

Mantoux test was confusing. We proceeded to respiration of the abscess for both diagnostic and therapeutic reasons. The product of aspiration was a typical TB fluid. Its nature was confirmed by cultures. The patient was started on anti-TB treatment and had a good final result.

Spinal TB complicated by femoral psoas abscess is rare nowadays. The course of the disease may be mild and diagnosis may be missing for a long time. Constitutional symptoms are not always present.

37. Surgical anatomy and pathology of the lumbar spine and sacrum—a videodisc exhibit

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New procedures in spinal surgery (percutaneous, micro, minimum invasion), new spinal fixation devices and the rapid advances in computed and magnetic resonance tomography (CT, MR) call for increasingly detailed knowledge of the complex relationships of the vertebral column to the neurovascular spinal elements for both surgical approaches and procedures, as well as for multiplanar diagnostic imaging reference.

Over a 10-year period, more than 80 cadaveric spines have been studied. Among these, 53 displayed pathological findings such as fractures, cancer metastases, degenerative conditions such as spondylosis and spondylarthrosis and a wide array of disc pathology. Apart from virtually all stages of internal disc disruption, nine subligamentous disc herniations were encountered. Five discs showed evidence of repetitive herniations: vascularized granulation tissue with arterioles sprouting into the clefts of the old ruptures. Several of these showed communication between the ventral internal venous plexus and the degenerative cavities in the discs. Five specimens with severe central and lateral spinal stenosis were studied in great detail and at submillimeter intervals.

Fifteen postsurgical specimens were examined. The surgical procedures had been performed to correct degenerative compressive conditions, segmental spinal instability and spinal metastases. They encompassed decompression, stabilization with segmental pedicle fixators, laminotomies, fat grafting and filling of the resection sites with autografts or bone cement. After extraction of the devices from the frozen specimens, the screw tracts were filled with coloured contrast. All specimens were examined on a CT scanner before cryosectioning, employing optimized high resolution scanning algorithms. More than 15,000 accurately registered overview and high magnification close-up images, patient and specimen CT scans and radiograms were transferred to an optimal laser videodisc.

Interactive electronic programs were designed for

instantaneous random access to all cases and individual images, allowing correlation of the in vivo and in vitro MR and CT scans with the anatomical images. Special tutorial lessons on surgical and diagnostic topics were also designed for each day of the meeting, including surgical standard approaches, percutaneous approaches, pedicle and sacrum screw insertion and entailed studies of a variety of lumbar cancer metastases. Specialized interactive lessons were also designed for self-paced viewing and self-assessment.

Hip arthroplasty

38. The effects of polymerization heat and toxicity from PMMA bone cement and the effects of a new MMA/DMA/IBMA bone cement

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In a paired study on canine tibial diaphysis the effects of polymerization heat were investigated by exposing the bone to curing PMMA bone cement within a monomer "tight" membrane compared to filling with "inert" bone wax (6 dogs, 4 week's observation). Toxicity of hot leaking monomer was studied by filling the bone with PMMA bone cement compared to filling with bone cement within a monomer "tight" membrane (9 dogs, 4 weeks observation). The effects of a new MMA/DMA/IBMA bone cement with lowered exotherm and less MMA leakage were tested against PMMA bone cement (6 dogs, 4 weeks observation and 2 dogs, 12 weeks observation) and filling with "inert" bone wax (6 dogs, 4 weeks observation). The parameters recorded were bone blood perfusion estimated by the microsphere technique, and bone remodelling estimated by ^{99m}Tc -MDP uptake.

Results: No effects of polymerization heat alone could be found. Exposure to hot leaking monomer, however, resulted in lower blood perfusion and decreased remodelling activity ($p < 0.03$). MMA/DMA/IBMA bone cement decreased blood perfusion less than standard PMMA bone cement ($p = 0.03$). ^{99m}Tc -MDP uptake were larger in 5/6 cases with MMA/DMA/IBMA bone cement (NS). Filling with MMA/DMA/IBMA bone cement compared to bone wax did not disclose any statistical differences.

