Dissertations

The postoperative lumbar spine—a radiological investigation of the lumbar spine after discectomy using MR imaging and CT

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Problems and aims: The clinical outcome of repeat lumbar discectomy is not as satisfactory as that of the primary surgical procedure. One reason is the difficulty of assessing postoperative radiological investigations and particularly the significance of the various radiological changes. A second problem is differentiating between the two forms of post-operative discitis, a rare but important complication after lumbar discectomy. The aims of this study were: to improve understanding of the significance of certain post-operative radiological changes; and to evaluate differences in the MR features of septic and aseptic post-operative discitis.

Material and methods: A total of 192 patients (209 disc levels) took part in this study; all had had prior lumbar discectomy. Nineteen of these patients were regarded as asymptomatic and they served as a control group in the evaluation of certain post-operative changes in the symptomatic patients. Twelve patients with post-operative discitis were examined in order to compare the MR features of septic and aseptic discitis. MR imaging was performed first without and then with contrast enhancement in all patients. Contrast-enhanced MR imaging was also compared with contrast-enhanced CT.

Results: Owing to its superiority in distinguishing the nerve roots at the surgical site, MR imaging was found to be a more valuable diagnostic method than CT.

Disc herniations were found in 16% of the disc levels in asymptomatic patients and in 38% of disc levels in the symptomatic patients. Significantly more disc herniations were found in patients who had only a short duration of recurrent symptoms (maximum 3 months) before MR investigation than in the asymptomatic patients. Nerve-root displacement due to disc herniation was also significantly more frequent in patients with the short symptom duration than in the patients with a longer symptom duration. True intradural nerve-root enhancement was found in 7% of symptomatic patients, and focal enhancement in the root sleeve was found in 26% of them; there was good correlation to clinical symptoms and other pathological findings. Thickened nerve roots were found with equal frequency in asymptomatic and symptomatic patients. Epidural scar tissue diminished with time, showing no significant difference between asymptomatic and symptomatic patients.

Out of 6 patients with septic post-operative discitis, 3 showed extensive MR changes; the remaining 3 showed moderate changes which were similar to those in another 6 patients who had aseptic discitis.

Discussion and conclusion: MR is the imaging method of choice in the evaluation of patients with recurrent clinical symptoms after disc surgery. Disc herniations may be found in asymptomatic patients, it is therefore important to assess the plausibility of the assumption that the finding of a herniated disc correlates well with the actual clinical symptoms. Nerve-root displacement and nerve-root enhancement caused by recurrent disc herniation may strengthen the indication for repeat discectomy. On the other hand, the finding of a thickened nerve root seems to be of no diagnostic value. The MR features in post-operative discitis develop only gradually and the differentiation between septic and aseptic forms of discitis is thus difficult at the early stage.

ISBN 91-628-2759-6

Magnetic resonance imaging in Legg-Calve-Perthes' disease

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The aims of this study were:

to compare the cartilaginous outline of the femoral head obtained on arthrograms with those on MR images and to correlate it to the bony head outlines on conventional radiograps.

to study early, postoperative cartilaginous and bony remodeling of the femoral head, after proximal femoral varus derotation extension osteotomy, with MR imaging and conventional radiography.

to describe signal abnormalities on MR images in the femoral epiphysis, their location, extent and restitution over time.

to evaluate the degree and persistence of synovitis in the hip joint by MR imaging.

to analyze the metaphyseal histology and to correlate it to the signal intensity on the MR images in the corresponding biopsy region.

Results and condusions: MR imaging and arthrography define the shape of the femoral head cartilage equally well. The bony head outlines on conventional radiographs do not adequately reflect the cartilaginous outlines of the femoral head obtained by MR imaging. There is an early, postoperative, continuous, spherical remodeling following proximal femoral varus derotation extension osteotomy. The cartilaginous remodeling as seen in MR images appears earlier than the bony remodeling seen on conventional radiographs. In the coronal plane on MR images, the pathological signal is lowest in the central portion of the necrotic epiphysis. In addition, hips with advanced disease show signal changes in the peripheral regions. Repair processes start from the periphery, slowly progressing towards the center of the necrotic epiphyseal region. Signal changes persist in the period 3-6 years after diagnosis. All diseased hips have synovitis initially. The degree of synovitis on MR images in the inferomedial aspect of the hip joint correlates to the extent oi the epiphyseal necrosis seen in conventional radiography or MR imaging. Synovitis is most intense initially in the disease, slowly decreasing, but persisting for several years, in some hips for more than 5 years after diagnosis.

There is no correlation between the uniform histological pattem of consistent morphologic changes of the metaphysis and MR imaging with a low-field unit.

Dynamic fixation of unstable trochanteric hip fractures—a clinical and radiographic evaluation of the Medoff sliding plate

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In stabilising extracapsular hip fractures, the Medoff sliding plate (MSP) differs from other screw-plates by its compression capacity along the femoral shaft (uniaxial dynamization). Additional compression along the neck of femur can be achieved by primary release of the lag screw (biaxial dynamization).

