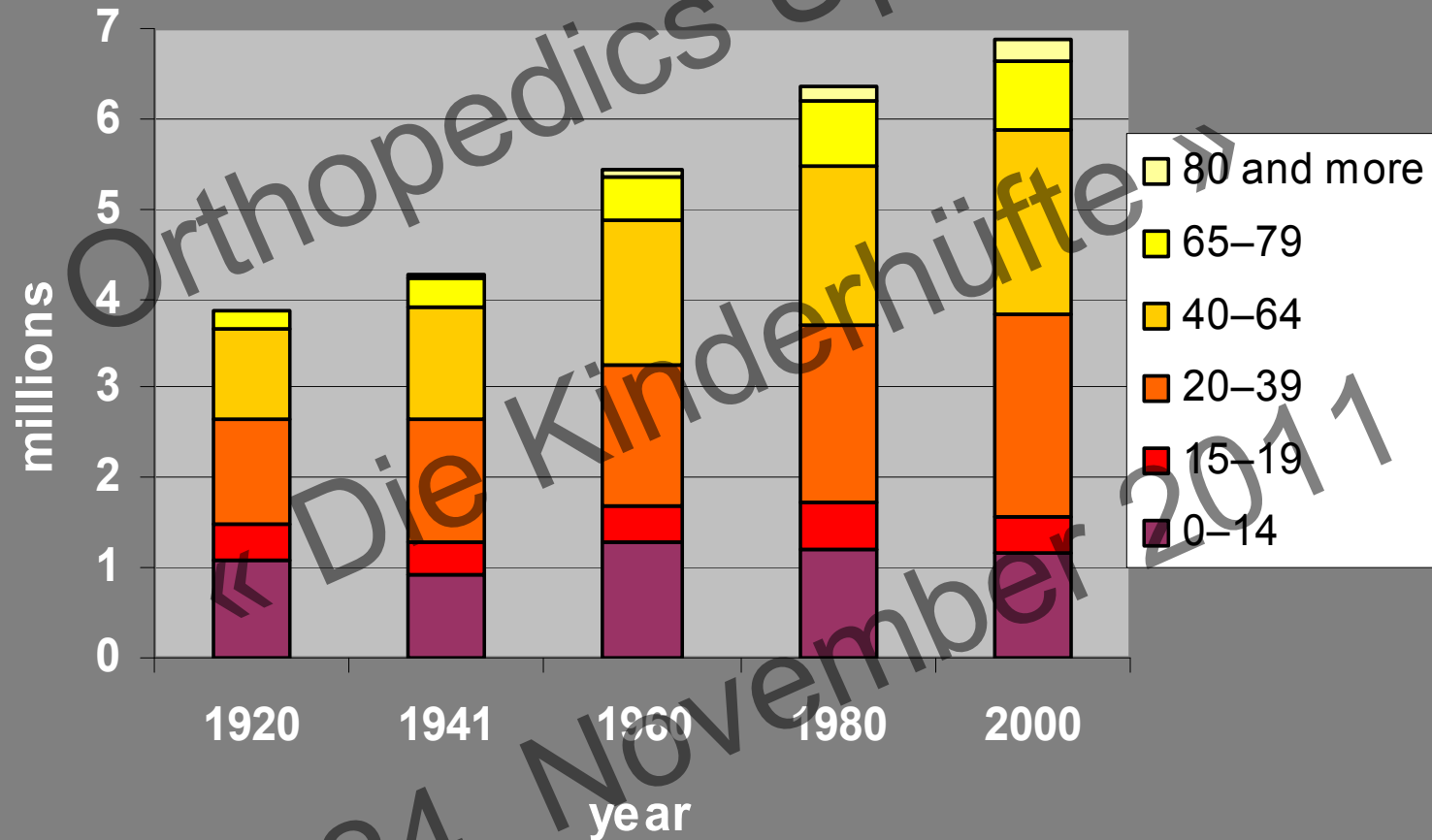
Population in Switzerland



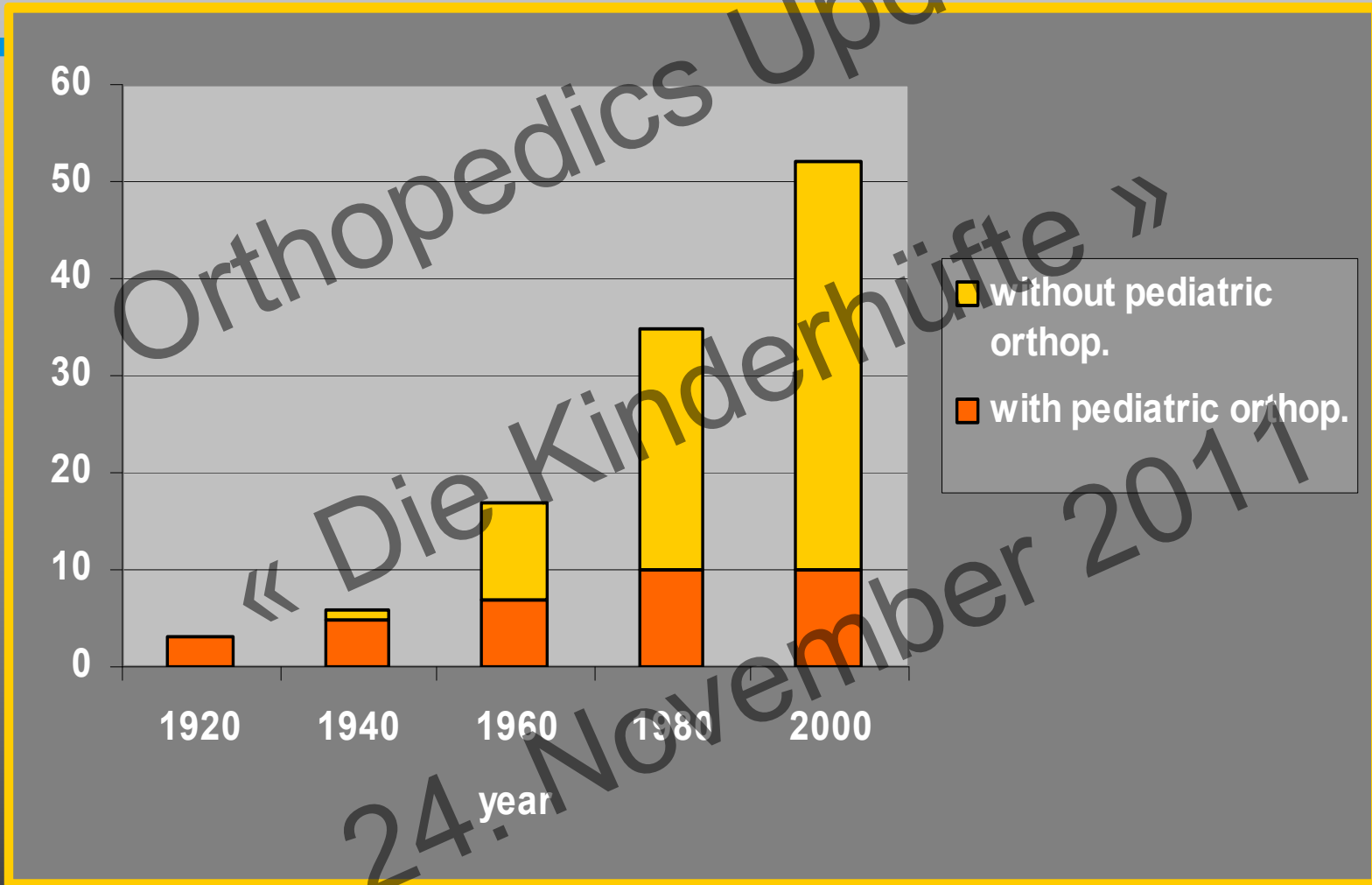
Figures from „Bundesamt für Statistik“



Age distribution of Swiss population



Orthopaedic institutions in Switzerland



Figures from „Bundesamt für Statistik“

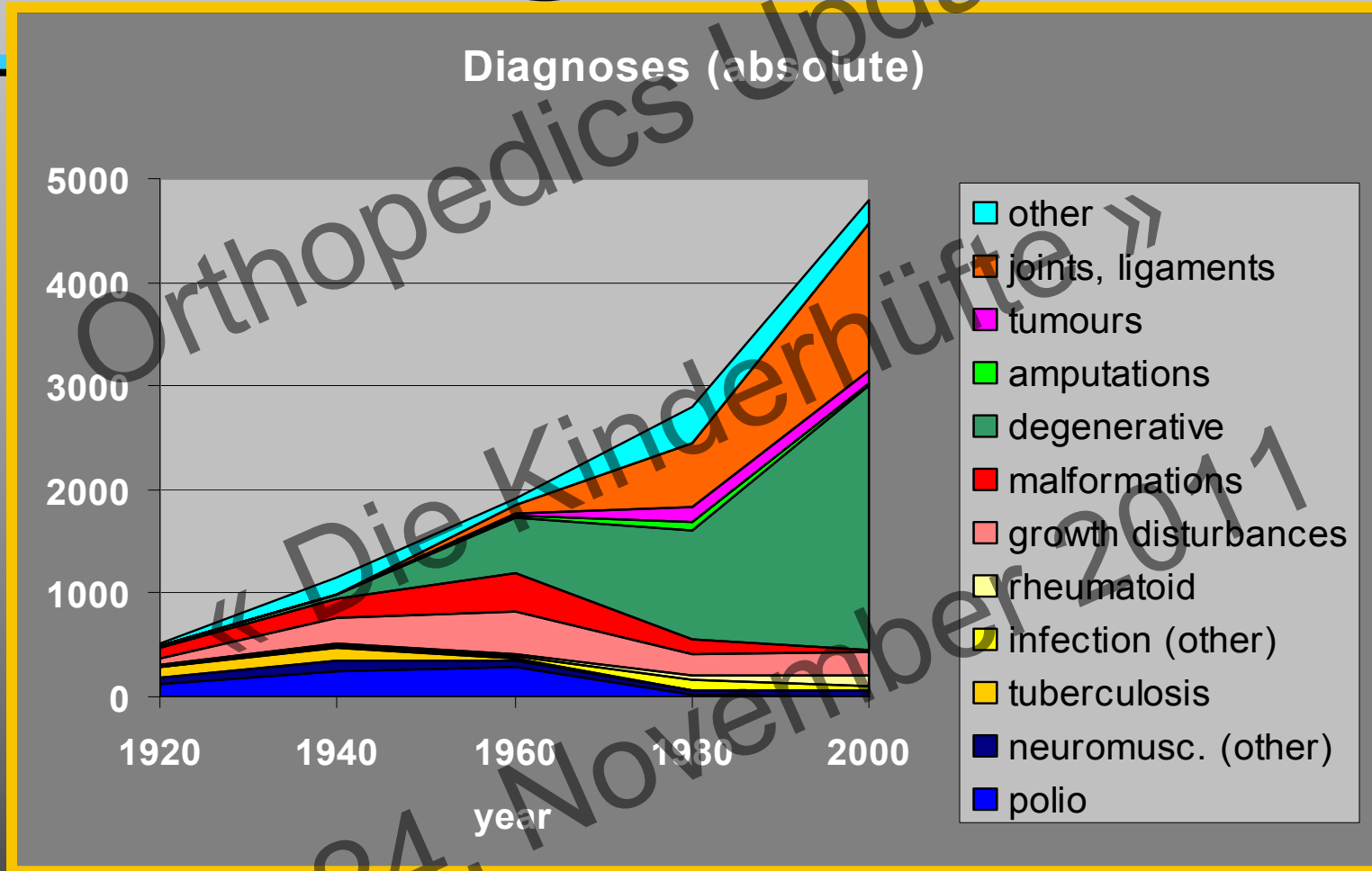


Statistics from yearly report of the following (paediatric) orthopaedic institutions in Switzerland

