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1. Treatment of deep cartilage defects in the knee with periosteum transplantation

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Damage to patellar articular cartilage as a result of chondromalacia or dislocation or fracture is often seen in young adults. Full-thickness defects of the cartilage may progress to osteoarthrosis which is troublesome in younger patients. Therefore, there is an obvious need to treat these patients and try to accomplish regeneration of articular cartilage, and thereby prevent the development of osteoarthrosis. Experimental studies have shown that the periosteum has a chondrogenic potential, but there are few clinical reports indicating beneficial effects in humans.

Patients and method: This study includes eighteen consecutive patients (sixteen men and two women) with a mean age of 32 (19–52) years at operation. All patients had a full-thickness patellar cartilage defect. The etiology was chondromalacia in seven cases, three cases had defects after patellar fractures and the rest had sustained patellar dislocation (n=3) or contusion of the knee (n=5).

The chondral lesion was excised, sclerotic subchondral bone was removed and multiple drilling into the cancellous bone was done. The cartilage defects ranged in size from 0.75–16.0 cm^2. The periosteum was taken from the proximal tibia and anchored by throughout sutures and Tisseel R to the patellar bed. Postoperatively, all patients started continous passive motion (CPM) the day after operation and were treated by CPM (0°–70°) during one hour every four hour six times a day for five days.

Results: There was no swelling or effusion after the first three postoperative weeks. After six months, all patients had a normal range of motion while quadriceps atrophy was more prolonged. At follow-up examination at a mean of 27 (12–56) months, all patients were graded as excellent (n=14) or good (n=4). All patients had returned to their previous occupation and resumed their sports or recreational activities at the former level. Repeated MRI-investigations showed progressive, and finally complete, filling of the articular defects. Biopsies were taken in five randomly selected cases (all more than one year postoperation). All five showed normal hyaline cartilage.

Conclusion: Treatment of deep cartilage defects of the patella with autologous periosteum transplants resulted in excellent or good results in all our patients at a mean follow-up more than two years. Meticulous surgical technique and rigorous postoperative CPM-regimen are probably of outmost importance in this procedure.

2. Perichondrial arthroplasty for repair of chondral defects in the knee

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Full thickness defects of the articular cartilage have a poor healing tendency. In younger patients this results in a poor activity level.

Material: 17 patients age 17–50 years with knee pain of medium 3.6 years and a lesion of the articular cartilage in the knee are included in this study. Seven lesions were osteochondritis, 7 were of degrading types, 3 with other kinds of lesions. The medium area of the lesions was 4.1 (2–10) cm^2, the medium depth was 6.1 (3–15) mm.

Methods: The lesions were carefully cleaned with a cutter into cortical bone. Perichondrium from rib cartilage was adapted to the lesion by fibrin glue. Arthroscopic examination was performed after 3 and 12 months. Clinical examination pre operatively and at follow up (12–16 months).

Results: After 3 months all lesions but two were completely filled with a slightly softer cartilage. 15 of the patients were examined by arthroscopy at 12 months. All had lesions completely filled with new cartilage. 5 of those had a new minor lesion on the new cartilage from degrading type. 7 of the patients had a new lesion of degrading type on the old cartilage. d'Aubigné-Postel knee score pre operatively and at follow up (12–16 months) was: pain: 3.82–4.82, function: 4.59–5.53, range of motion: 5.65–6.00. Three of the patients were classified as failures and had the same score preoperatively and at follow up.

Conclusion: 14 out of 17 patients were clinically improved. Arthroscopy verified a rapid growth of new cartilage in all patients. Twelve patients had a minor new lesion on the new or the old cartilage indicating a strong tendency of

chondral degrading. The formation of new cartilage in all patients and clinical improvement in all but three can justify the use of the method.

3. Treatment of combined injuries of the anterior cruciate ligament and localised deep cartilage defects in the knee with ligament reconstruction and autologous periosteum transplantation

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The combination of an anterior cruciate ligament injury and a localised deep cartilage defect in the knee is a troublesome injury. Instability of the knee may lead to further cartilage lesions and full thickness defects of the cartilage may progress to osteoarthrosis, which is a serious complication especially in younger patients. There is an obvious need to treat these patients and try to accomplish a stable knee and a repair of the articular cartilage defect.

Experimental studies have shown that the periosteum has a chondrogenic potential, but there are few clinical reports on the effects in humans. To our knowledge, there are no clinical reports on treatment of the combination of anterior cruciate ligament rupture and full thickness cartilage defects.

Patients and method: This clinical report includes 7 consecutive patients (6 men and 1 women) with a mean age of 29 (22–38) years at operation. All patients had a total tear of the anterior cruciate ligament and a full thickness defect of the cartilage at the medial femoral condyle. All patients had disabling instability and medial knee pain when walking. The etiology was distortion of the knee during soccer (n=6), and during ice hockey (n=1). The anterior cruciate ligament was reconstructed with a bone-tendon-bone graft of the central third of the patellar ligament. The chondral lesion was excised, sclerotic subchondral bone was removed and multiple drilling into the cancellous bone was done. The cartilage defects had a mean area of 7.3 (1.0–13.5) cm^2. The periosteum was taken from the proximal tibia and anchored by suture anchors and Tisseel® to the condylar bed. Postoperatively, all patients started continous passive motion (CPM) the day after operation and were treated by CPM (0°–70°) during one hour every four hour six times a day for five days. A Genu-range R bandage (0°–90° flexion) was used the first three postoperative weeks.

Results: After six months, all patients had a normal range of motion while quadriceps atrophy was more prolonged. At follow-up at a mean of 12 (6–18) months, all patients were graded as excellent (n=6) or good (n=1). All patients had returned to their previous occupation, had stable knees, could walk and do their rehabilitation training without pain or locking. Repeated MRI-investigations showed filling of the articular defects.

Conclusion: Treatment of combined injuries of the anterior cruciate ligament and localised deep cartilage lesions at the medial femoral condyle with the combination of anterior cruciate ligament reconstruction and autologous periosteum transplantation, is technically possible, and has resulted in excellent or good results in seven patients with a mean follow-up of one year. Meticulous surgical technique and rigorus postoperative CPM-regimen and rehabilitation are probably of outmost importance in this procedure.

4. ACL reconstruction with an anatomical vascularized graft and biodegradable augmentation

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This paper describes an anatomical vascularized reconstruction technique for the ACL-deficient knee and the results after the procedure.

Patients: 62 knees (62 patients, 54 men and 8 women) with symptomatic chronic ACL-deficiency who consecutively underwent reconstruction with an anatomical vascularized graft composed by the medial third of the patellar tendon and the longitudinal medial patellar retinaculum augmented by a biodegradable PDS-band. Exclusion criterias were prior surgery to the ACL, PCL-deficiency in the studied knee, ACL/PCL-deficiency in the opposite knee and generalised joint laxity.

Methods: The knees were evaluated at an average of 28 months after surgery using The Knee Ligament Standard Evaluation Form from IKDC, Lysholm and Tegner scores and a Biodex test.

Results: In IKDC final evaluation 71% of the knees were graded normal or nearly normal, 27% were graded abnormal and 2% were graded severely abnormal. 94% of the knees were subjectively stable. The Lachman test was normal in 78% and slightly increased in 22% of the knees, whereas the pivot shift sign was absent in all knees. KT-1000 arthrometric evaluation revealed a mean side-to-side difference of 1.6 mm at 135 N. The operated knees had an average range of motion of –1° to 138°. One-leg hop test had an average of 97% performance compared to the non-injured side. An isokinetic Biodex test showed 12% mean deficit in extension peak torque and 4% mean deficit in flexion peak torque at 300°/s. The mean Lysholm score was 95 points. 47% of the patients occasionally experienced slight pain in their knees, but in 69% of these cases other significant injuries on collateral ligaments, cartilage or meniscii were observed at the time of surgery.

Conclusion: Reconstruction of the ACL-deficient knee with an anatomical vascularized graft, augmented by a biodegradable PDS-band, is a safe procedure which restores the sagittal stability.

5. Autologous reconstruction and biodegradable augmentation in ACL surgery

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The aim of this study was to indentify prognostic factors for the outcome after ACL-surgery in different patient subgroups.

Patients and methods: A consecutive material of 135 operated knees (133 patients, 96 men and 37 women) was evaluated two years after surgery. The Knee Ligament Standard Evaluation Form from IKDC, Lysholm and Tegner scores and a Biodex test were used, and the patients were clinically examined for generalised joint laxity.

Results: If the ACL-injury was associated with other injuries to the knee, n.b. the collateral ligaments or cartilage, the outcome was inferior concerning subjective assessment of function and symptoms, but not in terms of stability. Operation within two weeks after injury showed no differences at follow-up regarding range of motion, stability and patient satisfaction, compared to reconstruction in the chronic phase. In women (36 knees) the results after ACL-surgery were in most respects slightly inferior than in men (99 knees). Compared to younger patients (109 knees) those older than 35 years (26 knees) had equal results regarding range of motion and stability, but somewhat inferior results in subjective assessment of function and symptoms. The outcome after revision surgery for ACL-deficiency (17 knees), without a new significant trauma, was grossly inferior to results after primary surgery. There was a pronounced negative correlation between generalised joint laxity (34 knees) and outcome after ACL-surgery in all respects except for range of motion. In a logistic regression analysis two statistically significant independent prognostic factors for an unsatisfactory final result emerged, namely collateral ligament injuries, relative risk 10 (2.5 – >100) and generalised joint laxity, relative risk 3.3 (1.1–10).

Conclusion: Excellent and good results can be expected after surgery in the ACL-deficient knee, provided no concomitant injuries to the collateral ligaments or cartilage or generalised joint laxity are at hand. Sex, age, early or late surgery did not significantly influence the outcome.

6. Antherior cruciate ligament revision surgery, with reharvest of the ipsilateral patellar tendon

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One of the still unsolved problems in anterior cruciate ligament (ACL) revision surgery is the optimal choice of graft. Among the options are either the contralateral patellar tendon, reharvest of the ipsilateral patellar tendon or a free hamstring (e.g. semitendinosus) graft. The aim of this study was to assess the function after ACL revisions with reharvest of the ipsilateral patellar tendon, and to compare with the results of primary ACL reconstructions in a matched group of patients.

Patients and methods: 10 patients (Group A) were operated on with ACL revision. All-inside arthroscopic procedure was used, with reharvest of the ipsilateral patellar tendon. For comparison (Group B) 10 matched primary ACL reconstructed patients operated with the same technique were choosen. The median time period since the first reconstruction in Group A was 60 (15–132) months. The median age of the patients was 27 (23–33) years. All the patients were reexamined by an independent observer, for Group A; 26 (20–33) and for Group B; 24 (23–26) months postoperatively.

Results: In Group A the median total KT-1000 side-to-side difference was 3 (-0.5–8.5) mm, and the Lysholm score was 58 (25–89) points. Only 1 patient was classified as excellent or good. The stability and pain subscores were 10 (5–25) and 8 (0–20) points, respectively. The Tegner activity level was 4 (1–7). Nine patients underwent MRI screening, which showed that the donor site gap was 6 (3–10) mm. One patient had two 5 mm gaps at the donor site. In Group B the median total KT-1000 side-to-side difference was 3 (-0.5–6.5) mm, and the Lysholm score was 90 (75–95) points. 9 patients were classified as excellent or good and the stability and pain subscores were 24 (20–25) and 20 (15–25) points respectively. The Tegner activity level was 7 (4–9). MRI showed that the donor site gap was 5 (2–8) mm. In Group A 9/10 patients complained of discomfort at the donor site and/or had problems to kneel. Two major complications occured, i.e. a patellar fracture and a rupture of the patellar tendon. In Group B 6/10 patients complained of discomfort at the donor site. No major complications occured in Group B.

Conclusion: This study shows that stability can be restored with reharvest of the ipsilateral patellar tendon. Reharvest of the patellar tendon is possible, but the rate of serious complications was high in this study.

7. Closure of the gap in the patellar tendon after arthroscopic anterior cruciate ligament (ACL) reconstruction

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Usage of the central third of the patellar tendon for reconstruction of the anterior cruciate ligament is often called "the golden standard". Concerns have been raised regarding the relatively high incidence of complications; the most common being anterior knee pain reported in some studies in 20-40% of patients. The aim of this study was to evaluate whether suture of the gap in the patellar tendon and bone grafting of defect of the patella, after harvesting a central

bone-tendon-bone (BTB) graft improved the results after cruciate ligament reconstruction, especially postoperative patello-femoral pain.