Conclusion: Polymerization heat alone does not seem to have any significant effect on bone remodelling. Hot leaking monomer, however, inhibits bone remodelling severely. A new cement with lowered polymerization heat and toxicity, does not inhibit bone remodelling as much as standard PMMA bone cement.

39. Increased strength of PMMA by vacuum mixing, chilling and augmentation of mixing material

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Aseptic loosening of the bone-cement-implant complex is one of the most common causes of mechanical failure of TJR. Improvement in cement technique has led to better results, as has the introduction of newer types of PMMA, and experimental efforts are continuing with the aim of creating a "stronger" PMMA. Towards this end, favourable results have been reported from simply changing the methods of preparation of commercially available P.M.M.A.

Our experiments were designed to investigate the effect of 3 factors—vacuum mixing, chilling, and doubling the PMMA quantity—on its strength in compression. The load necessary for fracture was measured in 8 groups of cylindrical bars of CMW-1 standard viscosity cement, alternately combining the 3 factors until all 3 were applied.

Our results indicate that there was an augmentation of fracture strength as each factor was added, but that it reached a statistically significant (analysis of variance) increase of 17.5% only when all 3 modifications were applied.

Our results agree with those of previous investigators who have dealt with this subject, and we feel that these modifications of PMMA preparation should be universally adopted. One difference exists in the fact that a statistically significant increase was obtained only when all 3 factors were applied. This could be explained by the way our test bars were prepared in compression.

40. Interface mechanics and histomorphometric analysis of different types of bio-ceramics in canine bone

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Introduction: An experimental study was designed for histological and biomechanical evaluation of the interface between bone and three different bioceramic implants used in orthopedic surgery. A newly developed glass-ceramic by P_2O_5 , CaO , SiO_2 and Al_2O_3 , with a crystal phase composed of CaP_2O_6 - $AlPO_4$ - SiP_2O_7 , was compared with hydroxyapatite (HA) coated Ti-6Al-4V implants and porous tricalcium phosphate (TCP) implants.

Material and methods: A total of thirty implants were inserted in the femur condyle of fifteen adult golden retriever dogs of female sex weighing 20–25 kg and

followed for 12 weeks. The implants were examined by mechanical testing, histology, histomorphometry, micro-radiographic methods and EDAX analysis.

Results: The ultimate shearing strength of the HA-coated implants was significantly higher than in the glass-ceramic group. When these values were related to the histomorphometric measurements, the difference could be explained by the tissue-to-implant contact. The glass-ceramic was in direct contact only with nonmineralized, osteoid bone. The HA-coated implants, however, were well integrated into the bone. The study indicated that porous glass-ceramic containing $AlPO_4$ causes local osteomalacia and might not be suitable for clinical purposes.

41. Wear assessment in hip arthroplasty. Two retrospective methods compared with roentgen stereophotogrammetry

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Introduction: Wear of the polyethylene cup can affect the longterm result after hip arthroplasty. The accuracy of wear measurement on standard radiographs is not well known. We compared the accuracy of two methods with roentgen stereophotogrammetric analysis (RSA).

Material and methods: Thirteen patients (13 hips) were repeatedly examined with RSA and standard AP pelvic radiographs for 3 years. On the standard radiographs the wear of the cup was measured according to the Scheier-Sandel method (requiring just a pencil and a ruler) and to the EBRA method (requiring a digitizing table and a personal computer). The accuracy of RSA was evaluated by 36 double examinations, and the SD for error of measurement of wear (from zero, the expected mean difference within pairs) was determined. The accuracy of the Scheier-Sandel and of the EBRA methods was estimated as the mean difference (SD) from RSA.

Results: The SD was 0.084 mm along the transverse axis and 0.046 mm along the longitudinal axis for RSA. The mean difference (SD) was 0.14 (0.10) mm along the transverse axis and 0.20 (0.20) mm along the longitudinal axis for the Scheier-Sandel method. The mean difference (SD) was 0.13 (0.11) mm along the transverse axis and 0.10 (0.10) mm along the longitudinal axis for the EBRA method.