- 1920, 1940:
 - Balgrist, **Zürich**
 - Hôpital orthopédique, **Lausanne**
- 1960, 1980, 2000:
 - Balgrist, **Zürich**
 - Hôpital orthopédique, **Lausanne**
 - Universitäts-Kinderspital, **Basel**
 - Centre hospitalier universitaire, **Genf**
 - Kinderspital **St. Gallen**



All Diagnoses (absolute)



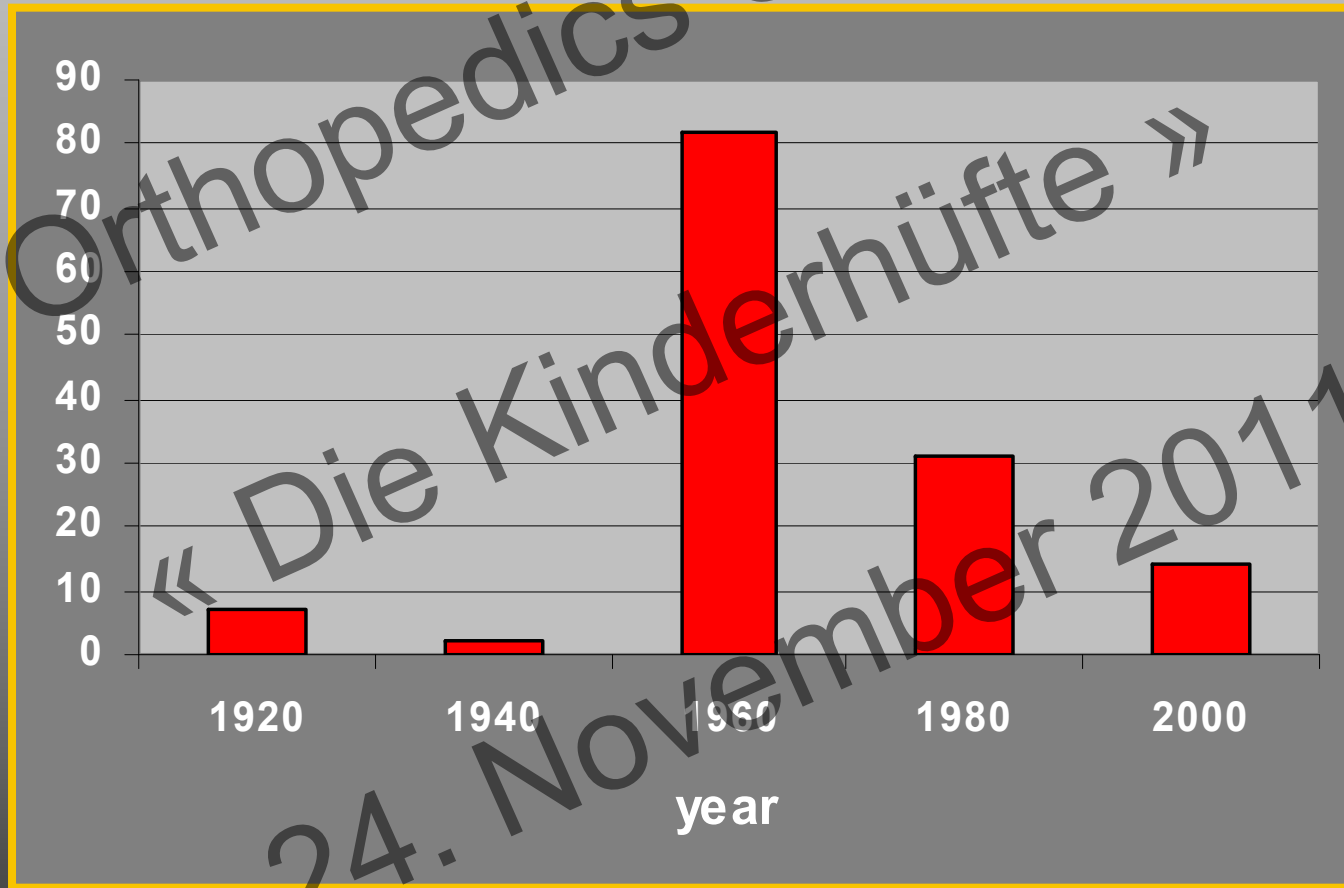
Figures from 2 Orthopaedic Institutes (Lausanne and Zurich)



Congenital dislocation of the hip

(new, hospitalized cases)

Universitäts-Kinderhospital
beider Basel



Figures from 5 Orthopaedic Institutions in Switzerland

Geological Map of Europe



Geological Map of Europe

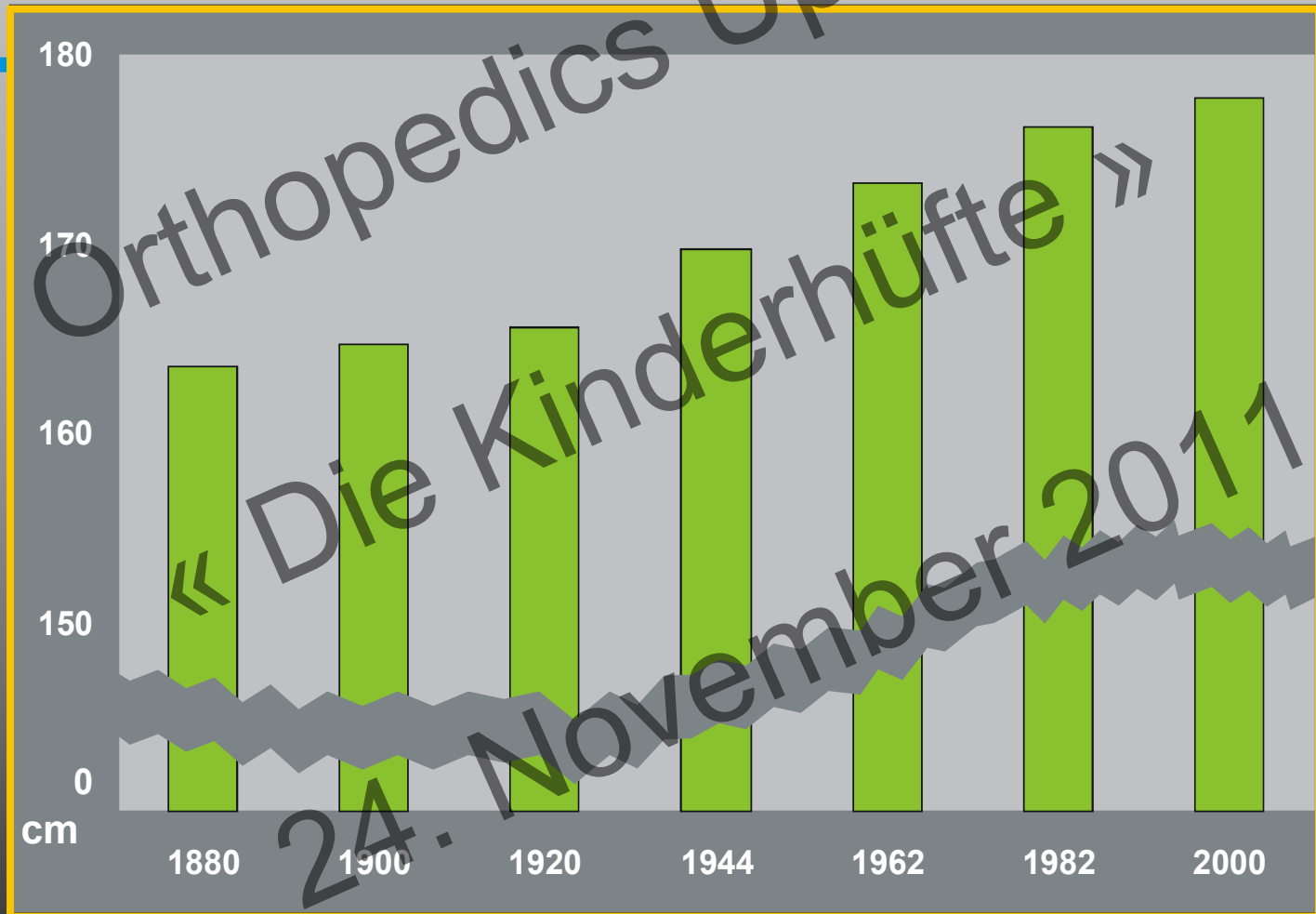
Countries with the historically highest incidence of DDH