Patients and method: 60 patients, 40 men and 20 women with a mean age of 28 (17–48) years, that underwent arthroscopic anterior cruciate ligament reconstruction were randomly allocated between two groups. In Group I suture of the gap in the patellar tendon and bone grafting of the defect in the patella were performed. In Group II both the gap in the tendon and the defect of the patella were left open.

Results: Preoperatively no significant differences between the Groups in neither Lysholm, Tegner, patello-femoral score nor knee stability as measured with KT-1000 stabilometer were found. The preoperative Lysholm score was 70.9 ± 15.6 in Group I and 70.5 ± 16.4 in Group II (n.s.). The Lysholm score improved significantly at 2 years follow-up in both groups, to 93.3 ± 7.5 in Group I and 92.7 ± 9.6 in Group II (n.s.). Tegner activity score was significantly lower after 2 years; 5.7 ± 2.1 (2–10) than the preinjury level; 7.2 ± 2.0 (2–10). The mean preoperative values for anterior tibial translation as measured with KT-1000 (180 N) were 6.5 ± 2.2 mm in Group I, compared with 6.7 ± 2.3 mm in Group II (n.s.). The corresponding values at 2 years follow-up were significantly improved in both groups, to 4.4 ± 1.7 mm in Group I and 4.9 ± 1.8 mm in Group II. No difference between the groups was found. Patello-femoral score was improved in both groups at 2 years follow-up compared with the pre-operative values.

Conclusion: Closure of the gap in the patella tendon and bone grafting of the patella does not appear to improve the functional results after harvesting a BTB graft as compared with neither suture nor bone grafting. The patello-femoral score improved after the reconstruction in both groups.

8. Problems in arthroscopic anterior cruciate ligament surgery

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This study reports the intra-operative complications and post-operative problems for our first 52 patients of arthroscopic anterior cruciate ligament (ACL) reconstrucion.

Patients and methods: 52 consecutive patients with unilateral ACL ruptures were reconstructed by the same surgeon (JK). 12 patients had acute ruptures and 40 had chronic ruptures. All patients were operated on with the same method and rehabilitated with a standard protocol. We used patellar tendon auto graft, all-inside technique and interference screw fixation on the femoral side and when possible on the tibial side (all but 4 patients). The rehabilitation consisted of early closed chain training in full range of motion and full weight bearing. 51 patients were reexamined by an independent observer (LM) after a mean period of 18 (12–27) months postoperatively.

Results: 2 major intraoperative complications occured. 1 graft was partially damaged when the femoral screw was inserted and in 1 patient the posterior cortex was perforated when the femoral tunnel was drilled. 5 early (< 3 months) complications occured. 2 subcutaneous wound infections and 1 pressure wound on the ipsilateral heel during the first post-operative week, 1 patellar fracture after 6 weeks, and 1 skin perforation caused by subcutaneously placed meniscal sutures after 11 weeks. 45 late problems (> 3 months) occured. Significantly (p=0.04) more patients in the acute group 4/12 than in the chronic group 3/39 were rearthroscoped due to an extension deficit of > 3° compared with the non-injured knee. At follow-up examination 13 had 5°–15° flexion deficit compared to the non-injured knee. The metal implants on the tibial side (2 staples and 2 interference screws) were removed due to pain in 4. Palpatory donor site tenderness was observed in 21.

Conclusion: A considerable number of complications and problems occured when we changed to the arthroscopic technique. Most of the problems were, however, minor and easily solved and no serious disability was recorded. Patients where acute reconstructions were performed more often needed rearthroscopy due to late postoperative extension deficit than patients where chronic insufficiency was reconstructed.

9. Increased early migration of the cemented SHP hip prostheses—a randomized study against Lubinus SP2 using RSA

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This study evaluated the early fixation of a new cemented hip prostheses designed to optimise the stress distribution in the cement mantle.

Patients and methods: 37 patients (38 hips, 16 men, 22 women; median age 67 years) with osteoarthrosis and undergoing THR were randomised to a Lubinus SP2 or SHP implant design. All hips were done by the same surgeon using third generation cementing technique and Palacos R cement. RSA measurements were done postoperatively and after 6 months. Eleven in each group have also so far been followed for 12 months.

Results: At 6 months increased subsidence of the SHP stem was noted with a median value of 0.22 (0–0.84) mm compared to the SP2:s 0.001 (0–0.28) mm (p=0.02). At 12 months median subsidence increased to 0.31 (0–1.2) mm in the SHP and to 0.08 (0–0.26) mm in the SP2 group (p=0.003). Increased retroversion of the SHP stem was also noted (p=0.009). The acetabular component of the SHP hip also displayed increased proximal migration during the post-operative year; (SHP=0.31 mm, SP2=0.06 mm; p=0.0009). The clinical results did not differ and the hips have performed well.

Conclusions: Previous studies have indicated that early subsidence is associated with later failure as regards several

designs of hip prostheses. Compared to the Lubinus in the control group and earlier investigated cemented Charnley and Spectron stems, the SHP stem displayed up to 10 times higher subsidence. The reason for the high migration values of the both components is not known and we think these patients have to be followed for a longer time until further use of the SHP hip can be recommended.

10. Fixation of hip prostheses with a cold curing compared to a standard bone cement

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Heat and release of toxic monomers from the cement are supposed to be important reasons for loosening of hip prostheses. This study aimed to evaluate a new low temperature curing bone cement, Cemex, regarding the fixation of implants and the biologic response of the host bone.

Patients and methods: 50 THA in 31 women and 19 men, mean age 68 (50–80) years, with osteoarthritis were randomly allocated to cementation with either Palacos R or Cemex Rx bone cements without gentamycin. Third generation cementation technique was used and all patients received a Lubinus SP2 implant with a Ti-Al-V (Tilastan) stem. The fixation of components were recorded up to 1 year using RSA. Biologic markers of bone turnover (P1CP, 1CTP) were determined after 6 weeks.

Results: At one year the mean medial/lateral, proximal/distal and anterior/posterior migration of the cup reached 0.13/0.28, 0.21/0.23 and 0.15/0.13 mm (Cemex/Palacos: not significant). The mean cup rotations around the three axes varied between 0.31°–0.58° (ns). The mean stem subsidence the first year reached 0.14/0.12 mm (0–0.44) in the two groups (C/P : ns). The stem rotations varied between 0.2° and 0.7° (ns). There were no differences in Harris hip score, lab tests at third day (CRP, ALAT, ASAT) or markers collagen metabolism at 6 weeks (P1CP, 1CTP).

Discussion: Earlier studies (Mjöberg 1986) found less early migration using a cold curing cement, and Thanner et al. (1995) recorded a poor fixation of implants with Boneloc were the methylmetacrylate has been partially substituted. In Cemex the smallest particles are excluded in the PMMA powder allowing a reduction of monomer by 30%. According to our study this cement had the same performance as Palacos regarding early implant fixation and biologic response of the host bone.

11. PCA versus Harris-Galante (HG I) in uncemented total hip arthroplasty—a prospective and randomized study

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The PCA and Harris Galante prostheses represent two different cementless designs introduced to address problems observed in cemented fixation 10 to 15 years ago. This study was initiated to evaluate these prostheses in a randomized study.

Patients and methods: 171 patients with a mean age of 50 (21–64)years were randomized to either a PCA (n=84) or a Harris-Galante I (n=87) prosthesis between August 1985 and March 1989. Clinical and radiographic examinations were done every second year and up to 10 years. Four patients deceased and 1 patient was lost to follow-up. The mean follow-up was 7.5 (5–10) years.

Results: 19 hips were revised (18 mechanical loosening, 1 infection) after 10 months to 9.3 years after the operation (median 6.3 years). The cup was exchanged in 5 hips, the stem in 8 and in 3 hips both components were revised. In further 4 hips only the polyethylene liner was exchanged. 7 of the 8 revised acetabular components were of the PCA design (p=0.03) and 8 of 11 revised stems were of the HG type (n.s.). At the latest follow-up (non-revised patients) the mean Harris pain score was 41/43 (PCA/HG; p=0.04). An increased frequency of cups with wear (p<0.001) was noted in the HG group. The frequency of osteolysis or radiolucent lines did not differ between the two groups.

Conclusion: The PCA prosthesis was associated with an inferior clinical result. Difficulties to measure wear of the PCA cup with a more radio-opaque metal-backing might partly explain the differences in wear between the 2 groups.

12. A prospective clinical outcome analysis of 100 patients operated with a total hip arthroplasty—a comparison of a disease-specific and a non disease-specific score system

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Total hip replacement is, above all, a method of relieving pain and increasing the patient's quality of life. The most common way to report clinical results after THR is to use a disease-specific score system. Several studies have shown that they are inconsistent, often given contrary measures of success in the same patient. The aims of this study were to evaluate quality of life (Nottingham Health Profile – NHP) before and after total hip replacement with a minimum follow-up of 5 years, and to compare the results obtained with a "traditional" score as Harris Hip Score (Harris HS). Further aims were to compare the results after cemented and uncemented techniques, and between two different age groups.

Patients: 54 patients were treated with a cemented and 46 with an uncemented THR. Mean age at operation was 71 and 49 years, respectively. No patient was lost to follow-up.

Methods: All patients were followed prospectively, pre-

operatively and after 1, 3, and 5 years. Preoperatively the patient got a NHP questionnaire. The Harris HS was assessed by the surgeon. We asked additional questions about marital and socio-economic status, other diagnosis and duration of hip symptoms. We classified the patient in clinical categoryies according to Charnley. At each follow-up the clinical examination was done by an unbiased observer, who assessed the Harris HS, clinical category and asked for the patient's satisfaction. The patient was then left alone to answer the NHP questionnaire.

Results: The preoperative mean values of total Harris HS was 36 and pain score 13 in the cemented group and 40 respectively 12 in the uncemented group. Part I of NHP showed pronounced dysfunction in the sections of pain, energy and mobility and the profiles were almost identical in the two groups. Most of the patients had problems in daily activities (Part II). In this part of the health-profile there was a clear difference between the age groups. The younger population—the uncemented group— seemed to have more problems in daily activities, especially with house-work and to participate in holidays and hobbies. Problems with paid employment was more pronounced among the young population so also in the field of social life and sexual function. Harris HS, patient satisfaction and NHP did not change when comparing results from 1, 3 and 5 year follow-up examination. At 5 years the mean values for Harris HS was 86 and pain score 42 in the cemented group and 92 and 41, respectively in the uncemented group. The values for Harris HS varied significantly when comparing different clinical categories, especially in the older population, with a mean value of 98 in category A to 76 in category C. The pain score and satisfaction did not show the same variation. 91% of the patients in the cemented group were satisfied and 93% in the uncemented group. The health-profile—Part I—improved significantly within all sections in both groups and became almost similar to the control group. Only in the section of mobility the result was significantly worse compared to the control group. There was, however, a significantly improvement compared to the preoperatively values. All domains in Part II were significantly improved but there was still a difference between the two age groups. The young population had postoperatively and still after 5 years some problems with housework, hobbies and holiday. Among the additional questions martial status was the only background variable that correlated with outcome. Patients who were single had worse quality of life in terms of social isolation and emotions.

Conclusion: Harris HS is a blunt tool which reflects the patient's age and clinical category more than the actual hip function or the patient's subjective assessment of the clinical result. If a hip score is used it is necessary to correlate it to age, diagnosis or clinical category. Perhaps it is more adequate to report the difference between the follow-up and preoperatively value. The preoperative NHP clearly showed that the hip diseased patient had a severely impaired quality of life compared with an age and sex matched population and that the young population had more pronounced dysfunction in daily activities. The health-profile improved significantly for all items after surgery and persisted for a period of 5 years. We think that it is necessary to include patient based analyses of changes of life quality and satisfaction when assessing long-term results after implant surgery. This is also important in order to give priority and to allocate limited resources fairly. In this example Harris HS, additional questions and NHP included 65 questions to answer for the patient at each follow-up. It is possible to do that kind of extensive questionnaire for controlled studies at university hospitals but it is difficult to handle for routine use and quality control at other departments. The need for a simple, adequate and standardised score is obvious.

13. Economical aspects of recurrent dislocations in Charnley hip arthroplasties

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Dislocation after primary total hip arthroplasty (THA) in Scandinavia has been reported to occur in 3–5% of the cases and to be somewhat higher in revisions. Both the prognosis of recurrency and the results of operative and conservative treatment can be evaluated by survival analysis. These calculations can be used to predict claimed hospital resources and financial costs.

Patients and methods: We studied 160 Charnley or Charnley hybrid THA:s operated on between 1979–1994 with at least one dislocation after a primary (n=121) or revision (n=39) hip replacement. The recurrent dislocations were treated with reoperations in 15 cases, revision with exchange of prosthetic components in 50 cases and complete removal of the stem in 7 cases.

