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.

We only considered the diagnosis of FAI when the patients had clinical symptoms (positive impingement test) and the Nötzli alpha angle was greater than 50º.
- 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 (a² + b² = c²). If R ≥ r + 2 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 45.3º (range 21º to 92º)
• 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.

References