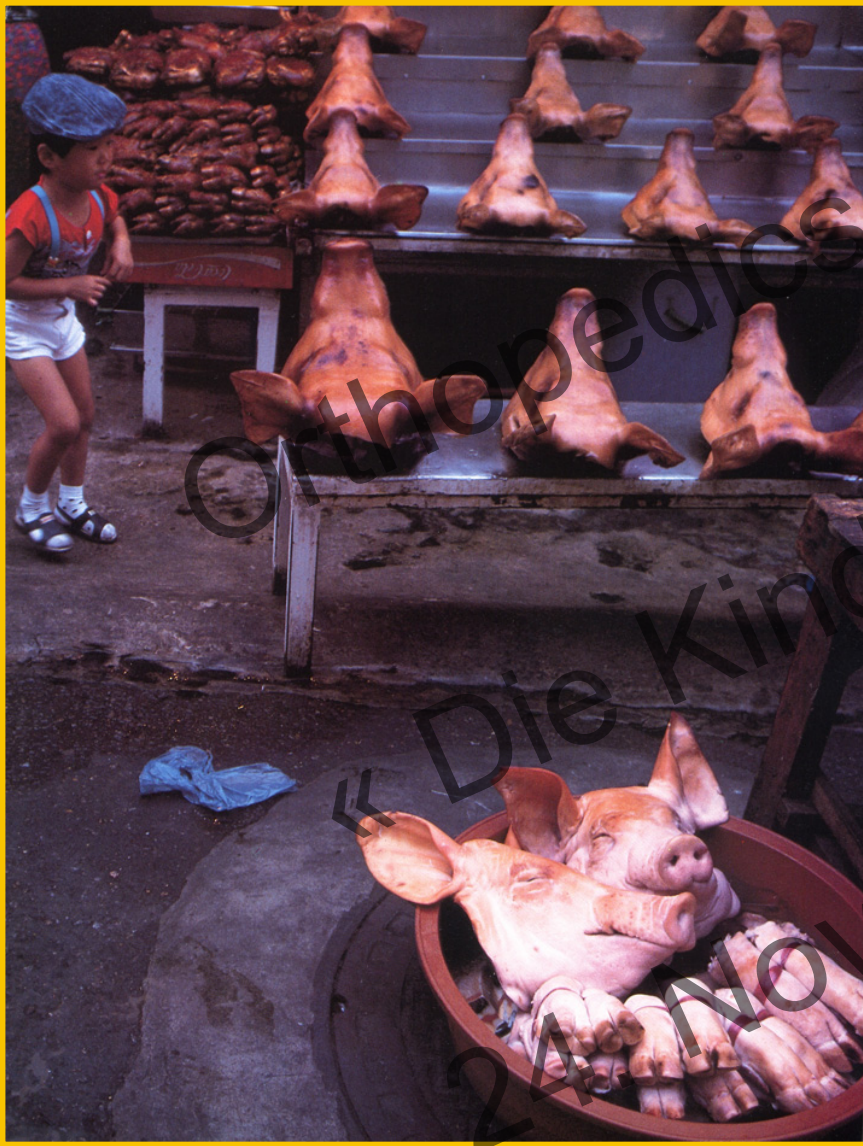
Farmhouse, 19th century

Average Height of Swiss recruits



Figures from „Bundesamt für Bevölkerungsschutz“

*Is it the
update
nutrition, rich
on proteins?*



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Genetic Intermixture

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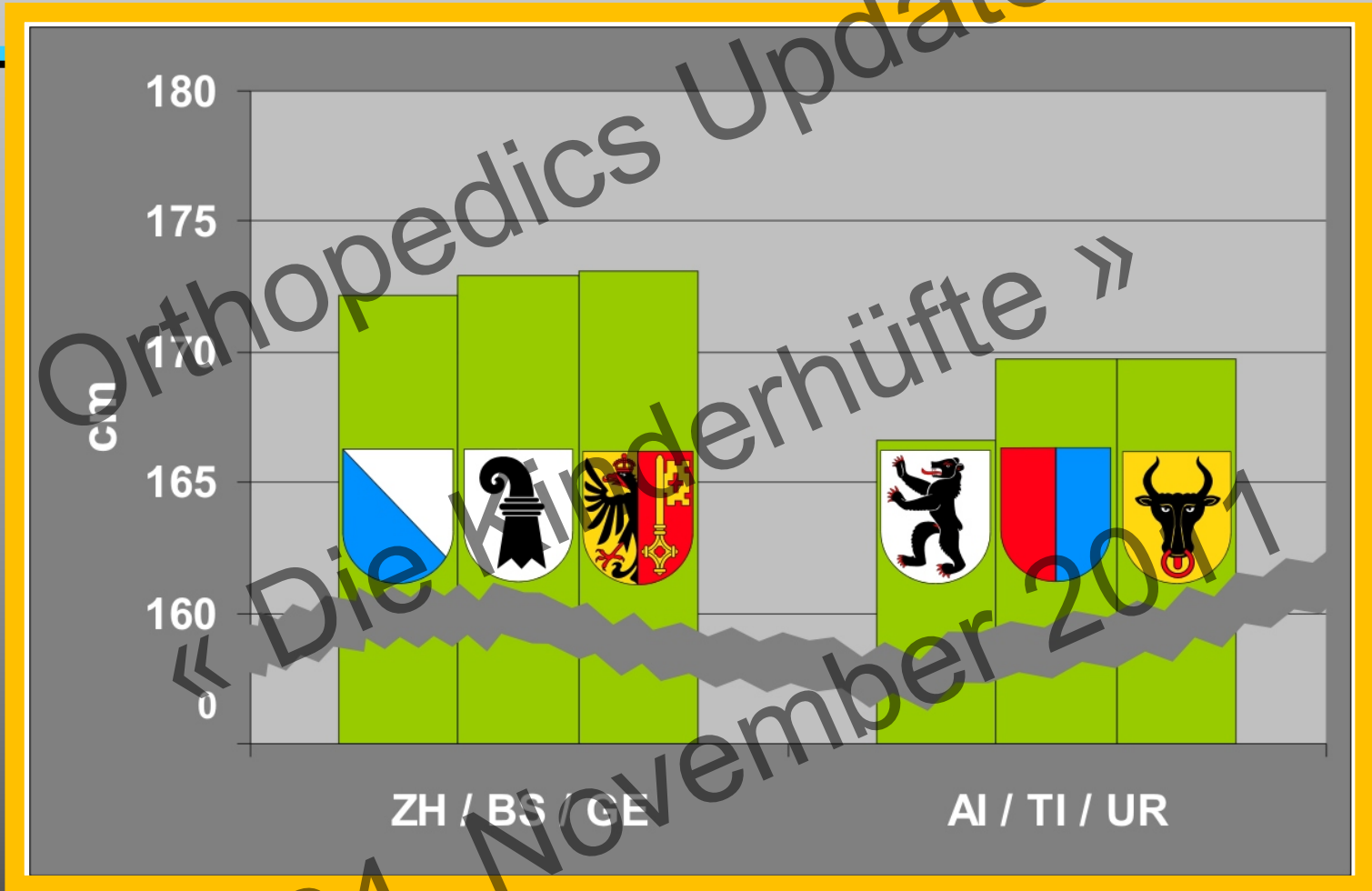
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The great majority of skeletal dysplasias is associated with short stature



Average height of Swiss recruits dependig on area of living

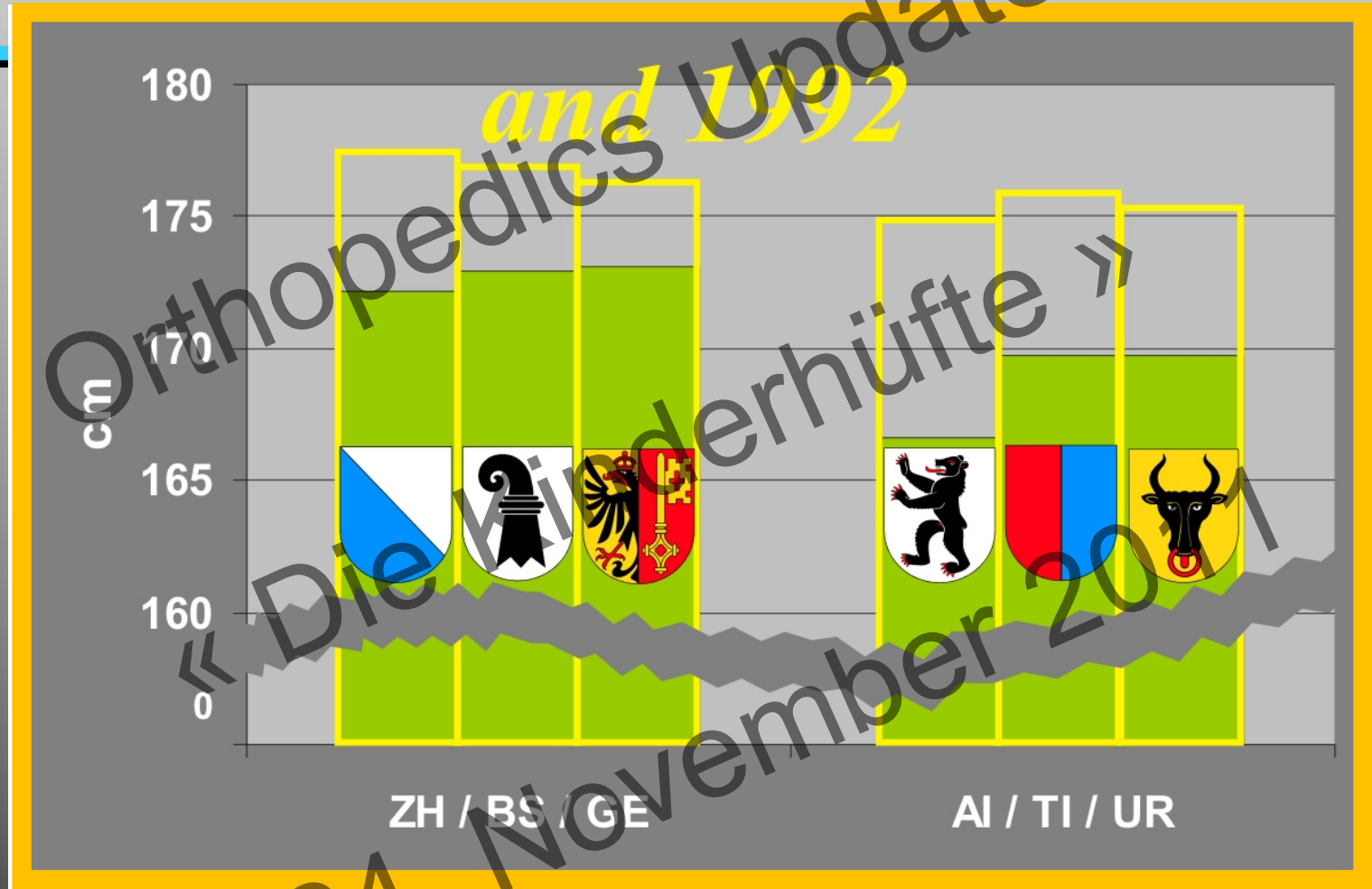


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cities

rural, mountainous areas

Average height of Swiss recruits dependig on area of living



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cities

*rural, mountainous
areas*



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***Peasants
from
Appen-
zell***

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*The new
Appenzell
family*

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Saying in Appenzell



the small ones are
from intermarriage...



...and the tall ones
from the tourism

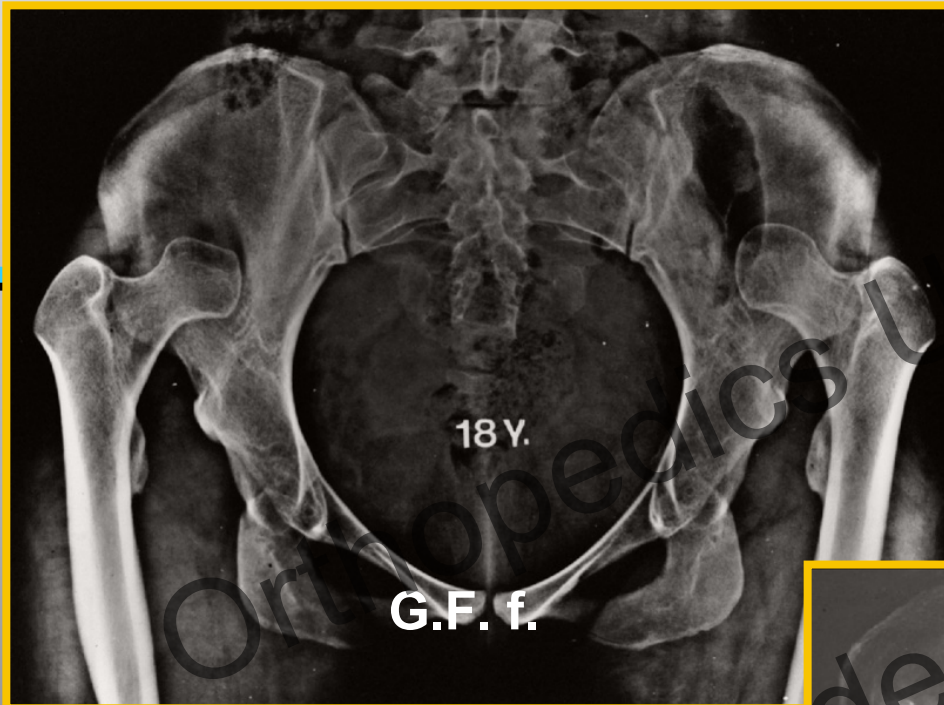
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***This man did not
change the
incidence of DDH***

***but the
consequences of
DDH***

Prof. Reinhard Graf, Stolzalpe, Austria



***Persistent
dislocation***

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L.A. f., 78 J.