Results: The survival analysis of all THA:s that had suffered from one dislocation, indicated that 36% had no further dislocation or revision due to instability within 1 year. The occurence of a second dislocation resulted in a decreased 1-year survival of 31% with further declining rates after a third, forth or fifth dislocation. The survival was influenced by gender and time to first dislocation but not by age, diagnosis or primary operation.

The results of treatment and estimated costs are presented in Table (next page). Median values have been used.

Conclusions: Our results show that the prognosis for a dislocating hip to stabilize by conservative treatment is poor and especially if several dislocations have occurred. The recurrent dislocations causes both a considerable patient discomfort as well as a high consumption of hospital treatment. Carrying out an exchange of one or both prosthetic components seems to be justified in selected cases.

Table. Results of treatment for a dislocating hip and estimated costs, median values

Treatment	Time in operation room (min)	Days in care	Estimated total cost	Success rate (in 2 years)	Cumulative survival (2y)	Returned home
Closed reduction	5+35	1	8,500	–	–	–
Reoperation	85+60	24	66,500	4/15	27%	8/11
Revision (exchange)	120+140	22	82,000	37/50	71%	38/45
Revision (removal)	85+55	6	28,500	–	–	1/7

14. State of the art in odontoid fracture treatment?

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Treatment of odontoid fractures has always been controversial due to the high incidence of non-unions regardless treatment modality. Over the last decade, anterior screw fixation has been popularized in contrast to previous non-operative treatments, including halo-vest fixation. However, screw fixation is not without complications, is limited to certain fracture types and also associated with non-unions. Therefore, we believe halo-vest treatment still remains as an alternative. This paper describes a consecutive series of halo-vest treated odontoid fractures.

Material: Between 1976 and 1996, 34 patients with odontoid fractures, 14 men and 20 women, were treated with halo-vest. The fractures were almost equally divided into Anderson-d'Alonzo type II and III fractures. Age range was 9–89 (mean 51) years. Patients with associated scull-fractures or non-compliant were treated by primary open fixation or with collars. The treatment period ranged from 8–15 (mean 11) weeks.

Results: All fractures healed but 2, both type II fractures, which gives an overall 94% healing rate. One patient, 89 years old died within 3 weeks due to respiratory complications but no other serious complications were encountered.

Conclusion: We have found, that halo-vest treatment in these fractures offers a safe alternative to surgery and leads to a high union rate with few complications. Important are standardized treatment routines and a correct reduction.

15. Cervical disc herniation—a prospective randomized study using plate fixation

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Surgery of cervical disc herniation often includes anterior fusion. However pseudoarthrosis is not uncommon and increases with the number of levels addressed. Therefore, the advent of locking plates is believed to reduce this complication. In the present study, plate fixation in cervical disc surgery is evaluated.

Patients and methods: In a prospective series, 46 patients were operated on with disc excision and anterior fusion due to cervical disc herniation. Until now, 22 patients (10 men, 12 women) have been followed for more than 1 year postoperatively. The patients were operated either on one level (12 patients) or 2 levels (10 patients) between C4 and C7. They were randomized to fusion with or without a titanium locking plate (AO/Morscher). The plate was fixed with two solid screws inserted into the adjacent vertebrae. Pain was recorded using visual analogue pain scales (VAS) both for the neck and for the arm pain. This was done preoperatively, and at 3, 6, and 12 months postoperatively. At the 1-year follow-up an unbiased observer (neurologist) examined the patients and classified the clinical outcome according to Ogdem's criteria.

Statistics: Mann-Whitney U-Wilcoxon Rank Sum W test.

Results: Plate fixations was used in 11 patients (8/1 level, 3/2 levels) whereas another 11 patients were operated without a plate (4/1 level, 7/2 levels).Mean age was 45 and 42 years, respectively.

Arm pain: The mean preoperatively score was 5.35 (max 10) in patients randomized to plate fixation and 5.09 in those without a plate (n.s.). 3 months after surgery the score in the non-plate group decreased to 4.23 but again increased to 4.97 at 12 months. With plate fixation the arm pain decreased to 2.81 at 3 months and 2.77 at 1 year (p=0.07).

Neck pain: Mean preoperative score was 5.44 in the patients with plate fixation and 6.27 without a plate (n.s.). After 3 months the pain was reduced to 3.96 in both groups but again increased at 12 months to 4.72 in patients without a plate and 4.48 in the other group (n.s.). According to Ogdem's criteria the patients without a plate were graded: 4 excellent, 4 good, 2 fair and 1 poor. In the patients with plate fixation: 3 excellent, 5 good and 3 fair. One patient developed a pseudoarthrosis and the plate broke between the 3rd and 6th month. All other fusions were healed at the 1 year follow-up.

Discussion: The overall results according to Ogdem's criteria does not differ from previous studies even if the arm pain seems to be slightly more reduced in patients with plate fixation. Interestingly, pseudoarthrosis occured only in a patient when a plate was used.

16. Radiographic examination in flexion-extension after neck injuries?

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The examination of the patient with a history of neck distortion has so far often included both a standard radiographic evaluation and after a period of immobilisation a follow-up examination with flexion-extension views. The Quebec Task Force on Whiplash-Associated Disorders concluded that cervical collars combined with rest delay recovery. Before the adaption of the Quebec guidelines for patient care we have followed a 1 year material of patient with neck distortion from our emergency unit. We found that 2/3 of the patients received cervical collars. The majority had a second radiographic investigation with flexion-extension views. In one case did this affect the treatment. A more critical use of immobilisation and radiographic examination seems appropriate.

17. Impacted cortico-cancellous allografts and cement for revision total hip arthroplasty using Lubinus and Charnley prostheses

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Material and methods: We have used new special instruments for graft impaction in acetabulum and femur adapted for the Lubinus SP-II prosthesis and the Charnley standard prosthesis in 126 cases.

We now report the first 52 hips in 52 patients, 29–81 years old, 3 with deep infection, the others with mechanical loosening, first to eighth revision. Loss of bone stock was grade II and III according to the Endo-clinic classification. We used a posterior surgical approach with thromboembolic and antibiotic prophylaxis. Mobilisation was started 1–5 days after surgery with crutches and protected weight bearing for 3 months. The complications were one late re-fracture, one stem dislocation, one pulmonary edema and one subluxation.

Results: The results in 46 patients (21 Lubinus and 25 Charnley) followed for 18–44 months (3 dead after 6, 13 and 14 months) are equally good with few complications at this short follow up. Radiographic examinations gave evidence of frequent trabecular remodelling of the graft both with Lubinus and Charnley prosthesis.

Histologic examination of one retrieved femur 6 months after surgery with a Charnley flanged 40 prosthesis showed a high activity of new bone formation and osteoid in the grafted areas. We also saw dead graft pieces and pieces of new living bone in close contact with the cement.

Conclusion: The method of impacted cortico-cancellous allograft for revision total hip arthroplasty using Lubinus SP-II and Charnley standard prosthesis shows equally good clinical and radiographic results with evidence of frequent trabeculary remodelling with this short follow up. The use of the method with those two hip prostheses appears to be justified.

18. Subsidence within impacted cortico-cancellous allografts—biomechanical studies

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Implanting a prosthesis component on the bed of cortico-cancellous allografts is a relatively new method. The aim is to achieve an in-growth of living tissue, preferably living bone in the graft bed. Since almost nothing is known about the biomechanical properties of the morsellized and impacted bone graft before in-growth, the aim of this study is to describe two of those properties.

Material and methods: In an in vitro model morsellized and impacted allograft was forced to subside against a matt and even surface compared to the same impacted allograft that was forced to subside against an uneven surface with 1 mm micro-tracks 90° against the direction of subsidence.

In another model, morsellized graft was impacted in an 62 mm diameter aluminium cup and a polyethylene cup cemented on the graft bed whereafter the cup was loaded excentrically and forced to rotate. Three kinds of bone chips were compared: bigger size bone chips containing its marrow fat, the same size of bone chips defatted and smaller size bone chips also defatted.

Results: To achieve the same subsidence against the micro-tracked surface a 60 times bigger force was needed compared with the same subsidence against the matt and even surface.

A cup rotation against the graft bed with the smaller size and defatted chips was achieved after 2,000 N. The same rotation against the bigger size graft chips including its marrow fat required 3,500 N. The same rotation against the bigger size graft chips but defatted required a force of 7,000 N.

Conclusion: In this method there was less subsidence and rotation of the implant against the graft bed if the surface under the graft bed was uneven, if the graftbed was harder impacted, if the chips were slightly bigger sized and if the graft was defatted before the impaction.

19. Impacted cortico-cancellous allografts—recoil and strength in biomechanical studies

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Osteolytic destruction of bone around a joint prosthesis is a

challange for the surgeon. A revision can be performed using morsellized and impacted bone graft. Artificial joint replacements are sometimes revised by cementing the prosthetic components on a bed of morsellized and impacted bone graft. Little is known about the biomechanical behaviour of this impacted bone graft during impaction and insertion of the prosthetic components. In the early postoperative period the alignment of the prosthetic components rely upon a certain amount of stability of the graft bed. The aim of this study is to describe the recoil of the graft bed when the impaction force is released. In another model the stability of increasing load of the graft bed is measured.

Material and methods: Bone allograft was morsellized in two different milling machines (Tracer milling machine and Howex milling machine) producing two different sizes of bone chips. In an in vitro model each kind of bone graft was impacted with two different impaction forces. The recoil of the graft bed was measured. Another but similar in vitro model with the same two kinds of chips impacted with two different impaction forceswas also used. After the impaction force was released subsidence was measured during load on the four different graft beds.

Results: Most of the recoil happened within the first 10 seconds. There was more recoil after the higher impaction force. There was also more recoil with the smaller bone chips from the Tracer bone mill compared with the bigger chips from the Howex bone mill, 34% of the impacted graft thickness compared with 26%.

There was less subsidence on the hard impacted graft beds and there was also significant less subsidence with the bigger bone chips achieved from the Howex bone mill.

Conclusion: An impacted graft bed had a strong tendency of recoil as the impaction force was released. In a clinical situation this may result in a minor or completely absent space for a cement mantel around the implant. In the second model subsidence was less after harder impaction and was also less with a slightly bigger size of chips.

20. 1.5-year prosthetic migration after hip revision with impacted morselized allograft—a RSA study

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To evaluate by RSA the prosthetic fixation in cemented hip revisions with contained and impacted morselized allograft.

Patients and methods: 16 consecutive cemented hip revisions were performed in 8 men and 8 women aged 67–85 (mean 74) years. Indication for surgery was mechanical loosening in 14 cases and previous infection in 2. The Exeter revision system was used in combination with contained and impacted morselized allograft from frozen femoral heads to revise 16 femoral stems and 16 acetabular sockets. To enable RSA follow-up, tantalum balls were implanted at surgery. All patients were followed by RSA from the immediate postoperative period and at 1.5, 3, 6, 12 and 18 months postoperatively.

Results: There was one reinfection reoperated three months postoperatively. Due to detachment of the greater trochanter at surgery further three stems could not be followed by RSA. One stem showed pronounced distal migration before femoral shaft fracture five months postoperatively. For the remaining 11 stems RSA revealed successively decreasing distal migration rate and in some cases the subsidence was arrested within 18 months. The acetabular sockets behaved in a similar way with decreasing migration rate in the cranial direction.

Conclusion: In cemented hip revisions with contained and impacted morselized allograft the subsidence rate of the prosthetic components decreases successively and can come to a standstill within 1.5 years.

21. Fixation of the Spectron stem in revisions using impacted cancellous allograft

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Impaction of cancellous allograft combined with a cemented stem have been used with increasing frequency in hip revision surgery. The method was originally designed for a polished stem, but several other stem designs have been utilized. This study evaluated the early performance of the Spectron EF stem with a rough proximal surface.

Patients and methods: 15 consecutive patients (6 men, 9 women; median age 65 (38–79) years) with a loose cemented (n=10) or a cementless (n=5) were operated. 2 hips had Type 1, 11 Type 2 and 2 Type 3 loosening (Gustilo-Pasternak 1988). Radiostereometry was used to measure migration up to 1 year.

Results: The subsidence of the femoral head centre increased from 0.07 mm at 6 weeks to 0.22 mm at 6 months. Between 6 and 12 months a minimum increase was noted (12 months: mean = 0.29, max 1.14 mm. A minimum lateral (mean 0.06 mm) and a posterior (0.74 mm) migration of the femoral head center was found). The mean stem rotations varied between 0.15° and 0.74°. Factors such as age, gender, type of removed implant, preoperative bone loss or volume of graft bone had no influence on the fixation. Evaluation of conventional radiographs revealed development of radiolucent lines in one patient with the most pronounced subsidence. The median (range) Harris hip and pain scores were 73 (58–93) and 40 (20–44), respectively.

