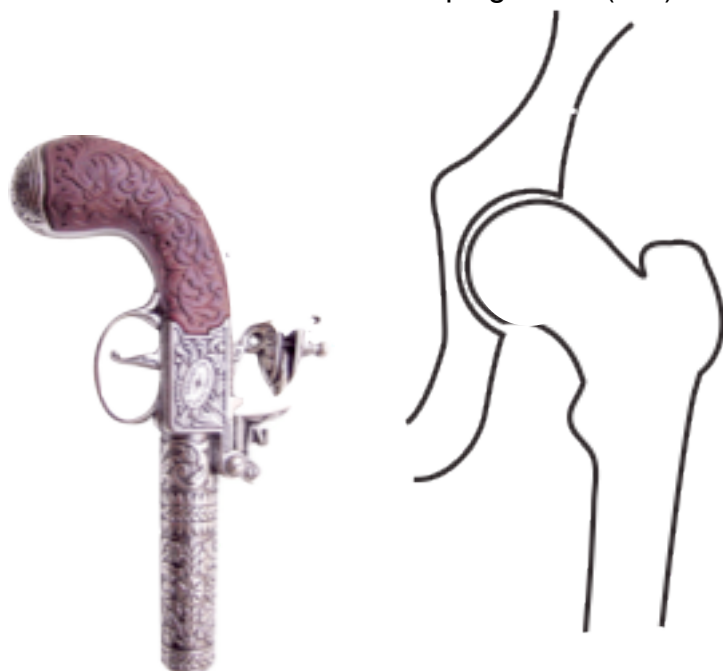


The natural history of osteoarthritis after a slipped capital femoral epiphysis / The pistol grip deformity.

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- A relationship between subtle deformity of the proximal femur and the subsequent development of osteoarthritis (OA) has been suggested since the earlier part of the last century.
- These deformities were termed “pistol grip deformity” and are now grouped under the term of femoroacetabular impingement (FAI)



- The role of FAI in OA remains controversial because a clear causal relationship has not been rigorously established and proven by evidence.

- Radiographic findings of FAI are quite common in many populations, and symptoms are not always present, a substantial proportion of hips with radiographic evidence of FAI may not in fact develop OA in the long term.
- One of the most common conditions that can lead to the presence of a pistol grip deformity is Slipped Capital Femoral Epiphysis for which the current standard of care is still in situ pinning with a single screw (stable SCFE).

Method

- 121 patients with stable SCFE treated with in-situ fixation were reviewed at a minimum 20 year follow up.
- The results were assessed using the Harris Hip Score (HHS).
- The presence of FAI was determined clinically when there was significant pain on internal rotation and flexion of the hip as well as when the impingement test was positive.

- Radiographically the Nötzli alpha angle was used:

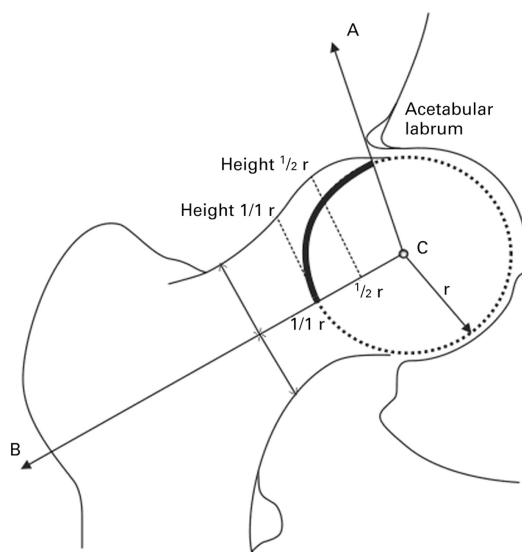


Diagram showing the alpha angle of Notzli et al (ΔACB) modified to the anteroposterior plane. The A axis marks the lateral departure of the radius (r) of the femoral head. The B-C axis is the longitudinal mid-axis of the femoral neck and is the radius of the normal femoral head.