Classical diagnostic tools *for hip dysplasia*

- History
- Clinical examination
- Ultrasound
- X-ray

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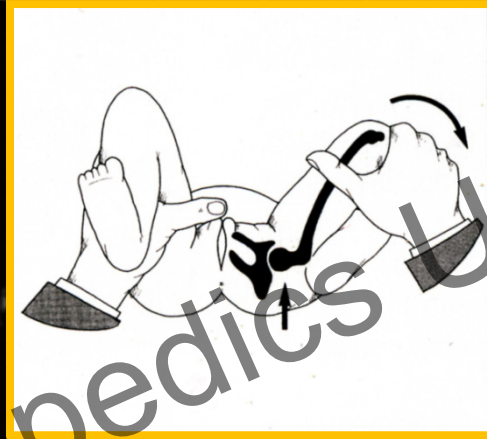
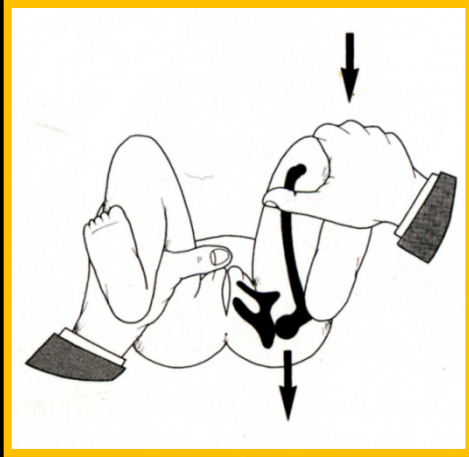
Diagnosis *of hip dysplasia*

in countries with ultrasound screening

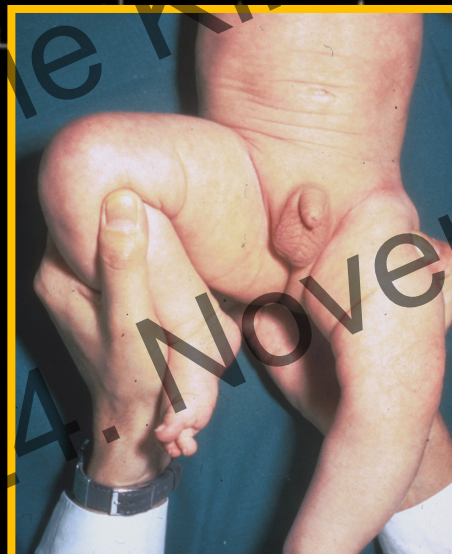
- **Ultrasound**

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In central Europe the ultrasound examination is the standard..



*Is the clinical examination
obsolete?*



Risk factors

- **History**
 - First born
 - Birch position
 - Deficiency of amniotic fluid
 - Siblings
 - other malformations
- **Inspection**
 - Asymmetry of skin folds
 - Leg length discrepancy
- **Examination**
 - Ortolani's sign
 - Instability
 - Limited abduction

Ortolani's-sign

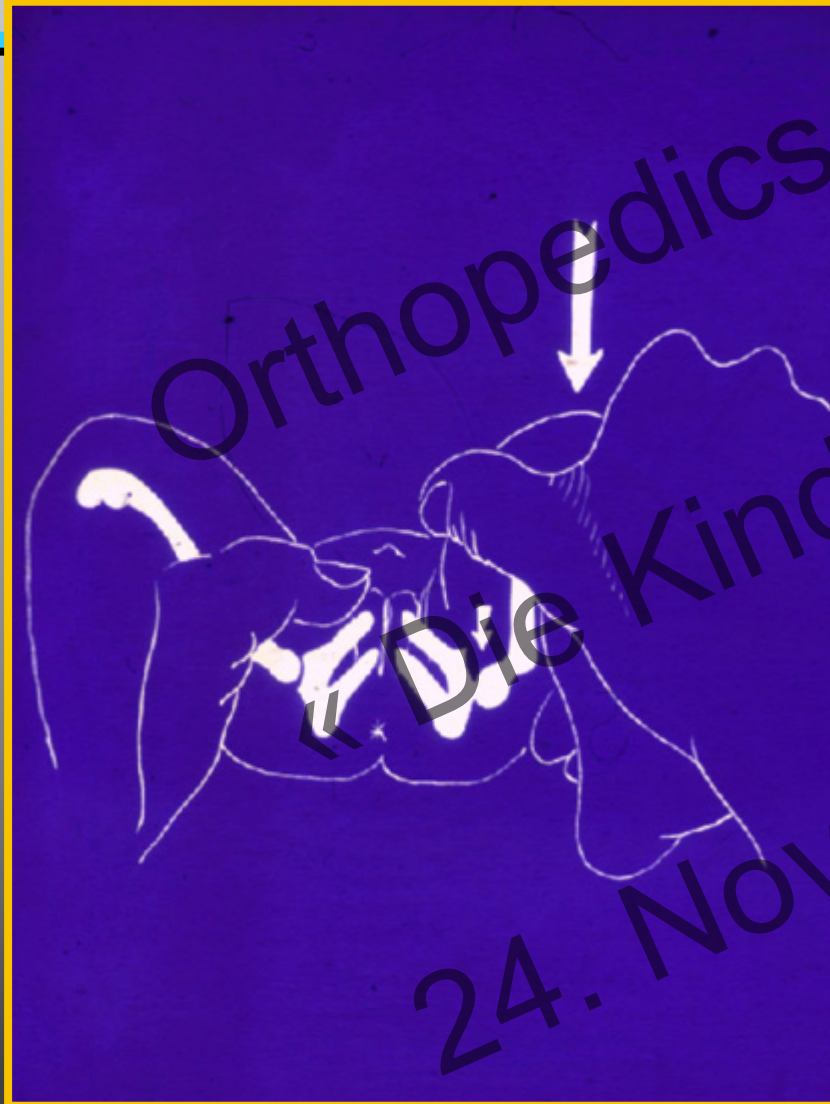


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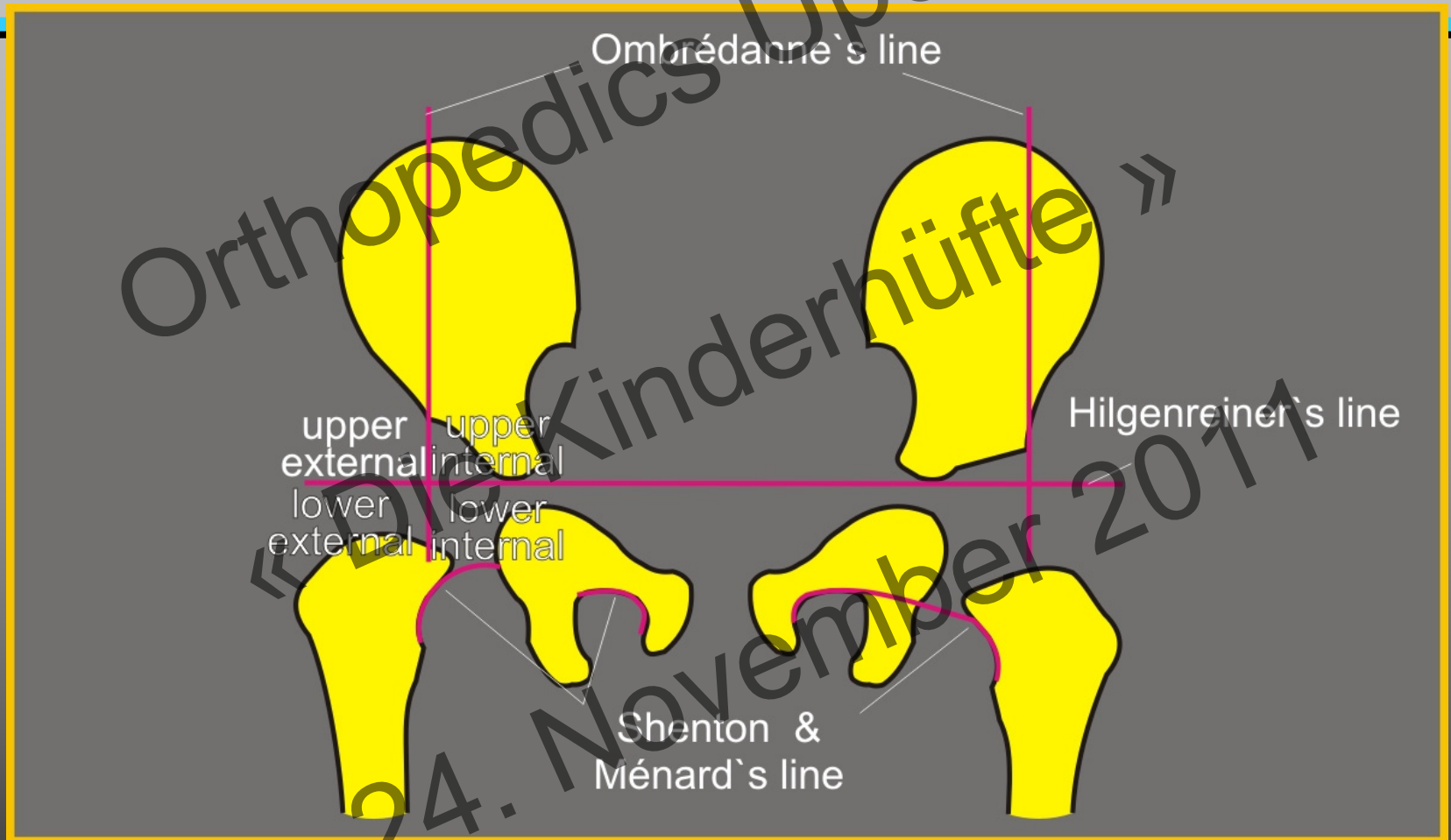
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Examination of Ortolani-‘s sign



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Radiological Assessment of the infant's hip