244 consecutive inter- and subtrochanteric fractures in 243 elderly patients were fixed with the MSP, and prospectively followed for a minimum of 1 year. 104 unstable intertrochanteric fractures were uniaxially dynamized and 108 similar fractures were biaxially dynamized. Postoperative weight bearing was permitted in 95 % of the patients. At 1 year, there was a significant difference (p=0.03) in the fixation failure (7 vs 1) between the dynamization groups. 32 subtrochanteric fractures were also dynamized with the MSP, 17 uniaxially and 15 biaxially. In the uniaxial group staged biaxial dynamization, i.e. initial plate slide later followed by secondary release of the lag screw, was done in 3 fractures with a complete plate slide, and which successfully stopped further lag screw migration. The one failure was a nonunion in a biaxially dynamized fracture.

We developed a practical method for establishing the real degree of sliding in screw-plate devices from standard a.p. radiographs, independently of the position of the hip. By analysis of the radiographs, we found that an unstable fracture configuration of the greater trochanter increased the degree of femoral medialisation and fracture compression in biaxially dynamized intertrochanteric fractures.

We also performed a randomised multicenter trial in 107 elderly patients, in order to compare the efffi-cacy of the load sharing concept of the MSP (n=55) with that of three more load bearing screw-plate devices (n=52) in fixation of subtrochanteric fractures. Significantly (p=0.04) more patients in the MSP group (78% vs 60%) were allowed immediate postoperative weight bearing. Significantly (p=0.01) fewer failures (1 vs 8) were found in the MSP group than in the other group.

We think that it is possible to reduce the rate of fixation failure by using the right dynamization mode of the MSP. We recommend uniaxial dynamization in the subtrochanteric fracture, staged biaxial dynamization in the combined inter/subtrochanteric fracture with a complete plate slide, and biaxial dynamization in the unstable intertrochanteric fracture.

The influence of alcohol on bone metabolism and fracture healing

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The influence of alcohol on bone metabolism, fracture and fracture healing was evaluated in men and male rats by measurements of bone mineral density (BMD), biochemical markers and biomechanical testings.

Retrospectively, 199 male patients hospitalized for tibia shaft fractures were studied. 49 were judged as problem drinkers. Abusers were more prone to sustain oblique fractures. The healing time was impaired in abusers who had sustained transverse fractures but this was not observed in oblique fractures.

Cross-sectionally, 61 male patients treated for tibia shaft fractures were studied with respect to the degree of posttraumatic osteopenia. 24 were judged as problem drinkers. In almost all measured regions of the lower extremities, the injured leg had a lower BMD. We were unable to identify an increase in posttraumatic bone loss among abusers, except for the femoral neck region.

In two animal studies (male rats) we found a reduction in total bone mineral content in animals fed an alcohol liquid. By using biomechanical testings we were unable to identify any negative effects of alcohol on healing properties of induced tibia fractures and on posttraumatic bone changes.

Cross-sectionally, we studied the effects of long-term alcohol withdrawal, at least 5 years, on BMD and biochemical markers. Abusers had reduced BMD, especially in the trochanteric region, and long-term abstinence tended to counteract this reduction. Furthermore, we found an imbalance between bone formation and bone resorption in abusers. Although the biochemical markers of bone formation tended to normalize shortly after alcohol withdrawal there were signs of a persistent high bone turnover after more than 5 years of abstinence.

In a prospective population-based study in 242 men, we found that forearm BMD and skinfold thickness on the dorsum of the hand could be used in predicting future fracture.

Testosterone and sex hormone binding globulin did not enhance the fracture prediction. Furthermore, we were unable to identify high consumers of alcohol by analyzing BMD and sex hormones.

Cervical radiculopathy—effects of surgery, physiotherapy or cervical collar—a prospective, randomised study

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The efficacy of surgery, physiotherapy or a cervical collar in the treatment of chronie cervicobrachial pain of radicular origin was evaluated in a prospective, randomised study comprising 81 patients of both sexes, 28–64 years of age, referred for possible neurosurgical treatment. After neurological and radiological examination and giving their informed consent, they were randomised to one of the three treatments. The surgery group underwent anterior decompression and single level fusion by bovine graft. The conservatively treated groups received individual physiotherapy or a rigid cervieal collar for three months. The effects were evaluated at 3 and 12 months later with respect to pain, tender points, sensory disturbance, muscle strength, neck and shoulder joint mobility, postural control, mood and health status.

All treated groups improved, although the improvement rate differed. The surgically treated group was significantly better at 3 months, but 1 year later, there was no significant difference between the three groups.

The studied variables also included the patients' balance in comparison with a healthy control group and the occurrence of headache.

Before treatment, the patients manifested significantly poorer postural control than sex and age-matched controls. Three months after treatment the surgery group showed a significantly improved postural performance and the collar group showed the poorest.

49 of the 81 patients were classified as having cervical headache and 24 of these reported that their headache had improved at the 3-month control. Patients with cervical headache reported significantly more cervicobrachial pain and higher tenderness score than patients with cervical radiculopathy with no headache. No 1-year follow-up was performed concerning balance and headache.

It may be concluded that pain intensity, sensory disturbance, muscle strength and health status can be expected to improve most rapidly after surgery, but a slow improvement with conservative treatments makes the 1-year results about equal.