Conclusions: The subsidence of the Spectron stem was 2 to 8 times smaller than reported in earlier studies. The rough proximal surface of this design preventing motion inside the cement mantle or differences in the surgical technique might be responsible.

22. Fixation of cemented and cementless acetabular revisions treated with impacted cancellous allograft

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This study aimed to evaluate the early fixation of press-fit cups coated with hydroxyapatite and tricalcium phosphate when used with or without a large volume of impacted morselised allograft. In cases with less than 50% host-bone available after grafting a cemented control group was also studied.

Patients and methods: In 27 acetabular revisions (12 men, 15 women; median age 66 (32–79) years) the fixation of the cup was measured using radiostereometry up to 1 year after surgery. The treatment was guided by the status of the host bed after reaming (Group 1: >50% host bone available; Group 2: ≤50% host bone). In group 1, the patients received a Harris-Galante cup coated with hydroxyapatite/tricalcium-phosphate placed on no (n=2) or a small amount (10–70 mL) morselised auto- (n=9) or allograft (n=2). In group 2 a Harris-Galante cup with ceramic coating (n=8; group 2A) or a cemented Spectron cup (n=6; group 2B) was placed on impacted morselised allograft (75–300 mL).

Results: At the 1-year follow up the proximal migration reached 0.13 (-0.1–3.2), 0.24 (0.1–1.3) and 0.23 (-0.13–1.94) in the 3 groups, respectively ($p>0.05$). Factors such as gender, age, weight, type of loosening (Gustilo-Pasternak), volume of transplanted bone, cemented/cementless fixation had no significant influence on the recorded migration values. However, patients with rheumatoid arthritis displayed increased proximal migration ($p<0.001$) and one of these cases had to be rerevised after 2 years (Group 1).

Conclusions: The use of impacted cancellous allograft does not significantly compromise the early stability of acetabular revisions even if the cup is resting on 50% allograft bone or more. Cemented and cementless fixation using screw fixated press-fit cups with ceramic coating provided similar results despite that large amounts of allograft were used. However, these findings have to be confirmed with longer follow-up.

23. Intracondylar retrograde nailing compared to supracondylar compression plate fixation of the fractured distal femur

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Treatment of fractures in the distal third of the femur is a technical problem. Before 1970 treatment in traction was advocated. The compression supracondylar plates have since 1980 been the dominating implant. Since aug 1994 the IMSC nail has been used at our department.

Material and method: Our first 34 cases treated with the Richards compression supracondylar plate 1979 to 1982 was evaluated according to Neer's criteria 6 and 12 months after the operation. Our first 24 IMSC operated patients operated between August 1994 and March 1996 were followed for at least 6 months and evaluated in exactly the same way. The functional outcome, disturbed healing, malalignment, operation time, peroperative bleeding and technical problems were compared.

Results: Preliminary results indicate equal or better alignment, shorter operating time and less bleeding for the IMSC operated patients.

Conclusions: The IMSC nail is a new valuable device and the primary choice in the management of unstable fractures in the distal third of the femur.

24. Unreamed nailing in open and closed femoral fractures

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Unreamed femoral nailing has gained increasing popularity as it is supposed to minimize the risk of complications, such as ARDS, infection and also non-union. The development of new nails made out of titanium alloy has made it possible to use a smaller diameter (9 mm) while still providing sufficient strength.

Patients and methods: Since August 1994 we have studied 20 consecutive cases with femoral fractures suitable for unreamed femoral nailing. There were two major types of patients: young (19–38 years), predominantly men, with high energy injuries and often multiple injuries (12 patients) and elderly women (77–88 years) with low energy trauma (6 patients). ISS in the high energy group ranged from 9–27 and fracture type according to the AO classification ranged from A2 to C3. Five patients had open fractures. AO classification in the low energy group were A1, A2, A3 and C3.

The nails used were ACE and UFN. All in the high energy group were primary treated with femoral nailing within 8 hours, except one, first treated with external fixation. Two patients were treated with retrograde nailing, the rest with antegrade nailing. All received both distal and proximal interlocking. Seven fractures, among them two subtrochanteric, were treated with retrograde proximal interlocking into the femoral head.

Results: In all cases except two it was possible to introduce the nail and reduce the fracture without reaming. Two had a too narrow medullary canal to allow introduction of the nail without reaming. One of these (high energy, ISS 9) was also the only one to have a mild pulmonary complication (pneumonia). There were no axial malposition or significant shortening in any case. No mechanical complications, redisplacements or non-unions have so far been noticed. One open fracture (Gustilo class IIIA) was complicated with in-

fection which healed after debridement and antibiotics. Mean time to bridging callus was three months.

Discussion: Based on our first experience we plan to continue to apply the method in both open and closed fractures. The technique was easy to apply and the complication rate was low even when used in open fractures and in severely injuried patients.

25. Retrograde femoral nailing of fracture distal to a Moore-prosthesis

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Fractures distal to prosthesis in the proximal femur is an increasing problem. Patients with Moore-prostheses are old with poor bone-stock. We present a simple procedure to stabilize a fracture below a Moore-prosthesis.

Patients: Seven women, mean age 84 (74–93) years with acute fracture distal to a Moore-prosthesis were admitted. Five patients were prior to the fracture walking, two patients were transferring bed to chair. All patients were followed to healing of the fracture.

Operative procedure: All patients were operated on a traction-table with the knee on the injured side flexed to 20 degrees. A pre-cut reamed femoral AO-nail was introduced through the femoral notch sliding over the distal end of the Moore-prosthesis. The nail was distally locked. Weight-bearing was immediately allowed.

Results: All fractures healed. Six patients returned to pre-injury ambulating status within six weeks. In one patient the distal end of the nail was not sufficiently seated into the femoral condyle, thereby hindering the knee to bend optimally. Although not complaining of pain, this patient was confined to wheel-chair. Leg length remained unchanged in all patients throughout the healing period.

Discussion: In the literature fractures distal to a Moore-prosthesis are recommended to be treated either non-operatively or by revision to a long prosthesis bypassing the fracture. However, any of these treatments is a major challenge to these fragile patients. Furthermore, most often these fractures are not amenable to open reduction and internal fixation by plating because of comminution of the fracture and osteoporosis. The described procedure is simple. The result was excellent in all but one patient, were the poor outcome could be explained by a peroperative technical error.

26. Fracture-resection and callus distraction in the early management of type III B and III C tibia fractures

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Open tibial shaft fractures with soft tissue loss demanding major reconstructive procedures such as free flaps and vascular reconstructions, could benefit from an early resection of the fracture site, followed by leg lengthening procedure as an isolated procedure or in combination.

Material and method: Five patients were treated with fracture resection (maximum 87 mm). The bone resection was performed between day one and 2.5 month post injury. At the time of resection the limb was stabilized with an LRS-frame (Orthofix). A proximal osteotomy was performed at the same time or shortly afterwards, depending on the soft tissue condition. After a delay of two weeks callus distraction was started.

Results: The fractures healed as well as the distracted callus. Only minor complications such as pintract infections were noted. A considered free flap procedure could be avoided because of this technique . In two cases the healing times were dictated more by the bone lengthening procedure than by the time to fracture healing. Improvement of ROM in the ankle joint was noted secondary to temporary "relative lengthening" of the soft tissue.

Conclusions: Early resection of the fracture and callus distraction is a method that should be considered in the management of open type III B and III C tibial fractures.

27. Treatment of closed tibia fractures with cerclage or lag-screw technique

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The standard treatment in Göteborg for closed tibia fractures, without soft tissue problems, or open fractures grade I, which are not stable after closed reduction, has been open reduction and internal fixation with cerclage or lag-screws (ORIF). This operative treatment is combined with a plaster above the knee for 4–6 weeks followed by a below knee plaster until healing. The combination of an open procedure and still need for plaster and immobilisation has been questioned. We have therefore studied the patients treated in this way 1991–1993 and compared them to patients treated with only plaster or external fixation.

Patients and method: 97 patients with tibial shaft fractures treated with closed reduction, ORIF or external fixation were retrospectively analysed. Time to union, disturbed union, malalignment, range of motion and sick-leave period were followed.

Results: The median time to union was 16 weeks for patients treated with plaster and 22 for patients treated with ORIF and 44 for patients treated with external fixation. In the group of fractures treated with ORIF pseudarthrosis, nonunions and angulations were frequent.

Conlusions: The treatment with semi-rigid internal fixation in combination with plaster has a high rate of complications and the healing time is long.

28. Subtrochanteric fractures—a retrospective study of different methods of internal fixation

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The treatment of subtrochanteric fractures is associated with a high complication rate. The aim of this study was to investigate the outcome of different methods of treatment.

Patients and methods: Between 1993 and 1995, 70 consecutive patients were admitted to the Karolinska Hospital with subtrochanteric fractures (61 women and 9 men with an average age of 72 years). All patients were operated upon with closed reduction and open internal fixation. 42 fractures were fixed with a Dynamic Hip Screw (DHS), 23 with a Dynamic Compression Screw (DCS) and 5 with an intramedullary nail.

Results: Suboptimal reduction was observed in 30 fractures (13 DHS, 16 DCS and 1 IM nail). Unsatisfactory placement of the implant was seen in 19 fractures (8 DHS, 10 DCS, 1 IM nail). Mechanical failure occurred in 14 fractures, (2 DHS, 12 DCS), which led to reoperation. In 10 of the 12 cases where the DCS was used, the compression screw cut out proximally and the fracture redislocated. In the other two cases, plate breakage occured. There were no nonunions.

Conclusion: The highest complication rate occured after fixation with the DCS and the lowest with the DHS. Despite compression at the fracture site, which was often seen after fixation with the DHS, fractures usually healed and reoperation was unnecessary. It was often difficult to obtain a satisfactory placement of the DCS. In some cases, the compression screw was too short and did not reach the femoral head and in others, appropriate reduction was not achieved, resulting in a residual varus position. We conclude that if the angle of the DHS/DCS-plate were modified, better placement of the device could be achieved. Intramedullary nailing with an unreamed nail and retrograde proximal interlocking seems to be a promising alternative.

29. The use of blood in orthopedic surgery in Sweden

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The risks of transmitting different kinds of viral infections has altered the attitudes to blood transfusion. Efforts are made to select donors after more rigid criteria and different tests are used to detect known infectious diseases. Fractioning and filtering of the blood is also used to remove harmful factors and cells. Because of these problems the use of autologous transfusions has dramatically increased during recent years. Different methods have been used more and more frequently to reduce the need for homologous blood. There is also a fear among patients for blood products, and an increasing awareness of alternatives. The purpose of this paper is to present the current situation of how blood is used in orthopedic surgery in Sweden.

Material and methods: A questionnaire was sent to all orthopedic units in Sweden. Orthopedic units not doing artroplasties were excluded in this study. Of 86 departments answers were received from 85. Questions were made regarding; 1) routines for ordering of blood, 2) the use of pharmacological treatment before, during or after operations, 3) if autologous blood donations were practised, 4) if preoperative hemodilution was used, 5) if some kind of CellSaver technique was used and 6) if postoperative collection of drain blood was practised.

Results: All hospitals had some kind of routine for ordering of blood, or a system with "base-test" by which homologous blood is available within 10–15 min. 21 hospitals had some kind of program for dealing with patients who are Jehovah's witnesses. Two thirds of the units used some kind of pharmacological treatment at least occasionally to either increase the preoperative hematocrit or to reduce blood losses. 5 hospitals used erythropoietin preoperatively. 13 used tranexamic acid and 27 used desmopressin per- or postoperatively. Predonation of blood was practised at two thirds of the hospitals, but only 5 had this as a regular routine. Hemodilution was used at 8 different hospitals, but only one department used this on a regular basis. CellSavers were used at 35 hospitals, mainly at reoperations of arthroplasties and at large spinal operations. Postoperative collection of drain blood was used in one fourth of all units and mainly after knee arthroplasties.

Conclusion: There is a clear interest among orthopedic surgeons for reducing the use of homologous blood at operations. The use of preoperative stimulation of the erythropoiesis is not yet widely used in Sweden. There seems to be a resistance from the blood banks against preoperative donation on orthopedic patients. CellSavers are widely spread in Sweden, even at smaller hospitals. Surprisingly postoperative collection of drain blood is not used as widely as the CellSaver technique, despite the lower costs.