Anatomy of the hip in the sonogram



1: Margin of femoral metaphysis

2: Femoral head

3: Fold betw. capsule + perichondrium

4: Joint capsule

5: Labrum

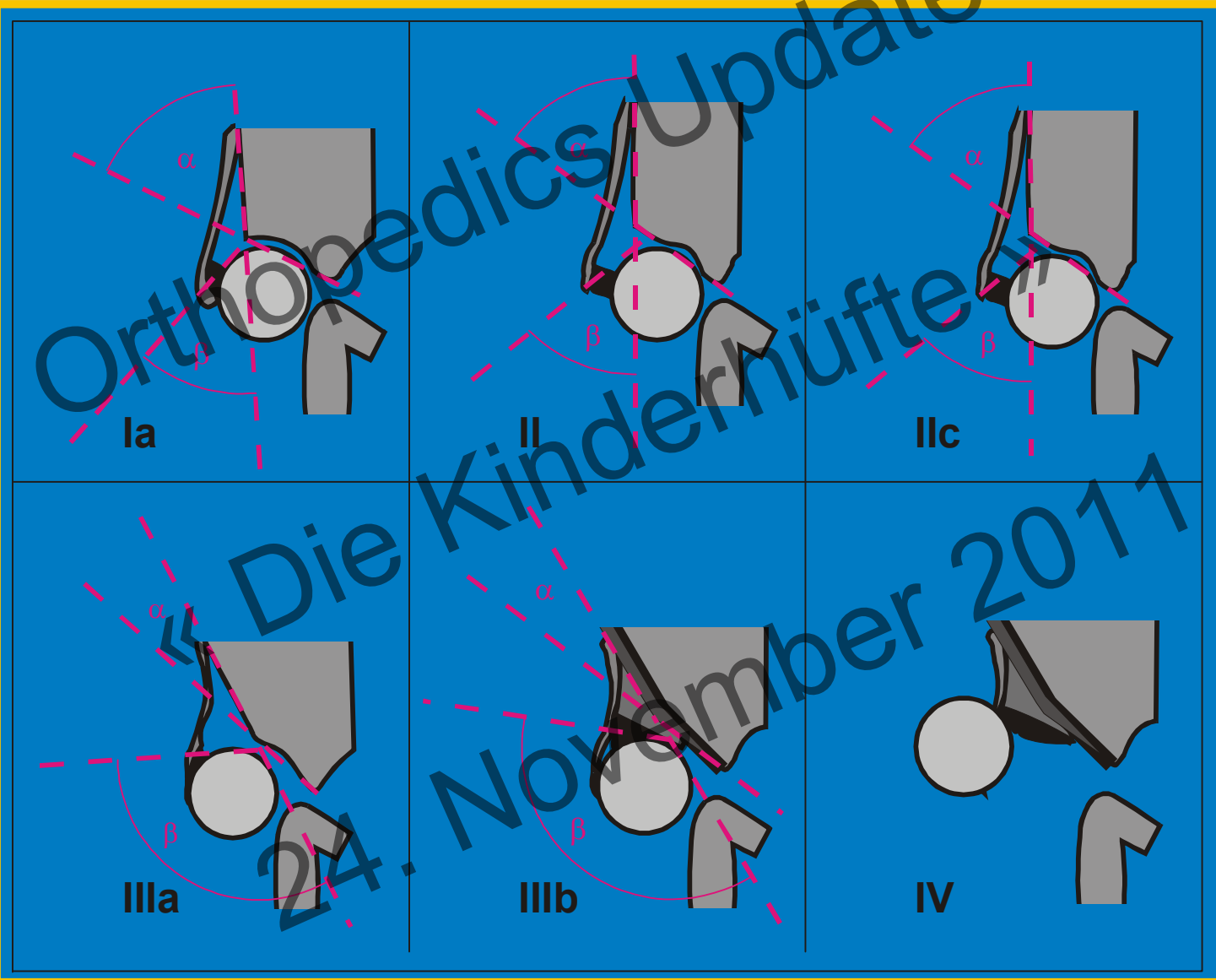
6: Hyaline cartilage of acetab. roof

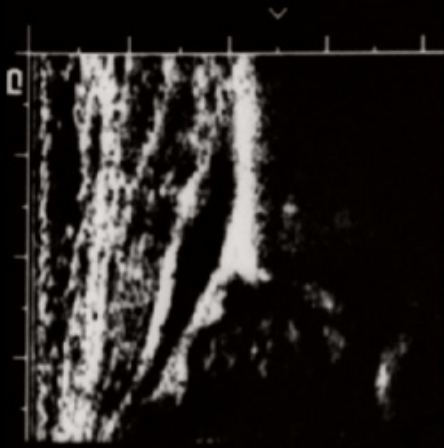
7: Osseous roof

8: Inferior margin of iliac bone

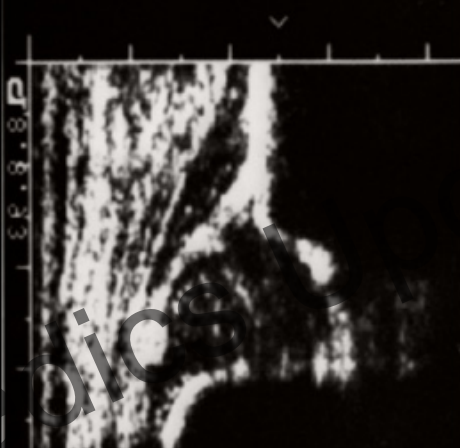
9: Anterior margin of Iliac bone

Ultrasound findings according to Graf

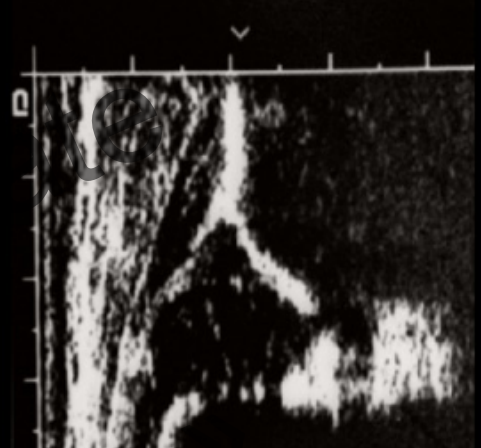




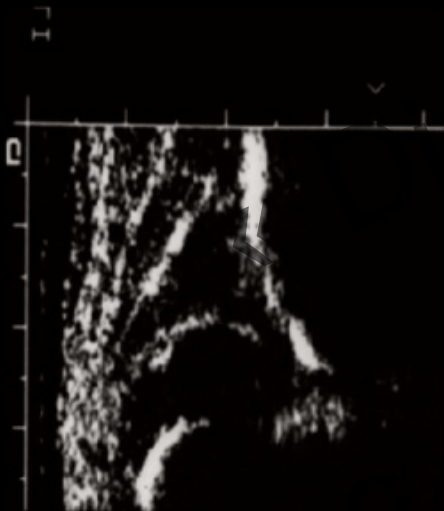
Ia



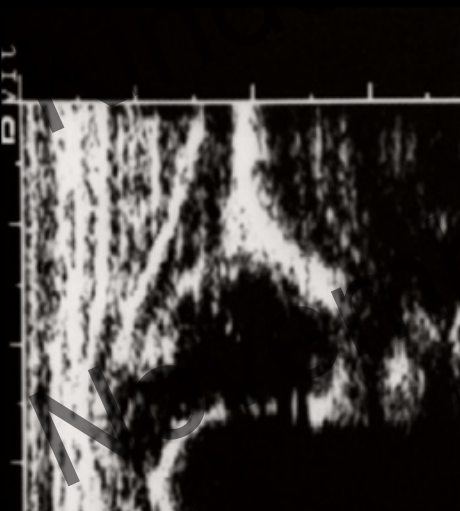
IIa



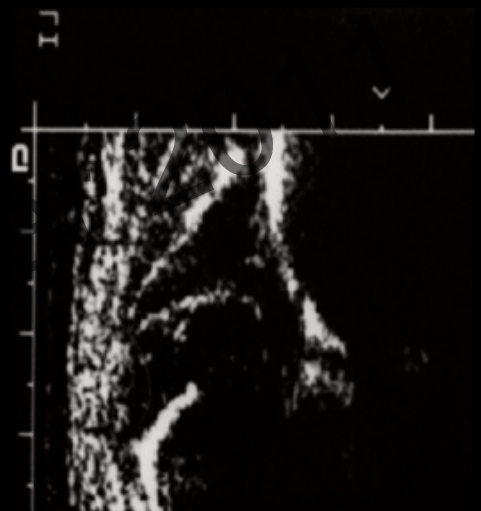
IIc



IIIa

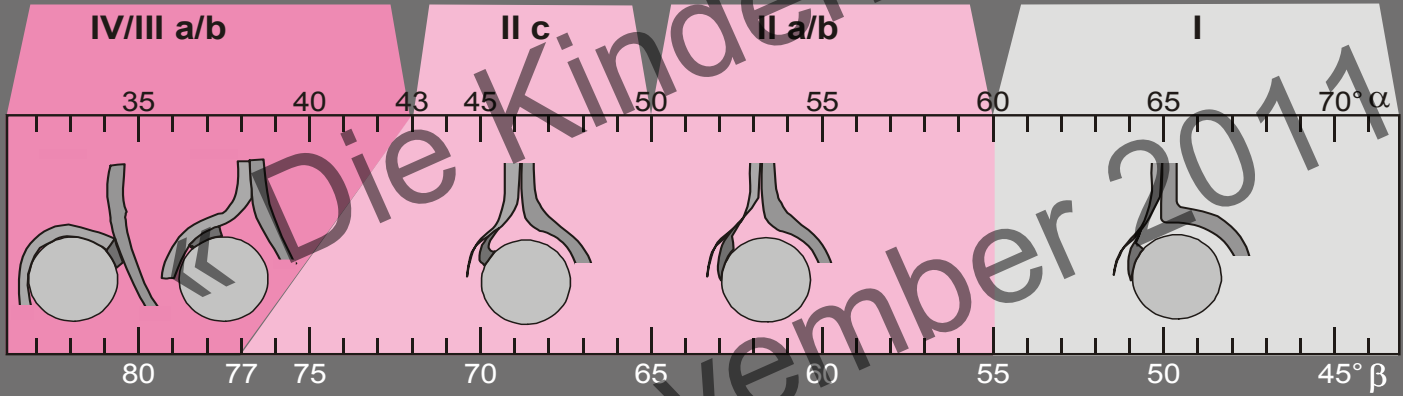


IIIb



IV

Template for the classification acc. to Graf

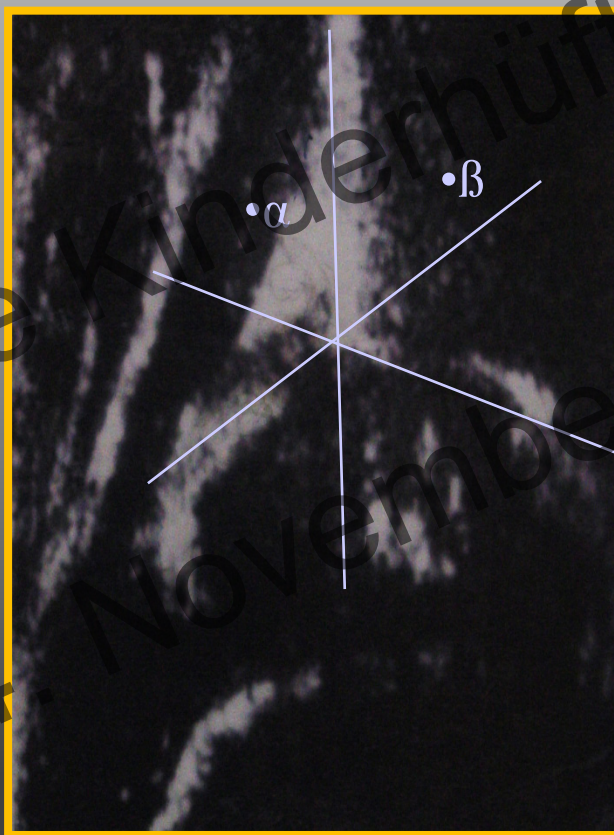
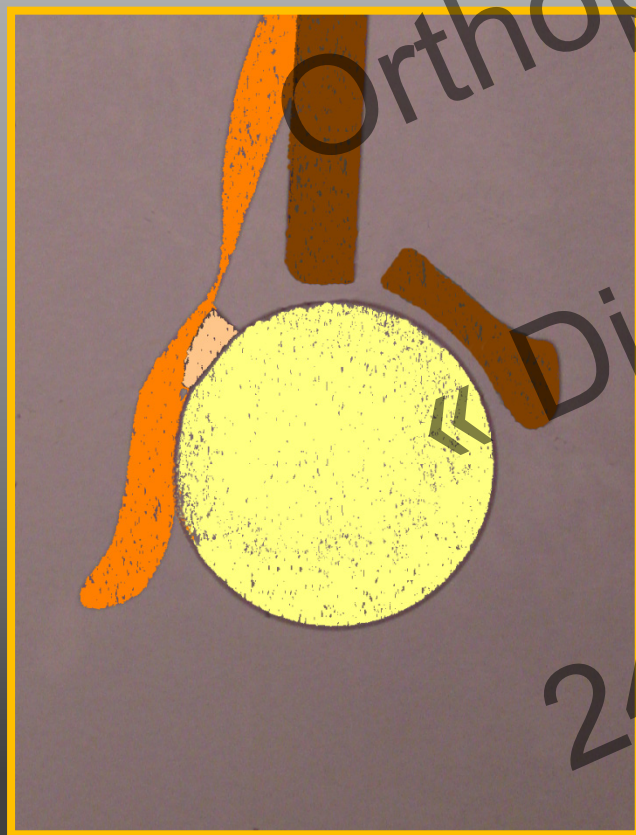


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Measurement of α - and β -angles

Well centered type I (mature) hip



- α -angle $\geq 60^\circ$
- β -angle (in this case without practical significance)

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Example of a decentered hip

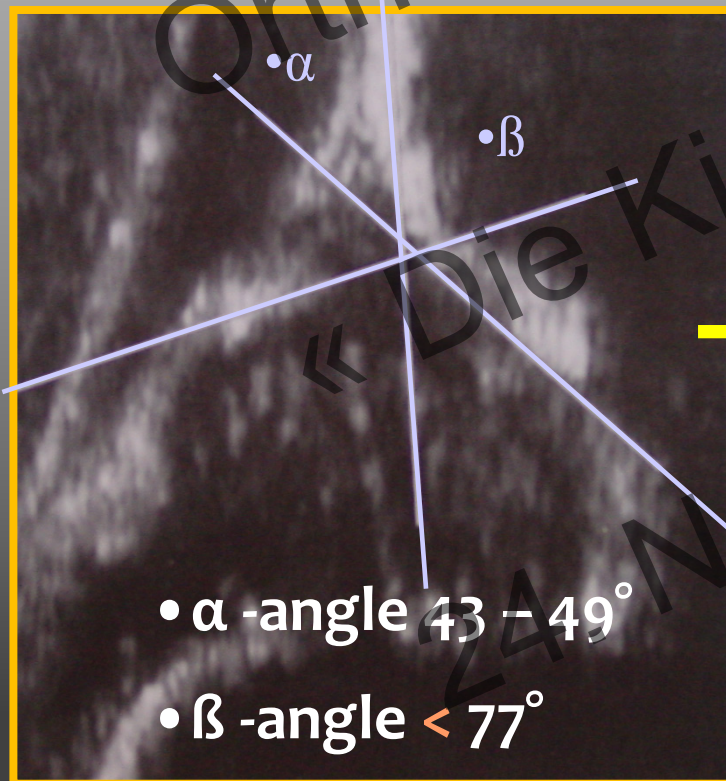
Type D



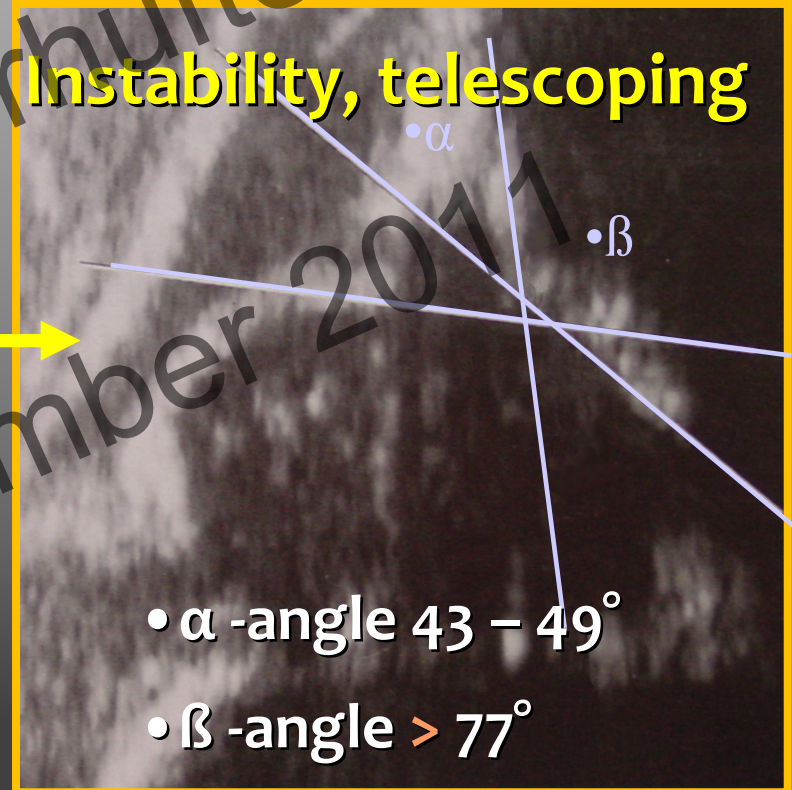
- α -angle $43 - 49^\circ$
- β -angle $> 77^\circ$
- cartilaginous roof is cranially displaced
- 1. stage of a decentered joint

Stress-Test

Centered hip
