

Hip range of motion and the prevalence of cam morphology in young athletes - clinical and radiological studies

AKADEMISK AVHANDLING

Som för avläggande av medicine doktorexamen vid Sahlgrenska akademien Göteborgs Universitet, kommer att offentlig försvaras i R-husets aula, Göteborgsvägen 31, Sahlgrenska Universitetssjukhuset, Mölndal.

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av

Anna S. Aminoff

Specialistläkare i allmänmedicin

Fakultetsopponent:

Adjungerad Professor Hans Tropp

Institutionen för biomedicinska och kliniska vetenskaper, Linköpings Universitet, Sverige

Avhandlingen baserad på följande delarbeten

- I Agnvall C, Swärd Aminoff A, Todd C, Jonasson P, Thoreson O, Swärd L, Karlsson J, Baranto A. Range of Hip Joint Motion Is Correlated With MRI-Verified Cam Deformity in Adolescent Elite Skiers. *Orthop J Sports Med* 2017;5(6):2325967117711890.
- II Swärd Aminoff A, Agnvall C, Todd C, Jónasson P, Sansone M, Thoreson O, Swärd L, Baranto A. The effect of pelvic tilt and cam on hip range of motion in young elite skiers and non-athletes. *Open Access J Sports Med* 2018;9:147-156.
- III Aminoff A, Agnvall C, Todd C, Jónasson P, Thoreson O, Sansone M, Swärd L, Karlsson J, Baranto A. Young elite Alpine and Mogul skiers have a higher prevalence of cam morphology than non-athletes. *Knee Surg Sports Traumatol Arthrosc* 2018; 020 Apr;28(4):1262-1269
- IV Swärd Aminoff A, Abrahamson J, Todd C, Thoreson O, Agnvall C, PT, Laxdal G, Pruna R, Jónasson P, Swärd L, Karlsson J, Baranto A. Differences in cam morphology and hip range of motion between young skiers and soccer players. Manuskript.

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR KLINISKA VETENSKAPER**



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Anna S. Aminoff

Avdelningen för Ortopedi, Institutionen för Kliniska Vetenskaper,
Sahlgrenska Akademin, Göteborgs universitet, Sverige, 2020

Abstract

Hip and groin pain is common among athletes and the active population, and one important cause for this is femoroacetabular impingement syndrome (FAIS). To meet the diagnosis of FAIS, a combination of radiological findings (cam and/or pincer morphology), hip pain and clinical findings (reduced hip joint range of motion and/or positive anterior impingement test) needs to be present. Factors that have been associated with the development of cam morphology are genetics, male sex, ethnicity and participation in high impact sports during the pubertal growth spurt. Why some individuals develop FAIS and others do not, in the presence of a cam morphology, is still unknown. Therefore, there are still many questions that need to be answered regarding the aetiology, prevalence, impacts of different types of sports and loads, and treatment of cam/pincer and FAIS. Cam-type FAIS has also been associated with early hip osteoarthritis, and therefore this thesis focuses on cam morphology.

The overall aim of this thesis was to investigate the prevalence of cam morphology, hip ROM, hip pain and FAIS among young elite skiers and soccer players. Further, to investigate the relationship between hip ROM and cam, and hip range of motion and pelvic tilt (with and without cam morphology).

The findings from the studies presented in this thesis, suggest that reduced hip joint internal rotation, hip flexion and a positive anterior impingement test are associated with MRI-verified cam. Hip range of motion changes depending on the pelvic tilt and the posture of the lumbar spine. The skiers had a higher prevalence of cam than non-athletes. Male athletes had a higher prevalence of cam morphology than female athletes, while both male and female skiers with cam morphology were more likely to meet the diagnostic criteria of FAIS compared with Icelandic soccer players. Only male skiers had an association between hip pain and cam. Young male soccer players had significantly reduced hip internal and external rotations, compared with male and female skiers.

Keywords: Young, athlete, gender, female athletes, skier, football player, pelvic tilt, FAIS, femoroacetabular impingement, cam, pincer, hip, hip joint, osteoarthritis, low back pain.