30. Postoperative drainage of knee arthroplasties is not necessary

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An inherent blood loss in knee arthroplasty often requires several units of blood replacement. A possible way to minimize postoperative bleeding and need for blood transfusions has been postulated by not using drains at all, or using autologous reinfusion systems. In a randomized prospective study, we have compared these two methods with conventional closed suction drains, keeping all other factors involved the same.

Patients and methods: 90 patients with osteoarthrosis who underwent primary total knee replacement were randomly allocated to three groups: a) no drains, b) Solcotrans® autotransfusion system, c) closed suction drainage (Redon®). Antiinflammatory drugs were withdrawn 14 days before and until 1 month postoperatively. The surgical procedure was the same, all prosthesis were cemented. A tourniquet was inflated before skin incision and was deflated after the leg had been dressed with an elastic compression dressing (Dauer®), which was maintained for four days. Continuous passive motion started the first day following surgery. Enoxaparin, as thrombosis prophylaxis, was given 40 mg/day s.c. during hospital stay with start on the operation day. All patients were followed by a custommade protocol for 4 months. The parameters measured included hemoglobin concentration, hematocrite level, time to dry wounds, drainage bleeding, blood transfusion, blood reinfusion, operation time, ROM, hospital stay (days), thigh circumference and VAS scales for assessment of pain. Statistical significance was calculated by means of ANOVA.

Results and conclusions: For all the parameters measured, no significant differences were seen between the three groups. This was true at all occasions including preop, postop, day 0-8 and at the 4-month follow-up. We found a strong tendency, although not significant, toward a shorter hospital stay in the group who did not receive drains compared to patients in the Solcotrans group. By using the Solcotrans® autotransfusion system the calculated economic loss in this study was SEK 20.000, and by using the Redon® drainage system the calculated economic loss was 3.000 SEK. Based on the above results, the use of drainage of knee arthroplasties is not indicated.

31. Recombinant hirudin (CGP39393) 15 mg is more effective than enoxaparin as prophylaxis of thromboembolic complications in patients undergoing total hip replacement

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The aim of this randomised double blind multicentre trial was to investigate the efficacy and safety of CGP 39 393 15 mg s.c. b.i.d. compared to low molecular weight heparin (enoxaparin) 40 mg s.c. o.d. in patients undergoing elective total hip replacement. Both regimens were started preoperatively, in the evening (12 hours before start of surgery) in the enoxaparin group and on the operation day, within 30 minutes before start of surgery (but after regional block anaesthesia whenever used) in the CGP 39 393 group. Duration of prophylaxis was 8–12 days.

2,079 patients were randomised in 31 centres in 10 different countries in Europe. The main efficacy parameter was the presence of a confirmed major thromboembolic event (proximal DVT, PE or death) during the prophylaxis period. DVT was verified by mandatory phlebography at the end of the prophylaxis period or earlier if clinical signs of DVT occured. The phlebography which had to be bilateral and performed according to standardised technique was evaluated centrally by two independent radiologists using predefined criteria. Suspected pulmonary embolism (PE) had to be confirmed by perfusion/ventilation scan, pulmonary angiography or pulmonary embolectomy. Safety was mainly evaluated by blood loss and transfusion requirements in perioperative (surgery up to 12 hours) and postoperative (12 hours up to postop day 6) periods. A total of 1,587 patients (76.3%) were included in the primary efficacy analysis. The main reasons for excluding patients from the primary outcome analysis were either due to phlebographies not performed or inadequate phlebogram. There were no major differences between the groups.

	enoxaparin	CGP 39 393	P-value
Evaluable patients	n=785	n=802	
Major thrombo-embolic events[a]	60 (7.6%)	39 (4.9%)	<0.02
Proximal DVT	59 (7.5%)	36 (4.5%)	
PE	2 (0.3%)	2 (0.2%)	
Death	0 (0.0%)	1 (0.1%)	
Overall DVT [b]	196 (25.5%)	142 (18.4%)	<0.01
Operated patients	1023	1028	
Median blood loss			
perioperative	950 ml	950 ml	
postoperative	200 ml	250 ml	
total	1200 ml	1240 ml	n.s.

[a] proximal DVT, PE, death
[b] proximal and distal

This trial showed that CGP 39 393 15 mg started preoperatively and administered s.c. twice daily, for 8 to 12 days, provides a benefit/risk ratio superior to that of enoxaparin administered s.c. once daily. CGP 39 393 15 mg is significantly more effective than enoxaparin 40 mg. The relaive risk reduction was 36.4% for major thromboembolic events and 40% for proximal DVTs. Both treatment groups showed a comparable safety profile.

31b. Autologous blood transfusion prevents postoperative thrombosis?

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Predonation of blood for autologous blood transfusion might activate the donor's hemopoietic and coagulation systems, resulting in for example reduced postoperative blood loss (!). The aim of the present study was to analyse the effect of predonation and bloodtransfusion on blood loss and hemostatic mechanisms.

Patients and methods: 80 patients with primary coxarthrosis were randomly allocated to preoperative blood donation or not. The last 10 randomized patients from each group were studied regarding their coagulation and fibrinolysis factors before blood donations i.e., in the morning approximately 6 weeks before operation, in the morning before surgery, 2 hours postoperatively and the following morning.

Results: PAI-1 increased postoperatively in the homologous group only ($p<0.01$). The platelet counts, vWF:Ag, PK and antithrombin III decreased during surgery in both groups. FVIII increased after the predonations (p 0.04) while other hemostatic parameters where unchanged. In the clinical study including 80 patients blood loss did not differ between the groups, neither did the total transfusion volumes. 7/38 patients in the autologous group received homologous packed red cells after they had been given their own two predonated units, compared with 29/40 in the control group ($p<0.001$).

Discussion: Considering the analysed coagulations and fibrinolysis factors the only factor that significantly differed between the groups where the PAI-1 value which was significantly higher in the homologous group postoperatively. This may be associated with an increased risk of postoperative venous thrombosis (2). This hypothesis is also supported by a study of Anders et al. (3) who revealed a decreased incidence of deep-vein thrombosis after total joint replacement when predonations of autologous blood had been undertaken.

References:

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31c. ASA and hip fracture—a combination to avoid?

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Acetylsalicylacid (ASA) and other non-steroidal antiinflammatory drugs (NSAIDs) are widely used in clinical praxis. As especially ASA decreases platelet aggregation it can cause serious bleeding complications during and after surgery. This has been proved to be true in elective surgery like cardiac bypass surgery and elective hip arthroplasty, but nobody has investigated the influence of ASA in bleeding complications in acute hip fracture surgery, where large bleedings may be due to ASA intake.

Materials: Between October 1993 and April 1994, 219 consecutive patients with a hip fracture were specifically asked about their ASA and NSAID intake the last 10 days before admission to the hospital. The following data were collected: type of fracture; type and duration of operation; blood loss during and after operation; blood transfusion before and after surgery; prevalence of wound hematoma, wound secretion and wound infection. Patients using warfarin (n=4) were excluded from the calculations. Eight patients died, 5 of whom due to myocardial infarction (one of them used ASA).

Results: From all patients 22% used ASA irrespective of NSAID intake while 15% was not sure. In 15% of all cases ASA was the only NSAID used while 39% used neither ASA nor another NSAID. There was no difference in ASA use regarding cervical (n=98) or trochanteric fractures (n=111). In cervical fractures the main operation type was 2 LIH hook nails (n=86; mean operating time 24 minutes) while in trochanteric fractures the operation of choice was the sliding hip screw with 4 holes-plate (n=98; mean operating time 38 minutes). For the characteristic type of operation, there was no difference in total blood loss in cervical fractures between ASA users and non-ASA/non-NSAID users: in trochanteric fractures however, total median blood loss was 220 ml when using ASA (n=16) compared to 120 ml without ASA/NSAID (n=36), mainly due to peroperative blood loss, but this was not significant; 8/16 patients using ASA and 18/36 patients without ASA/NSAID received blood transfusion with a median of 2 units. 66% of all groups received no blood transfusion at all whether using ASA or not. We could not find any significant difference between ASA and non-ASA/non-NSAID users regarding wound hematoma, wound secretion or wound infection.

Conclusion: Although ASA causes an augmentation of median blood loss in patients with a trochanteric fracture, this has no clinical significance. Further studies in a larger patient population are required to confirm these results.

33. Wide resection for bone metastases

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Surgical treatment for bone metastases is associated with a high risk of progressive tumor growth and implant failure. The risk of failure increases with the survival time. Resection and reconstruction is indicated in patients with a good prognosis for surviving at least one year.

Patients and treatment: This retrospective analysis includes 19 patients operated 1990–1995 for 20 metastases of the humerus (6) and the femur (14). The median age was 62 years and there were 11 males and 9 females. The primary tumor was kidney in 10, breast in 4 and various others in 5. 10 patients had the bone metastasis at diagnosis, whereas in 9 the bone metastasis appeared 4 (3–11) years after diagnosis of the primary tumor. 9 patients had a solitary skeletal metastasis, 4 had numerous skeletal lesions, and 6 had vis-

ceral metastases as well. 6 patients had been operated previously and were reoperated because local tumor progression.

The surgical margins were 4 intralesional, 6 marginal, and 10 wide. Reconstructions were custom endoprostheses in 14 cases and allografts in 6 (1 osteochondral and 5 intercalary). There were no perioperative deaths but 5 complications were recorded: 2 hip dislocations, 2 deep venous thrombosis, and 1 radial nerve palsy. Two patients have been reoperated, both involving allograft reconstructions of the humerus. One of these patients had fracture dislocation of the humeral head of a osteochondrial graft, treated with a composite allograft/prosthesis. The other patient had non-union of an intercalary graft and plate loosening, treated with reosteosynthesis. The 1 and 2 year survival rates were 0.5 and 0.3, respectively. The risk of reoperation for long-term survivors was approximately half of that of patients treated with stabilization but without resection of the metastatic lesion.

Conclusions: Wide resection and reconstruction, either with endoprostheses or allografts, provides good function and decreases the risk of reoperation in long-term survivors. These patients can be identified by prognostic analysis based on type of primary tumor, extent of skeletal disease and presence of visceral metastases.

34. Primary, major amputations in Malmö, Sweden from 1979, 1984, 1989 and 1994 —an effort to study changes in incidence and characteristics of the patients

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Patients: This report focuses on the incidence and characteristics of the patients that have had a primary, major low limb amputation, caused by arteriosclerosis in the population of the city of Malmö. Excluded are tumor or traumatic amputations. Four periods of 12 months each were analysed with 5-year intervals (1979, 1984, 1989 and 1994). From the patient charts the following data are collected: Age, sex, type of amputation, coexisting disease, postoperative complications including reoperation, mortality, mobility and wearing of prosthesis within the first year after the amputation.

Results: In 1994 the mean age of men and women was 75 years and 79 years respectively, the mortality within one year after the amputation was 62% and the number of amputations per 100,000 was 22 among all inhabitans and 59 among those over 50 years of age in the city of Malmö. A time trend analysis with logistic regression shows significant ($p<0.001$) decrease in the incidence of major amputations since 1979. From the year of 1979 to 1994 the annual risk of major amputation in Malmö was 0.97. Other significant changes during the period are shorter mean time in hospital, women more often were non-ambulant before the amputation, fewer amputated could walk/wear a prosthesis, more often vascular surgery was performed on their lower limbs (any time) before the amputation, men were in mean older and fewer, men became discharged to their own homes while more men were living alone when we compared 1974 to 1994. During these 15 years, patients with diabetes mellitus more often had been treated with an amputation below the knee.

Conclusions: The incidence of major, low limb amputations has decreased steadily from 1979 to 1994. 30/100,000 is a prognosis of the incidents in year 1999 of primary, major amputations among the population over 50 years in Malmö. Today the number of days in a ortopaedic ward are reduced. The high postoperative mortality remains. The amputated are today more often non-ambulant and they more often do not become ambulant.

35. Clinical audit in orthopedics—experiences from Borås and Eskilstuna

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The demand of quality assurance in public health organisations has increased. Peer reviews and clinical audits are methods where experts (surveyors) evaluate a medical department.

Aim: To develop a practical and useful method for mutual clinical audit without the character of authority inspection.

Method: Two equal departments of orthopaedics which ideally are not neighbours or direct competitors reviewed each other. Donabedian's model was used in which structure, process and outcome are studied. In addition a relatively large group (8 persons) of surveyors was used representing most categories of professionals within the departments.

Firstly there was a period of planning including studies of documents, hospital records and radiographs. Thereafter the revision took place in each department during 1-2 days and a report was written and presented to each other.