type IIc



Stress



Dias JJ et al.

***The reliability of ultrasound assessment
of neonatal hip. J Bone Jt Surg 75-B (1993)***

Ultrasound images of 87 patients were independently assessed by 5 experienced observers

Alpha-angle:

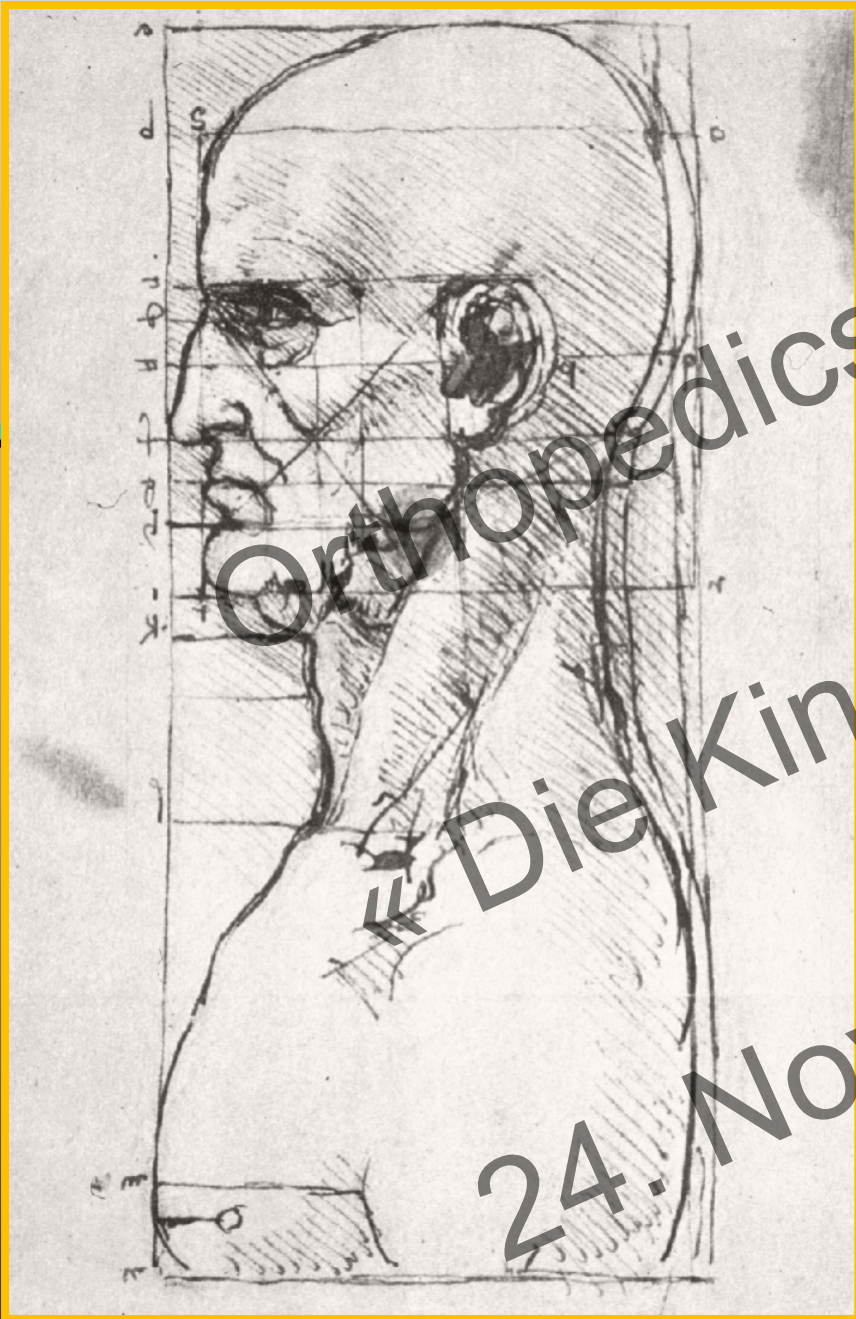
Intraobserver limits of agreement: +/- 11.4° (correl. 0.69)

Interobserver limits of agreement: +/- 12.6° (correl. 0.65)


Beta-angle:

Intraobserver limits of agreement: +/- 14.9° (correl. 0.78)

Interobserver limits of agreement: +/- 19.0° (correl. 0.11)



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Godward S, Dezateux C, Clarke NMP 
Routine clinical screening for neonatal hip instability. Can it abolish late-presenting congenital dislocation of the hip?

In a nationwide study in 1969 it was stated that the risk for the need of surgery because of DDH was 0.78/1000 live births

A new study in 1994 showed exactly the same risk for surgery

Conclusion:

Systematic clinical screening did not reduce the risk of the sequelae of DDH

Marks DS, Clegg J, al-Chalaibi AN
***Has clinical screening for congenital
dislocation of the hip in the United
Kingdom reduced the need for surgery?***

J Bone Jt Surg 76-B (1994)

14050 newborns have been screened clinically and with ultrasound. In 847 cases (6%) abnormal findings were found. 90% of them normalized within 6 weeks.