Conclusion: The EBRA method seems to provide the best accuracy for determining wear from conventional radiographs, probably due to the possibility of tilt analysis and of the exclusion of poor projections. The EBRA method is suitable for larger pro- and retrospective studies and the method also permits detection of early prosthetic migration (1).

Reference

1. Ilchmann T, Franzén H, Mjöberg B and Wingstrand H. Measurement accuracy in acetabular cup migration. A comparison of four radiographic methods versus roentgen stereophotogrammetry. *J Arthroplasty* 1992; 7(1): 1–7.

42. Histological findings in a case of cemented femoral revision treated by endosteal impaction grafting

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The long-term fate of the impacted cancellous allograft used in cemented THR revision surgery is unknown. Although the adaptive structural changes seen in radiographs suggest that at least part of the graft is replaced by viable bone, this has not been shown histologically.

This is a report on the histological findings in a femur retrieved from a patient who had a revision THR done 42 months previously, and in whom the endosteal grafting technique was used. At the time of revision surgery there were two large cortical defects in the femur; one caused by endosteal lysis and the other made by the surgeon in order to remove the distal cement. After the defects had been covered with wire mesh they were filled from the endosteal side with a cancellous allograft, and a cemented Exeter stem was then inserted. The patient regained excellent function. 3.5 years postoperatively he died from unrelated causes. Serial radiographs showed that the cortical defects gradually became filled with what appeared to be cortical bone. The femur was retrieved and fixed in formalin. Serial sections were cut transversely through the femur at the level of the previous defects, which were identified by the level of the wire mesh. Slab radiographs were obtained and histological sectioning was then performed. Undecalcified sections were cut at 5–8 microns and stained according to Goldner.

Results: The slab radiographs showed mineralized tissue in intimate contact with the cement and no radiolucent line. At one level the cement protruded through the femur between the graft and the original cortex, but otherwise the graft and the cortex were united. Histologically, what appeared in the radiographs as cortical bone corresponded to mineralized, viable bone with filled osteocyte lacunae and normal-looking bone marrow in the marrow spaces. Only scattered islands of dead bone were seen. The border zone between the bone and the cement was primarily made up of osteoid and multinucleated giant cells in direct contact with the cement surface. No instance of contact between fully mineralized bone and cement was noted. This zone of viable tissue was in direct continuity with dead bone trabeculae, probably entombed in the cement.

Conclusion: It is obvious that the allograft in this case had been replaced almost completely by viable bone, and this observation therefore offers hope for the future of femoral endosteal grafting.

43. Revision arthroplasty with an isoelastic cementless femoral stem

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The series comprises 101 revision arthroplasties with an uncemented isoelastic femoral stem (Mathys) performed on 91 consecutive patients (55 women, 36 men) with a mean age of 65 (30–84) years. The follow-up time was at least 3 years in patients without further revisions.

The indications for the reoperation were loosening in 71, infection in 15, fracture in 13, instability in one and a technical error in one case. The prostheses used in prerevision operations were Christiansen in 30, Müller in 23, Mathys isoelastic in 16, Exeter in 5, Lubinus in 5 and other types in 9 cases. 16 patients had had the prosthesis removed before the operation. The revision concerned was the second operation in 58, third in 27, fourth in 11 and fifth in 5 cases.

In many cases the quality of bone was poor and there were frequently fractures and defects in the proximal end of the femur. The isoelastic femoral stem is large enough to fill well the medullary cavity and still allowing bone grafting and rotational stabilizing. Osteosyntheses with screws, plates and cerclages were performed. The radiological survey revealed some migrations, which in most cases occurred during the first three months.