Result: Due to structural changes and cut-downs at the hospitals it took a year and a half to finish the project. The reports were extensive and gave implements for improvements as well as increased interest in quality assurance. Both departments were found to provide orthopaedic services with resonable quality in relation to available resources.

Conclusions: This type of quality control has obvious advantages: the atmosphere is openminded, there are opportunities for discussion. The broad constitution of the surveyor group ensures acceptance of the review by the whole department. However it would be desirable to have a detailed protocol to follow to save time. Such a protocol could be used in similar situations within the speciality. The review ought to be repeated to safeguard continous quality assurance.

36. Rehabilitation after autologous periosteum transplantation in the treatment of deep cartilage defects in the knee joint

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Full thickness defects of the articular cartilage in the knee joint is a serious injury that may progress to osteoarthrosis. Methods to treat these patients are under development. The periosteum has a chondrogenic potential and autologous periosteum transplants have been used in experimental studies, but there are few clinical reports on the effects in humans. In experimental studies, the influence of continous passive motion (CPM) in the immediate postoperative period has been evaluated, and shown production of hyaline-like articular cartilage containing type-II collagen from the periostal grafts. The rehabilitation programmes in the previous clinical reports are poorly described, and varies from immediate motion and weightbearing to immobilisation in a cast. At our clinic we treat localised full thickness cartilage defects in the knee joint with autologous periostal transplants.

Methods: An isokinetic concentric strength test of the thigh muscles is performed preoperatively. All patients are treated with continous epidural anesthesia the first 5 days postoperatively, to enable CPM treatment. At day 6 the patients are training passively (CPM) and actively without epidural anestesia. At day seven partial weightbearing with crutches is introduced and the patient is submitted from the hospital with a specific programme.

Thereafter, the patients are followed regularly by the operating doctor and the physiotherapist. Their rehabilitation programme is extended gradually if there is no swelling or pain in the knee joint. After 6 months the first postoperative isokinetic concentric strength test of the thigh muscles is performed. The patients are followed closely the first year and thereafter the follow-up continues on a yearly basis.

Results: At our clinic we have used the same postoperative rehabilitation model on 53 patients with localised deep cartilage lesions at various locations in the knee joint, with good clinical results. All patients have regained a full range of motion, and gradually extended their thigh muscle strength and functional capacity.

Conclusion: We believe, that rehabilitation with rigorous postoperative CPM regimen and slowly progressing strength training and weight-bearing activity, is a good rehabilitation model after surgical treatment of localised deep cartilage lesions in the knee joint, with autologous periosteum transplants.

37. Mulder rehabilitation score—an instrument to describe the patient with impaired leg function in the postoperative phase

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The majority of acute patients in the orthopedic ward are suffering from injuries or disabilities in the lower limb. To document the rehabilitation of the patient and communicate this information between different care personnel is time-consuming and difficult to do in a comprehensive form. Therefore a visual graphic score system was developed, mainly based on the rehabilitation of hip fractures. The score system might also act as a prognostic tool.

Material and method: A 0–15 scale was developed mainly based on the patients walking capacity and ADL. The score before injury was calculated score of each patient graphically noted every day. The first 735 cases, where the score system was used, including 93 hip fracture patients participating in another study, have been evaluated. The median Mulder score was calculated every day. The impact of walking problems or comorbidities before the injury have been analysed.

Results: The Mulder rehabilitation score system can distinguish between different diagnoses with or without comorbidities. For the 93 hip fracture patients, the Mulder score before fracture and after third day predicted the return to own home rate ($p<0.001$ and $p<0.05$).

Conclusion: Mulder rehabilitation score is a valuable system for documentation and communication of the patients rehabilitation after a trauma or an operation. The score system can act as a prognostic tool to a certain point.

38. Two case-control studies of the effect of rehabilitation programme for hip fracture patients

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Many studies have shown a good effect of rehabilitation programmes for hip fracture patients. The ÄDEL-reform in Sweden has meant a dramatic change of the prerequisite for such rehabilitation programmes. We have previously shown, that the total number of care days at any institution consumed by hip fractures patients, have not changed before and after the ÄDEL-reform.

Patients and methods: The study includes all patients with hip fractures that occured during two 12-month-periods, 1987/1988, and 1993/1994. These patients have been followed up during the first 4 months after the fracture, using the Rikshöft-protocol. Rehabilitation programmes were running for these patients during both periods, the Svalebo programme and the Vasa Ward 7 programme. 59 and 42 hip fracture patients participated in these programmes during the studied periods. Based on preoperative information, type of fracture, sex, age, ADL-function etc. controls were allocated to these programme cases. During both studied periods 1987/1988 and 1993/1994, the total care time at any institution was significantly shortened for the programme patients

compared to the control patients. The programme patients were better concerning ADL compared to the controls. The controls were slightly more healthy and had a better ADL-score before the fracture compared to the programme patients.

Conclusions: We have in another study shown that the ÄDEL-reform achieved a shorter length of stay at the Orthopedic and Geriatric departments, but an unchanged total length of stay at any institution for hip fracture patients when the years 1987/1988 and 1993/1994 were compared for the total hip fracture groups. This study shows that rehabilitation programmes for hip fracture patients are effective, both before and after the ÄDEL-reform. That implies that rehabilitation programmes are effective in any organisational or administrative setting.

39. Anterior-inferior capsular shift (T-plasty) for multidirectional shoulder instability

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Patients with multidirectional shoulder instability are notoriously difficult to treat. The purpose of this study was to report our results following anterior-inferior capsular shift procedures for the control of shoulder instability in these patients.

Patients and methods: 22 patients (23 shoulders) with multidirectional (MDI) shoulder instability underwent anterior-inferior capsular shift procedure. Shoulders with unidirectional anterior instability (Bankart's lesion) were excluded from this study. There were 15 women and 7 men, with an average age of 24 years. In 14 patients the repair was performed on the dominant shoulder. In 16 shoulders there was a history of recurrent anterior-inferior dislocation, while 7 had recurrent subluxation only. The patients with recurrent subluxation usually presented with shoulder pain due to secondary impingement. In all shoulders an anterior-inferior capsular shift (T-plasty) procedure was performed.

Results: 17 shoulders had excellent results, 4 good and 2 poor, as assessed with a modified Rowe scale. 2 patients have been reoperated, one with an acromioplasty for residual subacromial pain and one for restriction of shoulder motion. No redislocations have occured. 17 of 19 athletes returned to sports activity.

Conclusion: The conclusion of this study is that anterior-inferior capsular shift is a reliable procedure, that enables the majority of patients with multidirectional shoulder instability to return to physical activity.

40. Capsular shift and Bankart suture with anchors—comparison by MR-artrography of unstable and stable shoulders after instability surgery

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The aim of the study is to find out if there were any differences in surgical variables or anatomical result that could explain postoperative instability.

Patients and methods: Anatomical result after instability surgery with capsular shift and Bankart suture with anchors were studied clinically and by MR-artrography (a-MR). 7 unstable patients (4 new trauma, 3 overhead activity) and 7 patients that were subjectively and clinically stable 2 years postoperatively volunteered for a-MR examination. All initially had posttraumatic Bankart lesions and were operated on as above mentioned. 3 of the unstable shoulders are also reoperated and a-MR findings verified.

Results: In both groups there were 6 patients with good healing of the Bankart sutures. One unstable patient had a loose anchor (of 3) but healed Bankart lesion at reoperation and one of the stable shoulders had healing at least at the lowest anchor. 2 of the stable shoulders had cuff affections, one degenerative biceps and cuff rupture and one minimal cuff tear dorsally, and both subsequently redislocated after a-MR. No differences were found in size of Bankart lesion, number of anchors used to repair it, or external rotation.

Conclusion: Since all Bankart sutures seemed healed (even after new dislocation) the surgical repair of the Bankart lesion was successful. According to external rotation (mean 13° at surgery in both groups) the degree of the shift were the same.

Beside known factors as laxity, joint anatomy, overhead activities and new trauma the only differences found unfavorable are highly placed lesions and subsequently highly placed anchors and additional damage or degeneration of the cuff.

40b. Arthroplasty of the shoulder joint

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Arthroplasty of the shoulder joint is used on strict indications for treatment of rheumatic diseases and fractures. The first known shoulder arthroplasty was performed in 1893 by JE Péan. In 1950 Neer introduced the first modern prosthesis for the treatment of fractures.

Aims: This study is a consecutive, cross-sectional and partly prospective study of the shoulder arthroplasties per-

formed during 1990 through 1995 at Sahlgrenska University Hospital.

Patients and methods: 35 patients had undergone 41 shoulder arthroplasties. One patient was deceased, leaving 34 patients with 40 shoulder arthroplasties in the study. The indications were rheumatoid arthritis (RA) in 16 shoulders, osteoarthritis, (OA) in 2, fracture in 16, of which 10 were performed in the acute phase.

Results: The pre- and postoperative comparisons, possible in the RA/OA group, showed better ADL function postoperatively ($p<0.05$), decreased pain at rest ($p<0.01$), and at movement ($p<0.001$), better abduction and outward rotation $p<0.01$), and the Constant score improved postoperatively ($p<0.05$).

Comparison of the postoperative data, between the RA/OA and fracture groups, showed no major differences in pain, range of motion, except in outward rotation where the RA/OA group had greater range ($p<0.05$). The strength testing in 8 positions showed no difference between the groups, but the nonoperated shoulders were stronger ($p<0.05$–0.01). The Constant, UCLA and von Korff scales did not differ between the groups. The late operated fractures were less good, and the RA, especially OA patients best when measured by the Constant ($p<0.05$), UCLA ($p<0.05$), von Korff pain ($p<0.05$) and disability ($p<0.01$) scores.

Conclusion: Shoulder arthroplasty was a worthwhile procedure in the studied indications. In the RA/OA cases, all measured parameters showed some improvements.

43. Long-term results after realignement procedures in physiolysis of the hip

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The treatment of physiolysis of the hip depends on the degree of the slip and whether the slip is acute (symptomatic < 3 weeks and no radiographic evidence of remodeling) or chronic. In mild (slipping angle ≤ 30°) chronic physiolysis of the hip, the treatment of choice is fixation in situ. The treatment of moderate (slipping angle 31°–60°) and severe (slipping angle >60°) chronic slips is, however, controversial. Som authors advocate fixation in situ if it is technically possible, while other have recommended different realignment procedures.

We reviewed the long-term results after the treatment of physiolysis of the hip using realignment procedures in 36 patients (37 hips) at an average follow-up time of 34 (26–42) years. Serious short-term complications occured in 7 of the 22 hips treated with subcapital osteotomy, 3 of the 11 hips treated with intertrochanteric osteotomy and 3 of the 4 hips treated with manipulative reduction. At re-examination, the clinical and radiographic results were excellent or good in 9 of the hips treated with subcapital osteotomy, in 4 treated with intertrochanteric osteotomy and in none treated with manipulative reduction. In all, 7 hips had been operated on with arthrodesis or total hip replacement.

The natural history was probably not improved by any of the treatments used in this study. We therefore discourage the use of subcapital and intertrochanteric osteotomies as well as manipulative reduction in the primary treatment of chronic physiolysis of the hip.

44. Periacetabular osteotomy in the young arthrotic dysplastic hip

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Symptomatic osteoarthrosis of the hip in the young adult presents difficulties in treatment. These hips are often dysplastic and surgical options such as femoral osteotomy, arthrodesis and joint replacement have drawbacks concerning long-term results and functional outcome. We have therefore used the periacetabular osteotomy described by Ganz in this condition.

Patients and methods: We operated on 6 patients between 1994 and 1996. All patients had hip dysplasia with severe pain on walking and at rest. They were investigated with standard radiographic examination of the hip. In addition so called "faux profil"-projections according to Lequesne and CT scans with 3-D-reconstruction were performed. The acetabulum was freed completely by osteotomies through the ilium, the ischium and the pubis. The operative technique was in the first 4 patients as described by Ganz through a Smith-Petersen incision and in the last 2 patients modified by using an ilioinguinal incision for the complete procedure. Rotation of the acetabulum was done forward and laterally as indicated by the preoperative radiographic investigation. Postoperatively the patients were mobilized immediately with two crutches and partial weight bearing for 12 weeks.

Results: All patients healed their osteotomies. There was one postoperative complication. One patients had a slight loss of reduction discovered on radiographs at 6 weeks. The clinical result was not influenced by this. At follow-up after 6–18 months all 6 patients were pain free and walked without problems.

Conclusion: Periacetabular osteotomy in young patients with symptomatic hip dysplasia gives good pain relief and function provided preoperative radiographic investigation shows that concentric forward and laterally reduction of the acetabulum on the femoral head can be achieved.