In 5 children without risk factors and without clinical signs there were abnormal findings that did not normalize and that would not have been found without ultrasound

Incidence of operative treatment in various countries with regard to screening

Author	Year	Country	#	Screening	Incidence
Ihme et al.	2008	Germany	812'000	Gen. US	0.26
Godward et al.	1998	GB	826'000	Clinical	0.78
Chan et al.	1999	Australia	119'000	Clinical	0.46
Maxwell et al.	2001	Ireland	173'000	Clinical	1.03
Katthagen et al.	1988	Germany	594'000	Clinical	1.26
Paton et al.	2001	GB	28'000	Select. US	0.87

Treatment Concept

Phase	Graf-Type	Treatment
Preparation	III, IV	Overhead-Extension Pavlik-harness
Reduction	D, II, IV	Closed Reduction
Retention	Unstable IIc, reduced D, III, IV	Fettweis-Cast
Maturation	IIa, IIb and unstable IIc	Tuebingen- (or similar) splint

Treatment Concept

Phase	Graf-Type	Treatment
Preparation	III, IV	Overhead-Extension, Pavlik-harness
Reduction	D, II, IV	Closed Reduction
Retention	Unstable IIc, reduced D, III, IV	Fettweis-Cast
Maturation	IIa, IIb and unstable IIc	Tuebingen- (or similar) splint



Extension

Especially in cases with a high position of the femoral head

Longitudinal distraction

Overhead extension



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Treatment Concept

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Reduction	D, II, IV	Closed Reduction
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Maturation	IIa, IIb and unstable IIc	Tuebingen- (or similar) splint



Closed reduction



Reduction under
image intensifier
if possible with
not more than 60°
abduction

In very unstable hips
sometimes a bit more
abduction is necessary,
the femoral head has
to be pushed forward



2. Reduction with Pavlik - harness



Straps should be placed in order to allow cranial movement of the femoral head when the child is kicking

incorrect application causes therapy failure and a higher incidence of avascular necrosis



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Treatment Concept

Phase	Graf-Type	Treatment
Preparation	III, IV	Overhead-Extension Pavlik-harness
Reduction	D, II, IV	Closed Reduction
Retention	Unstable IIc, reduced D, III, IV	Fettweis-Cast
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Fettweis-Cast



Control of the reduction in the Fettweis-Cast with MRI



L.K., f. 8 mon.

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Treatment Concept

Phase	Graf-Type	Treatment
Preparation	III, IV	Overhead-Extension Pavlik-harness, Hanausek apparatus
Reduction	D, II, IV	Closed Reduction
Retention	Unstable IIc, reduced D, III, IV	Fettweis-Cast
Maturation	IIa, IIb and unstable IIc	Tuebingen- (or similar) splint

Maturation – abductions splints



***Tuebingen
splint***



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Maturation – abductions splints



***Hoffmann-Daimler
splint***



Düsseldorf splint

Maturation – abductions splints



Mittelmeier – Graf - splint



Broad diapers?



This is not a treatment...

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Complications

after closed or open reduction

- **Redislocation**
- **Avascular necrosis of the femoral head**
- **persistent dysplasia of the hip**
- **Infection**
- **Fractures**



newborn girl

- sibling
- Graf-type?
- measures?



A.P., f.

2 days



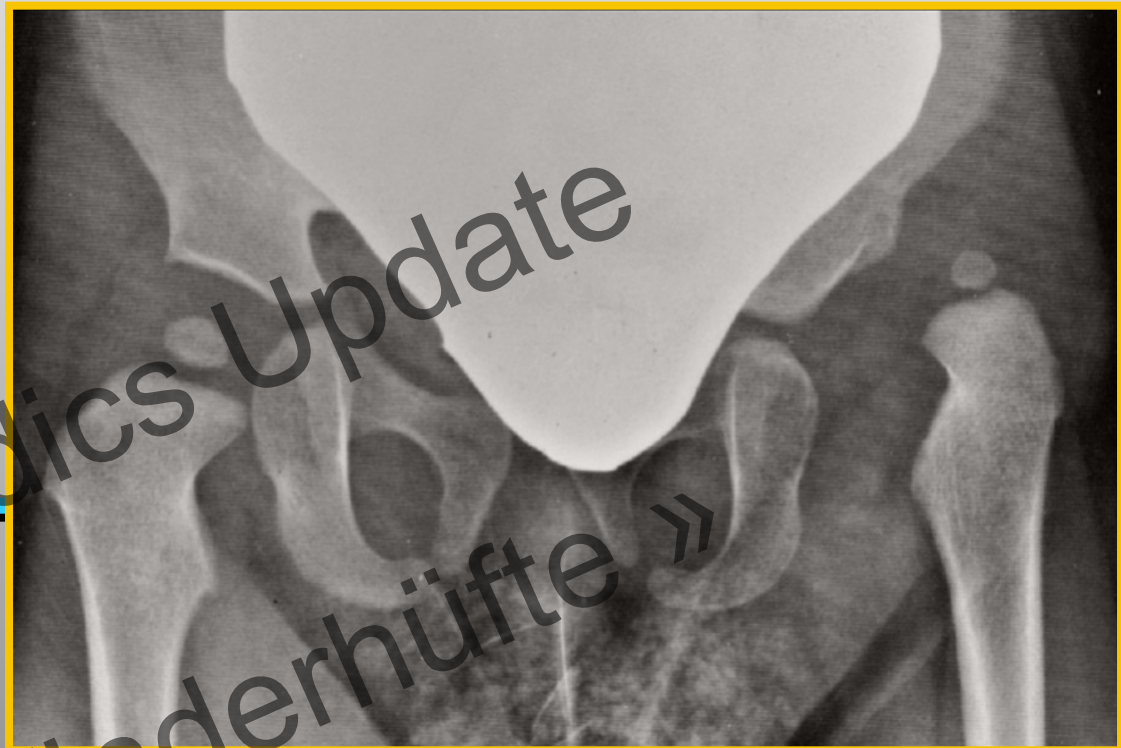


Dislocation of the hip

A.P., f. 1+6

the sister:

P.P., f. 1+6



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DDH

***at the age of
1 1/2 years***

- Treatment?
- Controls?

O.K., f. 1+8





DDH

***at the age of
almost 9 years***

- **Treatment?**
- **Controls?**

O.K., f. 8+8



BB
nderspital

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DDH
at the age of
15 years

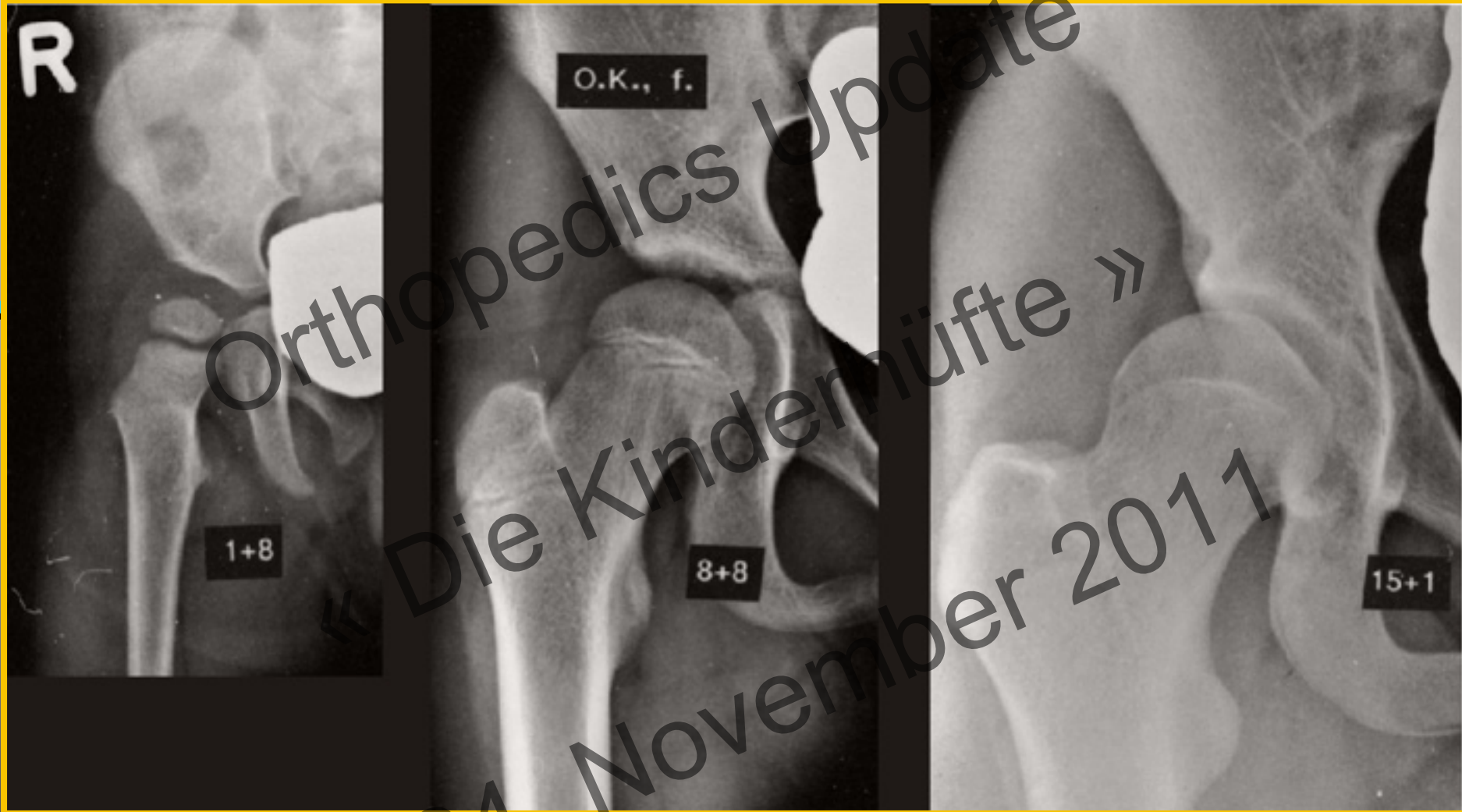
- Is this normal?