The early postoperative complications included 5 massive postoperative hemorrhages, 5 deep vein thromboses, 4 deep infections and 6 dislocations of the prosthesis. Later on 4 more infections, 8 loosening and 3 dislocations were observed. A new revision had been performed during the survey in 14 patients mostly due to infections or loosening.

The clinical outcome was favourable in most cases. Noteworthy was, that the functional status of the revised hip could not be assessed in 39 patients due to general disease or diseases of other joints.

The isoelastic femoral stem is an option in revision arthroplasty. The plasticity of the stem is an advantage in operations and in recovery—it seems to promote bone healing.

44. Repair of defects in the proximal end of the femur using allograft/prosthesis or megaprosthesis

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Introduction: Loss of bone in the proximal end of the femur is a common sequela to repeated hip arthroplasties. In addition, resection of bone for treating bone tumors and bone metastasis require a method to rebuild the skeleton.

Methods: In our department we have used 2 methods for this purpose: 1. Replacing the lost bone in the femur by an allograft. The allograft is plated to the host bone, and a cemented hip prosthesis is inserted in the allograft (allo group 10 patients).

2. Replacement by a modular tumor prosthesis (Kotz). Remaining bone is wrapped around the prosthesis (Kotz group, 9 patients). The selection of method was partly based on availability of allografts; in cases with recent infection we have chosen the megaprosthesis. All patients were followed prospectively, and data concerning operation, complications and function recorded at each visit according to the Musculoskeletal Tumor Society's system.

Results: The observation time in the Kotz group was mean 20.5 (2–48) months and in the allo group 19.4 (2–42).

Complications: In the allo group there was 1 infection, in the Kotz group 2, both prostheses were implanted in an infected area. One dislocation occurred in each group, one required open reduction. Two deep thromboses occurred, one in each group.

	Kotz	Allo
Mobility (degrees, mean values)		
Flex	100	86
Abd	30	26
Add	15	15
Rot. in	31	26
Rot. out	36	21
Total	198	184
Stability		
Excellent	2	6
Good	4	2
Fair	0	1
Poor	3	0
Pain		
Excellent	7	5
Good	0	3
Fair	0	1
Poor	2	1

Conclusion: The groups are small, and the observation time is short, and conclusions must be guarded. The stability in the allo group may be a little better than in the Kotz group. The only patients in the Kotz group with pain were the infected, and pain relief was good or excellent in patients without complications. The mobility was slightly better in the Kotz group. The methods seem so far to be fairly equivalent. The durability of the reconstruction may probably be better with an allograft.

45. Acetabular revision with a hydroxyapatite coated screw cup

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Introduction: Long time results after cemented revisions of loose acetabular prostheses are inferior to the results after primary total hip replacements. From 1989 we have routinely used a hydroxyapatite-coated screw cup (Landos corail) in revisions of loose acetabular prostheses.

Material and methods: The series consists of 42 patients, 31 women and 11 men, mean age 64 years (20–83). 4 hips had one or multiple revisions before the index operation, in 38 hips the index operation was the first revision. 26 of the removed prostheses were cemented (14 Müller/Landos, 3 Christiansen, 9 ICLH) and 16 were cementfree (15 polyethylene Endler and 1 PCA). Loose femoral components were exchanged simultaneously in 33 patients (15 femoral stems and 17 double cups). Allogene or autogene bone transplantation or a combination of both were carried out in 11, 9 and 3 hips, respectively. The patients were followed clinically and radiographically 4 months, 1 year and 2 years postoperatively with a mean follow-up of 1.7 years.

Results: 1 patient had a sciatic nerve palsy and another died postoperatively of cerebral embolism. The mean pain score (d'Aubigné/Postel) increased from 2.7 preoperatively to 5.6 and 5.7, respectively, after 1 and 2 years postoperatively. In one patient the acetabular prosthesis migrated 2 mm medially between the third week and the fourth month examinations. At the follow-up 1 and 2 years after the operation the prosthesis was stable and the patient pain-free. In the remaining 40 hips the prostheses were radiologically stable. In the cases with bone transplantation the grafts had healed and remodelling of the bone around the prostheses had occurred. No radiolucent lines were seen.