45. High complication rate after trimalleolar fractures in patients with diabetes mellitus

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It is well known that in the treatment of trimalleolar fractures in patients with diabetes mellitus there are several complicating factors namely microangiopathy, osteopathy and neuropathy. So far very few studies with few patients and no definitive line of treatment have been published.

Patients and methods: 15 patients with a diagnosis of fracture of the ankle in combinaiton with diabetes mellitus were treated at the Karolinska Hospital during the years 1991 to 1995. Nine of these patients were found to have had trimalleolar fractures.

5 of those 9 patients were treated with closed reduction and plaster. 2 patients first had closed treatment but were later operated on. 2 patients had primary surgery with open reduction and internal fixation.

Results: Anatomical or near anatomical reduction was achieved in 4 out of the 9 patients. Redislocation occured in 2 patients. Infection, causing reoperation, occured in all patients who had been operated on. However, all 9 patients, no matter of the initial treatment experienced pain and showed limited range of motion at follow-up.

Conclusion: Our limited study indicates the difficulty in obtaining good results with either closed or open treatment. We have studied the results of the same subset of patients obtained at other hospitals in Stockholm. The data seem to confirm our results. To minimize the complication rate we suggest closed treatment with plaster and frequent radiographic controls. Weight bearing should not be allowed until radiographic signs of healing appear. This usually means a longer fixation period than six weeks. If surgery is necessary we suggest prolonged antibiotic prophylaxis.

46. Instability of the subtalar joint—results after surgical treatment

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Recurrent lateral instability is reported in approximately 10% of patients after ligament injuries to the ankle. The interest has been focused on subtalar instability during the last years, as a possible factor behind functional instability of the foot in some patients. Previous studies have described etiology, differential diagnosis, ligamentous anatomy and evaluation of talo-calcaneal instability. Few studies have reported on the results after surgical treatment for chronic subtalar instability and there is still a lack of definition of subtalar instability. The aim of this study was to propose a definition and to report on the results after surgical treatment with anatomical reconstruction.

Patients and methods: Subtalar instability was defined as chronic functional instability, where stress radiographs showed normal values for anterior talar translation (ATT), but increased values ($\geq 3°$) for talar tilt (TT), and talo-calcaneal instability ≥ 2 mm in the A-P view compared with the contralateral side. 22 patients fullfilled these criteria and were included in the study, 16 men and 6 women. The median age was 28 (20–42) years. In all patients an anatomic reconstruction was performed; the calcaneo-fibular, lateral talo-calcaneal and the cervical ligaments were imbricated and reinforced with the lateral root of the inferior extensor retinaculum. Post-operatively all patients were immobilized in a below-knee cast for 6 weeks. The minimum follow-up period was 2 years.

Results: The functional results were excellent or good in 18/22 and fair or poor in 4/22 of the patients. All 4 patients with nonsatisfactory results had chronic pain and 2 of them had residual instability. Surgical complications were seen in 3 patients with minor injuries to the lateral branch of the superficial peroneal nerve.

Conclusion: The prevalence of subtalar instability is probably low in patients suffering from chronic functional instability of the foot. The lack of a clear definition makes the differential diagnosis difficult. Anatomical reconstruction gave satisfactory functional results in 82% of our patients.

47. Excision of the radial head after fracture—a 13–33-year follow-up

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The purpose of this study was to describe the long time results after a radial head fracture followed by excision of the radial head.

Patients and methods: 41 cases treated with excision of the radial head due to radial head fracture with a mean follow-up of 19 (13–33) years after the injury were included. Old fractures were Mason type II in 32%, type III in 56% and type IV in 12%. 26 cases, 11 men with mean age 55 ± 10 and 15 women with mean age 70 ± 14 at the follow-up, were operated in conjunction with the injury - 15 cases, 8 men with mean age 59 ± 14 and 7 women with mean age 66 ± 20 had a late excision of the radial head at mean 2 years (1 month to 19 years) after the fracture.

Subjective, objective and radiographic findings were compared between the patient's two elbows and wrists.

Results: Subjective: 54% had no complaints, 44% had mild discomfort only seldom and then mainly when lifting heavy objects, 2% had severe daily discomfort in the former injured elbow. Objective: Flexion ($139° \pm 9°$ vs $140° \pm 8°$, $p<0.05$), extension ($-6° \pm 11°$ vs $-1° \pm 7°$, $p<0.05$) and supinaton ($79° \pm 18°$ vs $86° \pm 6°$, $p<0.05$) were less in the elbow

with radial head excision whereas valgus position (11° ± 6° vs 8° ± 5°, p<0.001) was greater.

Radiographs: There were more deformities in the former injured elbow (p<0.001) as compared with the uninjured. Nine cases (22%) had osteoarthrosis of the elbow. In the wrists there were higher degree of ulna plus (2.2 ± 2.0 vs 0.6 ± 1.2 mm, p<0.01) and osteoarthritis (p<0.001).

When comparing patients with early and late excision no difference was found in either subjective, objective or radiographic outcome.

Conclusion and discussion: Radial head fractures followed by excision of the head lead to a high degree of radiographic deformities in the elbow and in the wrist though usually not assisted with complaints. Late excision of the radial head lead to as good results as early excision.

48. Fractures of the olecranon—a minimum of 15 years' follow-up

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The aim of the present study was to investigate the long-term results of fractures of the olecranon.

Patients and methods: Patients with a fracture of the olecranon, treated at the Malmö University Hospital between 1969-79, were identified through our radiological archives. From a total of 315 cases, 98 still alive and living in Malmö were invited to a follow-up at mean 19 (15–25) years after the fracture. Two refused to participate, 77 answered a questionnaire and were clinically and radiographically examined whereas 19 patients only answered the questionnaire. 55 women, with a mean age of 46 ± 21 years and 41 men with mean age 28 ± 16 years at the time of the fracture, were included. The fractures were classified as undisplaced in 20%, displaced uncomminuted in 61% and displaced comminuted in 19%. The undisplaced fractures had been conservatively treated in all cases but two, seven of the displaced fractures were conservatively treated, the rest operated on. In 35 cases only a figure of 8-wire was used, in 32 cases Kirschner wires with tension band technique and in 5 cases other techniques were used.

Results: In patients with a former undisplaced fracture, 90% were without any discomfort or pain in the fractured elbow. The corresponding figures for displaced uncomminuted fractures were 83% and displaced comminuted fractures 83%. In patients with undisplaced fractures there was no difference in range of motion when comparing the injured and uninjured elbows. In both displaced uncomminuted and displaced comminuted fractures there was a significantly reduced extension in the earlier fractured elbows. There was also a significantly higher degree of degenerative changes in the fractured elbows as compared with the non-fractured. The highest rate was found in the elbows with a former displaced comminuted fracture.

Conclusion: The clinical outcome of olecranon fractures seems to be good even if the rate of radiographically degenerative changes is significant.

49. External fixation of unstable Colles' fractures in elderly patients

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In Helsingborg we frequently use an external fixation frame in the treatment of unstable, distal, radio-ulnar fractures either primarily or after redislocation in a plastercast. To analyse whether this method of treatment is optional for old people, we reexamined 26 patients, two years after they suffering a Colles' fracture treated with reduction and external fixation.

Patients and method: 26 patients, age 64 years (48-82) were examined. The radiographic anatomy of the fractured wrist, primarily and after healing, were analysed. The range of motion and gripstrength were measured and compared with their subjective functional status evaluated by a questionnaire. Their objective functional score was classified and used as a comparison of methods.

Results: Out of 26 patients, six healed in an excellent or good anatomical position. Two regained functional range of motion according to Sarmiento. Ten patients recovered less than half of the gripstrength of the uninjured hand. Twelwe patients suffered from poor wristfunction, confirmed by the score of objective function according to Gartland and Werley and to Lidström and Frykman.

Discussion: Two years after externally fixated, unstable, Colles' fractures, the radiographic and functional outcome in our study was inferior to that of previous studies. We suggest a detailed program of treatment based on a practical fracture classification.

50. Description of the hip fracture patients in Malmö, Sweden, comparing the 1980's and the 1990's

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Regarding the hip fracture patients in Malmö, we have previously described changes of incidence and characteristics from the 1950's up to the 1980's (1). We noticed an increase in incidence, mean age and also reduced health status.

Patients and method: During 1983–1985, 615 patients with hip fractures (1) were compared with 584 patients from 1994-1995 who were interviewed and described at the time of the fracture.

Results: When comparing the 1980's and 1990's, we found significant differences among the women regarding: increased mean age; higher proportion of women with an additional hip fracture and vision deficiency; less women with Parkinson's disease; reduced mean number of days in the orthopaedic ward and a higher proportion discharged to their own home, less patients staying in a nursing home and less home-aid and less need of a walking-aid at the time of the fracture during the 1990's. Regarding the men we found a drop in the mean number of days spent in our hospital and a reduction of the percentage of men with a history of alcohol abuse. Furthermore we noticed an increase in percentage of men with no home-aid before the fracture and an increase in additional diseases such as mental changes, diabetes mellitus and hearing deficiancy.

Conclusions: The patients with hip fracture in the 1950's (2) and in the 1980's was derived from a frail section of the urban population of Malmö. We also know the patients from the 1980's was older and more often had co-existing diseases compared to the 1950's. This report indicates that this course has been modified and altered during the 1990's, at least among women, in spite of a steadily increasing mean age of the patients since the 1980's.

References: 1) Sernbo. Hip fracture. Thesis. 1988.

2) Alffram. An epidemiologic study of cervical and trochanteric fractures of the femur in an urban population. Acta Orthop. Scand. Suppl. 65, 1964.

51. Incidence of hip fractures in Malmö, Sweden 1992–1995

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The incidence of hip fractures in Malmö has been subject for studies since 1924. A steady increase was seen from the beginning of the century until the 1980's. The aim of this study is to describe the incidence of hip fractures during 1992, 1993, 1994 and 1995.

Material: During 1992–1995, 2208 patients aged 50 and older with hip fractures were admitted to Malmö General Hospital, the only hospital in the city administering hip fractures. 76% were women with a mean age of 81 ± 8 years, and the mean age for men was 78 ± 9 years. 47% of the fractures were cervical.

Results: During 1992–1995, the annual incidence of hip fractures in men over 50 years and women over 50 were 36 and 83 respectively (per 10,000 inhabitants). The corresponding numbers for men over 80 years were 164 and for women over 80 years 287.

A time trend analysis with logistic regression based on results from 1950's to 1980's shows a significant decrease in hip fracture incidence in the 1990's.

The causes of such a trend-break could be successful information to the public concerning osteoporosis prevention, a healthier elderly population and/or the fact that a growing part of the population at risk already has two operated hips, due to previous fractures or arthrosis.

Incidence of hip fractures per 10.000 inhabitants in Malmö, Sweden

sex	age	50-61	67-68	74-75	83-84	1985	92-95
men	>50	15	18	21	33	39	36
men	>80	65	83	130	194	190	164
women	>50	30	40	42	74	83	83
women	>80	160	207	236	340	351	287

52. Transplantation of cultured, autologous nucleus pulposus-cells to the epidural space induces functional changes in adjacent nerve roots

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It was recently demonstrated experimentally that autologous nucleus pulposus can induce histologic and functional changes in spinal nerve roots when applied epidurally. The presence of active cells in the nucleus pulposus has been suggested to be responsible for inducing the nerve root injury. In the present study, cultured autologous nucleus pulposus cells (NP-cells) were transplanted into the epidural space to assess if cells alone, without the matrix, could induce functional changes in the adjacent nerve root. Autologous fibroblasts, dead NP-cells and fibroblasts, the culture medium, the medium in which the NP-cells was cultured (conditioned medium), nucleus pulposus frozen for 7 days, nucleus pulposus frozen for 7 days and with much of the matrix removed by digestion by collagenase and centrifugation, fat and normal nucleus pulposus were also included for controls. The totally 51 pigs that were included in this study were randomised to the different series. After the test substance had been applied to the sacrococcygeal cauda equina for 7 days, the nerve conduction velocity was measured in the nerve root within the application zone.

It was found that in the series where nucleus pulposus had been present there was a stastically significant reduction* of the conduction velocity as compared to control (fat), (ANOVA). Since the series with dead NP-cells induced similar reaction, it seems evident that the presence of nucleus pulposus-cell membranes are enough to injure the nerve roots. The data thus indicate that these cells may trigger specific cellular mechanisms which may have possible importance in the pathophysiology of sciatica.