- We only considered the diagnosis of FAI when the patients had clinical symptoms (positive impingement test) and the Nötzli alpha angle was greater than 50° .
- We also determined the presence of a pistol grip deformity by calculating the so called triangular index:

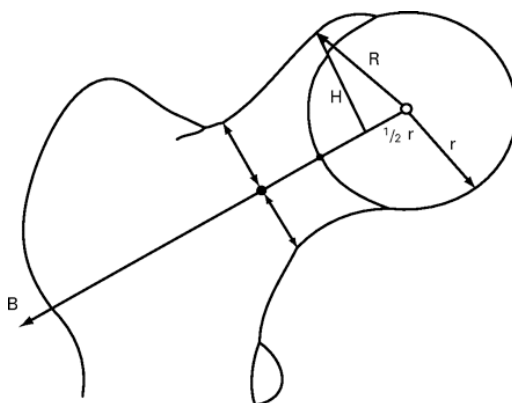
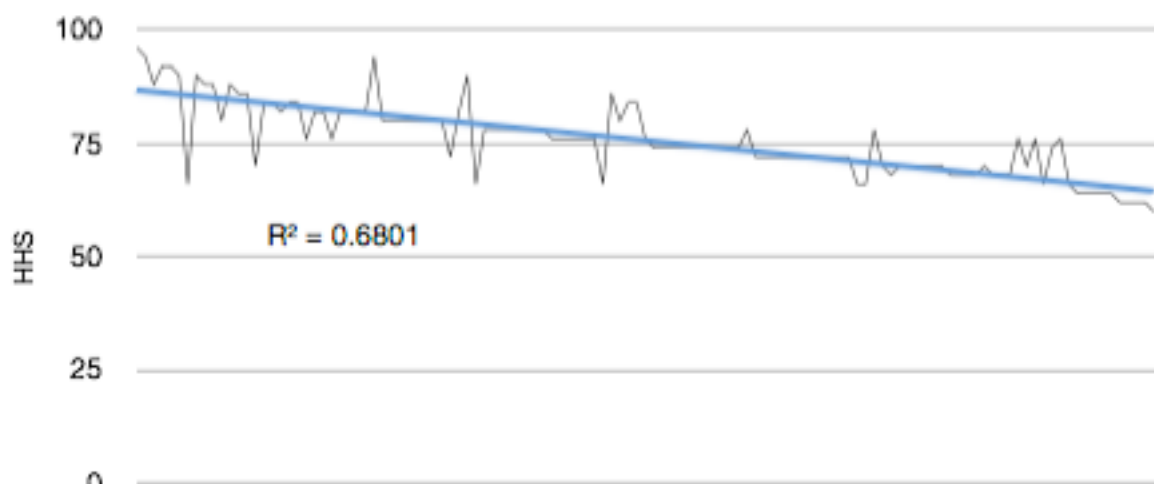


Diagram showing the triangular index for assessment of the asphericity of the femoral head and hump malformation. The radius (r) of the femoral head is measured. Then $1/2 r$ and the corresponding perpendicular height (H) to the cortex are measured. The pathologically increased radius (R) is found by applying the Pythagorean law for triangular figures ($a^2 + b^2 = c^2$). If $R \geq r + 2 \text{ mm}$ on a radiograph, with 1.2 magnification asphericity is for all practical purposes demonstrated.



- We determined the grade of OA at the time of final follow up using the Tönnis classification.

Results

- Mean follow-up was 22.3 years (range 20.1 to 32.5 years)
- The SCFE was considered grade I in 34 hips, grade II in 65 hips and grade III in 22 hips. The mean initial slip angle for the entire cohort was 45.3° (range 21° to 92°)
- The incidence of FAI according to our criteria was 79%.
- The mean Harris Hip Score (HHS) for the entire cohort was 75.6; however for the 25 patients without FAI it was 89.3 and for the 96 patients with FAI it was 75.4 ($p=0.004$).
- According to our criteria we found that 98 of the 121 patients presented a pistol grip deformity,
- We found radiographic signs of OA in all 121 patients
 - Grade 1 in 14 hips
 - Grade 2 in 32 hips
 - Grade 3 in the other 75 hips.

42 50 60 68
Alpha angle

- The mean Tönnis grade of OA was 2.5.
- We found a direct relationships between the grade of OA and:
 - The severity of the SCFE
 - The presence of FAI as determined by the alpha angle
 - The presence of a pistol grip-deformity
 - The Harris Hip Score
- The most significant predictor of OA was an increased alpha angle.

Harris Hip Score vs. Alpha angle

Conclusion

- The long term results of in situ pinning after a stable SCFE have been previously reported and are generally considered to be good or excellent
- Almost 80% of our patients presented clinical and radiographic signs of FAI
- The degree of deformity is directly related to the presence of OA in early adulthood

- The direct relationship between having FAI and developing OA was clear in our results
- Whether we can alter the natural history of the pistol-grip deformity is still unclear
- Our results should be added to the mounting body of evidence that shows that even subtle abnormalities of the morphology of the hip are related to degenerative joint disease.

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