O.K., f. 15+1





DDH



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Weinstein SL

*Natural history and treatment outcomes of
childhood hip disorders.*

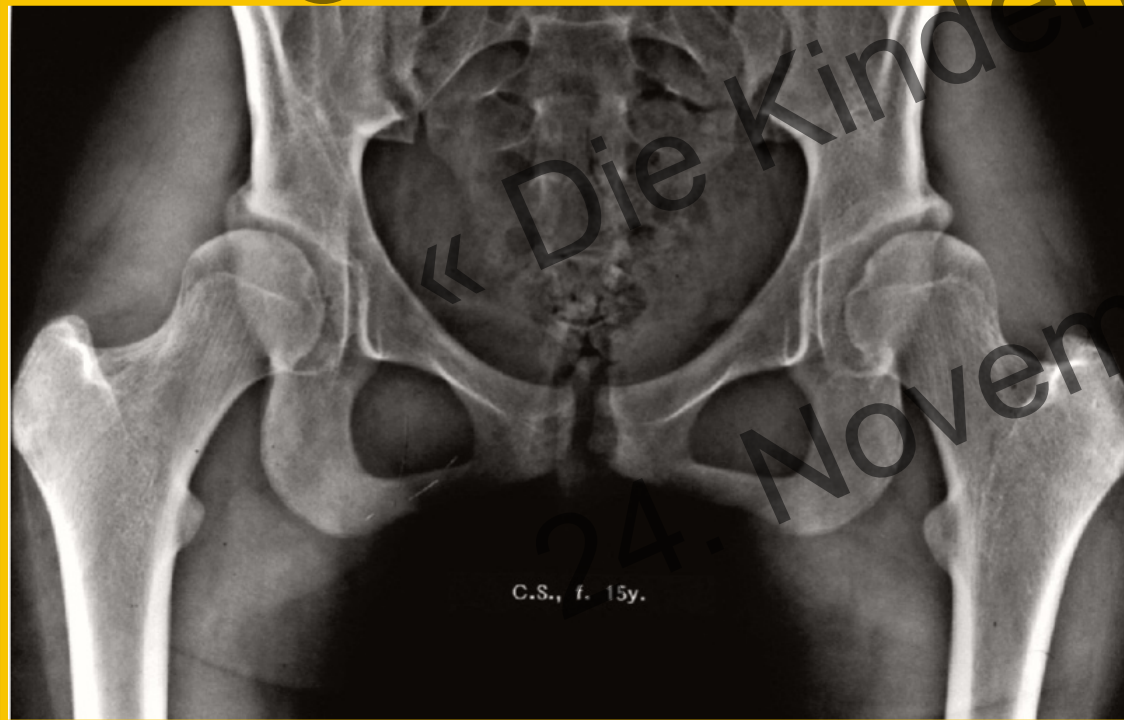
Clin Orthop 344: (1997)

„growth of the acetabu-
lum is essentially finished at
the age of 8 years”

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C.S., f. 8y.



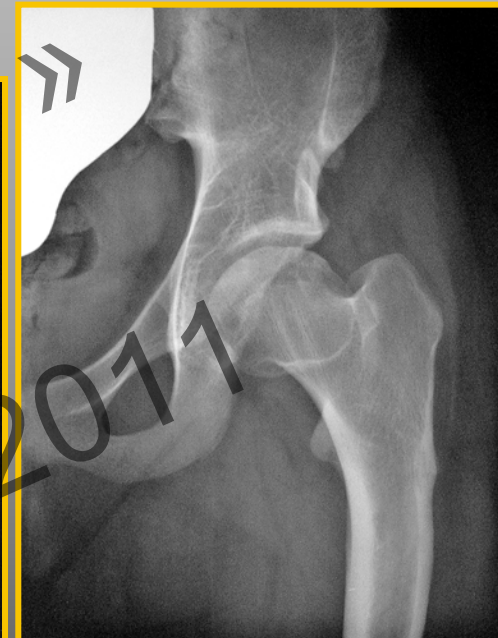
C.S., f. 15y.

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***Secondary
deterioration
during puberty***
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Open reduction in combination with pelvic osteotomy according to Salter und trochanteric osteotomy



P.P., f. 1+6

1+10

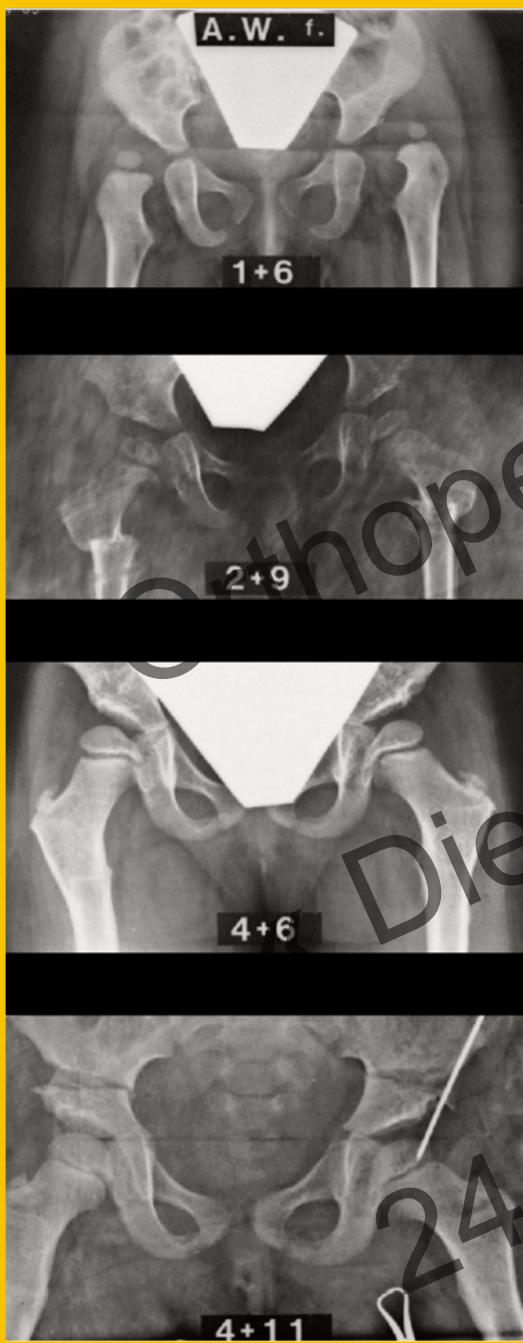
2+4

14 y.

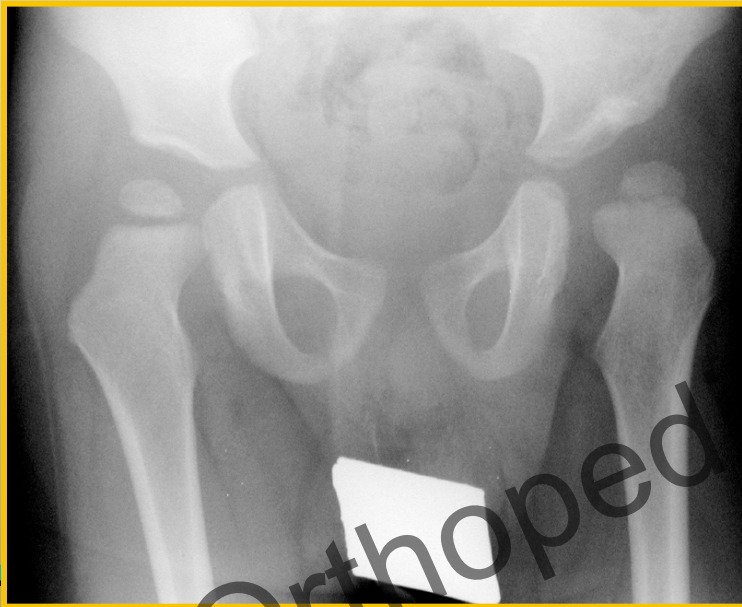
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Pelvic innominate osteotomy

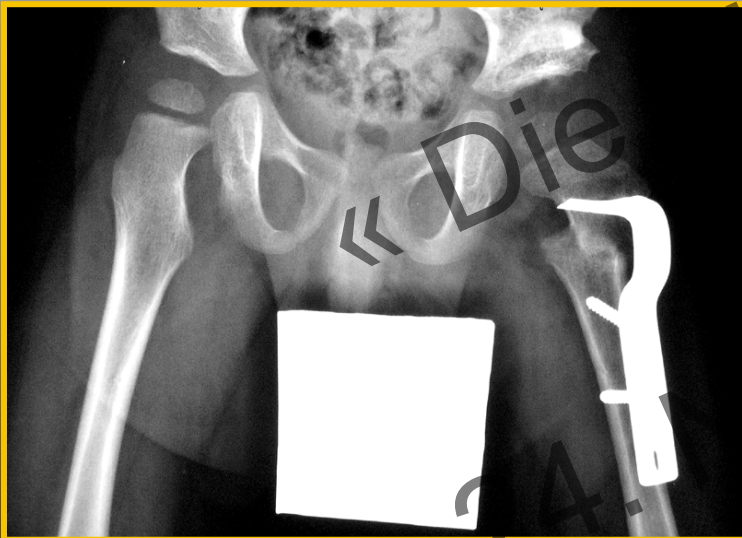


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T.D., m., 2 y.

*Open reduction in
combination with
acetabuloplasty
according to
Pemberton*



2+2



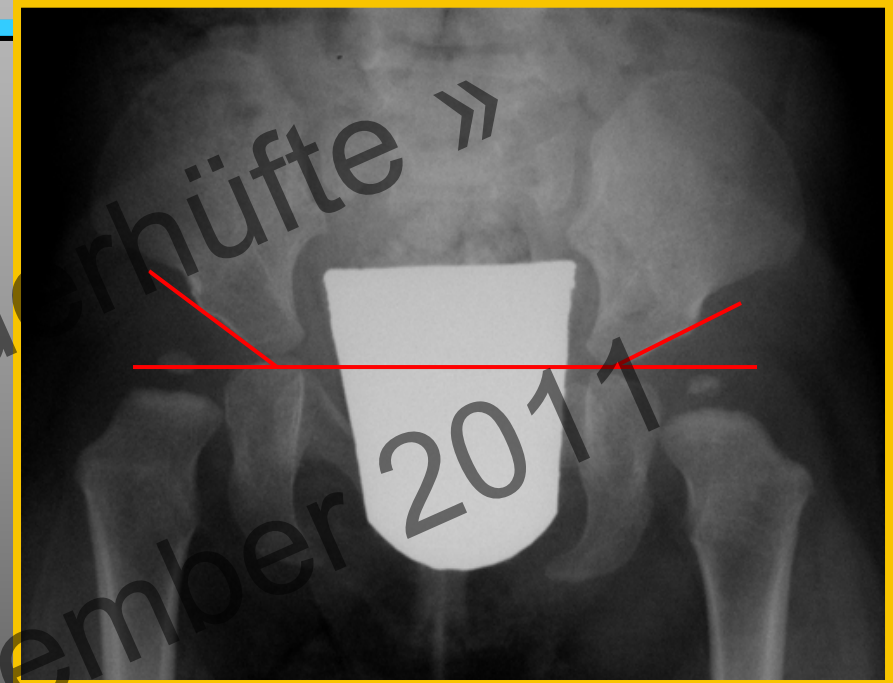
4+1



Indications for an early pelvic osteotomy (Salter or Pemberton)

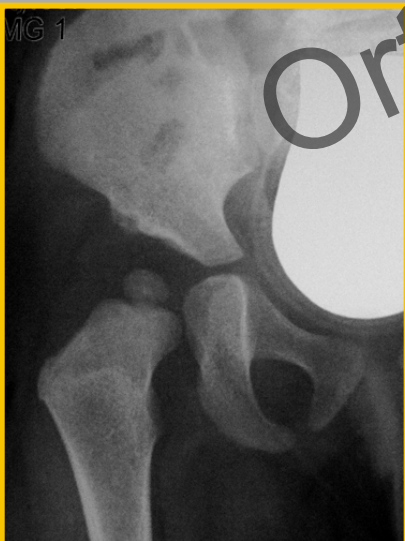
Measurement of acetabular angle

- age between 2 and 8 years
- Acetab. angle $> 30^\circ$
- rounded edge
- Acetab. not concave
- Decentered femoral head





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T.W., f., 1+8

3 J.

5 J.

5+7

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Don't be too impatient when following patients with hip dysplasia...





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Orthopedies Update

« Die Kinematik »

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