Series	NCV m/s ± SD
Control (fat)	76 ± 11
Medium	64 ± 14
Conditioned medium	66 ± 11
Fibroblasts	65 ± 10
Dead Fibroblasts	73 ± 9
NP-cells	52 ± 14*
Dead NP-cells	55 ± 15*
Frozen NP	55 ± 18*
Matrix-reduced NP	51 ± 15*
Nucleus pulposus	45 ± 19*

53. Mechanical and biochemical injury of spinal nerve roots—experimental evaluation

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Compression may induce morphologic and neurophysiologic changes in nerve roots. Experimental epidural application of nucleus pulposus (NP) may induce similar changes. Changes in the concentration of substance P and VIP have been demonstrated in various spinal pain models. The aim of this study was to assess the relative importance of mechanical nerve root deformation and NP application for inducing nerve root injury and neuropeptide changes.

Methods: A total of 62 pigs, bw 25–30 kg, were used. In 28 pigs NP was harvested from the L2-L3 disc under general anaesthesia. The 1st sacral nerve roots (S1) were exposed bilaterally. In 19 pigs, NP was placed around the left S1 root and, in 5 of them, chronic compression of the same nerve root was also induced by application of an Ameroid constrictor, with a gradually decreasing inner-diameter of originally 3.5 mm, around the root. In 9 pigs the NP was not used. Instead, retroperitoneal fat (RF) was placed around the nerve root. In an additional 34 pigs, nerve conduction velocity (NCV) was determined by EMG-recordings after 1 (n=12) or 4 (n=10) weeks of chronic compression, using the same constrictor, and 1 week after NP application (n=5) or the combined application of NP and chronic compression (n=5). Substance P and VIP concentrations were measured by radioimmunoasays in nerve roots and dorsal root ganglia 1 (n=6) or 4 weeks (n=6) after constrictor application, 1 (n=5) or 4 (n=4) weeks after NP application and 1 (n=5) or 4 (n=4) weeks after RF application.

Results: A significant decrease of the NCV in compressed compared to non-compressed spinal nerve roots was found after both 1 and 4 weeks. Histologically, the constrictors induced nerve fiber damage, endoneural hyperemia, bleeding and inflammation at the compression zone. These changes could not be found after application of only NP. Substance P concentrations were significantly increased in the compressed dorsal root ganglia (DRG) at both 1and 4 weeks and in nerve roots after 1, but not after 4 weeks. The VIP levels were not significantly changed. There were no significant differences in substance P or VIP concentrations in the NP exposed nerve roots or DRG compared to control nerve roots and DRG, exposed to RF, after 1 or 4 weeks. There was a significant reduction of NCV for all exposed nerve roots when nucleus pulposus had been applied, but there were no statistically significant differences between the NCV following the combined application of NP and compression or NP alone.

Discussion: The NCV results indicate that the combination of NP and compression does not induce more pronounced changes, than does application of either NP or compression per se. The histological changes, judged by the parameters analyzed here, seem to be unduced predominantly by compression. However, according to previous studies, the NP-induced nerve injury seems to be located to the Schwann-cells and may not be visualised by light microscopy. Chronic compression, but not NP application, may induce an increase in Substance P concentrations in DRG and nerve roots.

54. The predictive value of psychometric analysis in patients treated by discectomy of the lumbar spine

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We have studied the predictive value of psychometric evaluation of patients who were operated on for lumbar disc herniation.

Patients and methods: 52 patients (14 women and 38 men) with a mean age of 40 years were treated by lumbar discectomy. After treatment patients were evaluated by an unbiased observer. Beck Depression Inventory, the State and Trait Anxiety Inventory, the Multidimensional Pain Inventory, and Patient Pain Drawing and a pain Visual Analogue Scale were used to assess pain and function before surgery, 3 and 24 months after surgery.

Results: Two years after surgery, 40 patients were satisfied with the surgical outcome and 12 patients were not. Before surgery, the discounted patients were more anxious ($p<0.01$), more depressed ($p<0.1$) and experienced more pain. The predictive value of the psychometric tests was between 70% and 88% depending on which combination of the tests were used.

Discussion: Our results indicate that the damaging effects of long-standing leg and back pain upon important aspects of life quality may be substantially and rapidly reversed by discectomy in 70% of the patients. It also shows that function analysis including psychometric methods is valuable in evaluating the outcome of discectomy.

Conclusion: Psychometric analysis before surgery is a useful tool to identify patients with a good and those with less favourable prognosis following lumbar discectomy.

55. Evaluation of two training programs after lumbar discectomy—a prospective, randomized and controlled study

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We have evaluated two training programs both of which started immediately after surgery.

Method: 30 patients (group A) followed an early active excercise program. The excercises focused on local edema reduction and stimulation of the gliding surfaces. Thirty patients (group B) followed a traditional, less active excercise program. Patients in both groups were examined 3, 6, 12 and 52 weeks after surgery by an unbiased observer. ROM in the lumbar spine was measured with a kyphometer, the hip flexion and SLR with a goniometer. Pain was analysed by a visual analog scale and patients pain drawing. Sick leave was documented. 92% of patients answered a questionnaire 24 (14–36) months after surgery.

Results: 3 weeks after surgery no patient in group A and 7 patients in group B had a positive SLR ($p<0.05$). 12 weeks after surgery the range of motion in the lumbar spine and flexion of the hip increased significantly in group A ($p<0.01$). Extension but not flexion in the lumbar spine was greater in group A at 1-year follow-up. More patients rated themselve symptomfree in group A at 1-year follow-up ($p<0.01$). At 1-year follow-up there was no significantly difference between the groups regarding sick leave duration, apperence of SLR or ROM in the hip. Pain intensity was not significantly different between the groups. No patient in group A and one patient in group B had a reoperation within the first year. In group A 88% and in group B 67% were satisfied with the result of the operation (n.s.).

Conclusion: We recommend the early active training program after lumbar discectomy.

56. Whiplash-associated disorders (WAD)—self-reported data on pain, disability and health-related quality of life—a descriptive pilot study

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The report of the Quebec task force on Whiplash Associated Disorders expresses the need of structured information in the management of clinical practice and research on whiplash-injuries. Standardized patient-reported information and brief assessment will enhance management, correlation of clinical studies and insurance judgements.

Material: A sample (n=67) of the ongoing major Folksam epidemiological whiplash study was randomly selected for an early (4–15 weeks post crash, mean 75 days) multidisciplinary intervention at an in-patient rehabilitation clinic. The patients were referred from the insurance company on the basis of insurance claim post crash and continuing disorder after four weeks.

Methods: The patients completed questionnaires with items on pain intensity (Visual Analogue Scales, VAS), disability (the Disability Rating Index, DRI) and health-related quality of life (the Global Self-rating Index, GSI) at admittance. These instruments are scientifically evaluated concerning reliability, validity and sensitivity for change. They are also brief and practical in clinical routine use.

Results: The sample included 39 males and 28 females with mean age 39 (19–64). Means of pain "now" was 60 (SD 22.3) and pain "at its worst last week" was 70 (SD 20.3). The mean disability (DRI; 0-100; zero is the best) was 37 (SD 17.6). The mean health-related quality of life (GSI; 0-10; zero is the best) was 3.4 (SD 2.36). Gender differences, correlation to clinical measurements and correlation to work-related neck disorders are discussed.

Conclusion: Brief questionnaires on pain, disability and health-related quality of life are suitable for use in the clinical routine and is essential for monitoring and better understanding the natural course of whiplash-associated disorders.

57. Inferior results of the PFC unicompartmental knee arthroplasty in medial gonarthrosis—a clinical and radiostereometric study

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The PFC unicompartmental knee arthroplasty was introduced in Sweden during the beginning of the 1990'ies. Compared to its predecessor (Brigham UNI knee) the instrumentation is more sophisticated and the articular surface of the tibial components is more conforming. In order to evaluate the results of this prosthesis and compare them with a conventional uni prosthesis, this study was initiated in patients with arthrosis stage I-III.

Patients and methods: 17 PFC unis were inserted between 1992 and 1994 by 4 surgeons and followed clinically (series I). Between 1994 and early 1996 another 10 PFC unis (series II) were inserted by 2 surgeons in a randomized RSA study comparing it to the Endo Schlitten uni prosthesis (10 knees). Mean age in the total PFC material was 68 years (9 men, 18 women). RSA was performed postoperatively, 3, 6 and 12 months postoperatively.

Results: In series I there was loosening of the tibial component in 3 knees and an nontraumatic medial tibial condylar fracture of the prosthesis knee in 1 patient. The fracture occurred within 3 weeks postoperatively, and the loosenings within 18 months. Further, 2 other knees were revised due to progressive arthrosis of the lateral compartment. In series II there were 2 tibial loosenings occuring within six months and 1 femoral component loosening occuring within 12 months. There were no infections in the total material.

In the RSA study, the PFC prostheses displayed magnitudes of migration 2 to 10 times larger than the Endo Schlit-

ten. Largest differences were found for subsidence and anterior rotation of the tibial components. Even when the 2 loose tibial components were excluded the migration was still 2 to 3 times larger in the PFC group. The mean Knee Society Knee Score was 61, 69 and 76 in the PFC group and 83, 89 and 96 in the Schlitten group at 3, 6, and 12 months postoperatively, respectively ($p<0.05$, Mann-Whitney U-test).

Discussion: 5 tibial loosenings, 1 femoral loosening and 1 atraumatic fracture of the medial tibial condyle in total 27 prosthesis corresponds to a revision rate of 26% within 2 years. RSA revealed much higher migration in the PFC group even when the revised cases were excluded. The predominant mode of migration was subsidence of the anterior part. The findings indicate either bad surgical technique or that there are deficiencies of the prosthetic design or of the instrumentation, or both. Thorough continuous monitoring of patients already operated with this prosthesis is recommended.

58. Quadriceps function after total knee arthroplasty—the anterior medial incision, subvastus- and midvastus techniques

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We have measured quadriceps function and time for hospital stay in patients who were operated on with total knee arthroplasty with the anterior medial incision or the subvastus/midvastus techniques.

Patients and methods: Function was analysed in 27 patients operated on with the AGC knee arthroplasty. The anterior medial incision was used in 18 patients (Group A), 70 (SD 6) years of age, and the subvastus or midvastus technique in 9 patients (Group B), 70 (SD 3.5) years. Quadriceps function was tested on the first day after surgery by active straight leg raise test. Knee flexion and extension torque were measured before and 4 months after surgery by a Kinetic Computerized ergometer. Postoperative bleeding was measured.

Results: None of the 18 patients in group A and 8 of 9 patients group B could perform the active straight leg rise test on the first day after surgery. Hospital stay was 12.8 (SD 2.2) days in group A and 9.8 (SD 2.2) days in group B ($p<0.05$). Postoperative bleeding was 653 (SD 430) and 325 (SD 240) mL in the groups (n.s.). Knee joint torque tested 4 months after surgery was not significantly different between groups.

Discussion: Quadriceps function in the early postoperative period was significantly better in patients operated on by the subvastus/midvastus techniques. This may have clinical significance because activation of these muscles is a powerful edema reducing mechanism, and because the early rehabilitation was easier for these patients.

59. Occupational factors and the development of knee arthrosis

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This study aimed to detect occupational activities important for the development of arthrosis of the knee, taking into account the confounding factors that were suspected or could be identified.

Method: In the archives of the department of Diagnostic Radiology in Malmö all weight bearing radiographs of patients with painful knee joints 1982–1986 were reassessed. We found 340 probands with arthrosis of the knee of at least grade 1 in the Ahlbäck classification. These probands and their age and sex matched controls (680) were analyzed by a validated questionnaire for details of their knee moment inducing activities at work over three 15 year periods as well as their history of knee injuries at work or in their leisure time.

Results: The questionnaire was answered by 266 (80%) probands and 463 controls (70%). For statistical analysis logistic regression was used. The relative risks of arthrosis were slightly increased (RR 1.7) in probands with heavy knee moment at work whereas knee injuries (meniscal and/or ligamentous) showed an increase up to RR 13.2. High knee moment without controlling for confounders gave a significantly (RR 2.3) increased risk. Overweight was in our investigation observed to increase the relative risk to 2.6. A sedentary profession had a protective value to the probands' knees (RR 0.4). The knee injuries (66) were, but for 9 probands, sustained in leisure activities, mainly soccer.

Conclusion: A goal for our investigation has been to improve control of actual knee moment in the probands work situations and of back ground factors of knee injuries and obesity. We thus conclude that work inducing high knee moments by itself significantly increases the risk to develop arthrosis of the knee. In addition life style factors—sport activities with knee injury and obesity—increases the risk many times.