**Slipped Capital Femoral Epiphysis – Outcome After Treatment With the Hansson Hook-pin**

PhD Half-Time Seminar

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Slipped Capital Femoral Epiphysis (SCFE) is the most common hip disorder in early adolescence that affects 1-10/10 000 children, usually in the ages between 9-15 years. In a long-term perspective SCFE has been associated with an increased risk of osteoarthritis (OA). In order to improve the outcome of SCFE in the future it is essential to increase knowledge of its longitudinal aspects.

The general aim of the thesis is to increase knowledge about how various factors affect the outcome of SCFE in order to predict and prevent negative outcome in the future.

**Project 1**

*Unthreaded Fixation of Slipped Capital Femoral Epiphysis Leads to Continued Growth of the Femoral Neck*

**Background:** The optimal treatment for slipped capital femoral epiphysis (SCFE) remains controversial. In Sweden, the standard treatment is unthreaded fixation over the physis, with the purpose to permit continued growth of the femoral neck. The aim of the present study was to verify and quantify longitudinal growth of the femoral neck after in situ pinning with the Hansson hook-pin.

**Methods:** We performed a retrospective study of 54 patients treated with the Hansson-hook pin for SCFE. Postoperative radiograph and the radiograph after physeal closure were analysed. The femoral neck growth was determined as the difference in nail protrusion from the lateral cortex between the two radiographs.

**Results:** Significant longitudinal growth occurred both in the slipped and the prophylactically treated contralateral hip by mean 7.1 mm and 10.0 mm respectively. Young patients (<11 years) grew more than older patients (>14 years), 12.1 mm versus 4.2 mm. There was no difference in growth between genders.

**Conclusions:** Unthreaded fixation of SCFE with the Hansson-hook pin allows continued growth of the femoral neck. The remaining growth enables the patient to achieve an almost anatomical offset of the hip. This is essential in order to optimize the abduction forces that stabilize the pelvis during gait.
**Project 2**

*Continued Growth of the Femoral Neck Leads to Improved Remodeling After In Situ Fixation of Slipped Capital Femoral Epiphysis*

**Background:** Globally, the standard method for in-situ fixation of SCFE is a threaded screw which causes physeal arrest. The standard treatment in Sweden is unthreaded fixation using the Hansson hook-pin leading to continued growth of the femoral neck. Our purpose was to study remodeling during the remaining growth after fixation with the Hansson hook-pin.

**Methods:** 54 patients treated with the Hansson hook-pin for SCFE were included. Three radiographic assessments were analyzed: head–shaft angle (HSA), alpha angle (Nötzli), and displacement from Klein’s line.

**Results:** Significant remodeling was detected in all measured parameters. The mean postoperative HSA decreased by 9.0°. The alpha angle improved by a mean of 14.5°. Significant correlations were found between the reduction of the alpha angle and longitudinal growth of the femoral neck.

**Conclusion:** Unthreaded fixation of SCFE using the Hansson hook-pin leads to substantial remodeling of the femoral neck. The positive correlation observed between the improvement of the alpha angle and femoral neck growth supports the use of a method that allows continuous growth, to reduce the risk of femoroacetabular impingement.

**Project 3**

*Delayed Diagnostics in Slipped Capital Femoral Epiphysis in Southern Sweden – Risk Factors and Consequences*

**Background.** Delay in diagnosis of SCFE is known to correlate to slip severity and consequently possible future negative outcome such as permanent loss of function and osteoarthritis. The aim of this study was to map delay and identify possible risk factors for increased patient and doctors delay.

**Methods.** A retrospective review of medical records of 54 patients, previously treated for stable SCFE, was conducted. Also, a patient and guardian interview was performed. Data was collected regarding onset of symptoms, symptomatology, gender, dates of medical visits, type of medical contacts and slip angle.

**Preliminary Results.** Median total delay was 26.1 weeks, patients delay 10.0 weeks and doctors delay 4.0 weeks. Patients with the knee as dominant location of pain at onset of symptoms had a significant longer doctors delay and total delay. There was a direct correlation between delay and slip severity. No significant association to age at onset of symptoms or gender was identified.

**Preliminary conclusion.** A strong correlation between delay and slip severity confirms the issue of diagnostic delay and its implications on clinical outcome. The absence of hip pain at onset increases risk of doctors delay and misdiagnosis.

**Project 4**

*Slipped Capital Femoral Epiphysis Causes Early Cartilage Degeneration in Young Adults – an 11 year follow-up study with dGEMRIC*

**Purpose:** In a long-term perspective, SCFE has been associated with an increased risk of OA. The main purpose of the present study was to assess the status of hip joint cartilage with delayed Gadolinium Enhanced MRI of Cartilage (dGEMRIC) in very young adults who had been treated for SCFE in childhood.
**Methods:** We investigated 22 young adults (44 hips) (mean age 24 years, range 18-27). dGEMRIC indices were obtained in nine different regions. For FAI evaluation, the alpha angle was measured. Data of BMI and original slip severity were collected. A questionnaire of patient reported hip function outcome (HAGOS) was answered by all patients.

**Preliminary Results:** Mean alpha angle was higher in slipped hips, 61.5° vs 45.6°. The total dGEMRIC index was significant lower in SCFE hips compared to unaffected hips, 560 ms vs. 640 ms. In hips with SCFE, the dGEMRIC index tended to decrease gradually from the posterior to anterior regions. The alpha angle correlated negatively with the total dGEMRIC index in all hips and with the anterolateral cartilage regions in slipped hips. Mean HAGOS score correlated with the dGEMRIC-index. No correlation could be revealed between the dGEMRIC index and BMI, original slip severity or gender.

**Preliminary discussion:** Our findings confirm an increased risk of persistent FAI after SCFE. The negative correlation between the alpha-angle and dGEMRIC supports that FAI is a risk factor for future OA, and that this is detectable one decade after slippage. Our data indicates that the cartilage degeneration caused by FAI starts in the anterior aspect of the joint where the anterior part of the femoral head-neck junction abuts against the acetabular rim.