Conclusion: Clinical and radiographic results with this hydroxyapatite coated prostheses are very promising after 1 and 2 years follow-up.

46. Lymphocyte response to polymethyl-metacrylate in total hip prosthesis with aseptic loosening

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An interface bone-cement membrane resembling the synovial and rich in macrophages seems to be responsible for the loosening of prosthetic components after hip arthroplasty. If this membrane represents the immunological response of bone to the toxic effect of cement has not yet

been confirmed. We studied the lymphocyte-mediated immune response to polymethylmetacrylate bone cement (PMM) in patients who underwent revision surgery because of aseptic loosening after total hip prosthesis. The purpose of this study was to offer further information concerning the immunological response to PMM by investigating different lymphocytes clusters in blood samples using monoclonal antibodies.

Patients and methods: A series of 30 consecutive patients who underwent revision surgery because of painful aseptic loosening were subjected to a set of immunological studies. The average time between the first hip arthroplasty and the revision surgery was 8 (1–17) years. There were 17 women and 13 men with a mean age at the time of the first arthroplasty of 59 (17–73) years. Nine further patients with unilateral cemented total hip arthroplasty followed over an average period of 10 (6–12) years and showing neither clinical nor radiological signs of aseptic loosening were also immunologically assessed for comparison. There were 5 women and 4 men with a mean age of 57 years at the time of hip arthroplasty (36–72). Among patients with aseptic loosening, 18 patients exhibited the aggressive granulomatous type as judged by radiographs. The 12 remaining patients showed a simple loosening characterized by a regular radiolucent area around the femoral stem. Immunological studies included patch test against PMM, lymphoblast transformation test (LTT) and analysis of the phenotype of B and T lymphocytes and monocytic.

Results: Epicutaneous test against PMM was positive in 14 of the 30 patients with aseptic loosening. LTT induced by PMM was found to be 5-fold higher in patients with aseptic loosening than in the controls ($p=0.02$). Patients with loose hip arthroplasty presenting positive epicutaneous test disclosed higher LTT values than those found in patients with a negative skin reaction ($p=0.008$). In patients without prosthetic loosening, spontaneous lymphoblast transformation was not stimulated by PMM. Regarding lymphocytic phenotype, CD 2, CD 22 and CD 25 lymphocytes showed a statistically significant increase in patients with loose hip prosthesis compared with the control group ($p=0.002$, 0.04, and 0.02, respectively). In patients with aseptic loosening, there was a close correlation between the detected amount of CD 25 lymphocytes and the severity of the lymphoblast transformation induced by PMM ($p=0.0001$). Statistically significant higher amounts of interleukine-2 receptor-positive T lymphocyte, CD 25, were found in patients with positive epicutaneous test ($p<0.001$). The type of aseptic loosening, simple- linear or aggressive granulomatous, was not under the influence of any particular characteristic immune response.

Conclusion: Our results indicate that the lymphocyte-mediated immune response is activated in patients with aseptic loosening of cemented total hip prosthesis. The high rate of lymphoblast transformation given by PMM indicates that only this substance and not the bone-cement stabilizers acts as allergen. Preoperative tests to determine those patients at risk of presenting an unfavourable immunological response to PMM and their possible treatment with immunoregulator drugs deserve further studies.

47. Increased intracapsular pressure in osteoarthritis of the hip

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Introduction: The origin of pain and reduced Range Of Motion (ROM) in coxarthrosis is still unclear. In several disorders of the hip such as transient synovitis, septic arthritis, juvenile chronic arthritis and hemophilia it has been shown that an increase in the volume of intracapsular fluid causes pain and a restricted ROM. It has been suggested by several authors that clinical symptoms in coxarthrosis are a consequence of an increased intraosseous pressure in the head and neck of femur. In this study we compared the intracapsular pressure in 18 patients scheduled for hip surgery due to coxarthrosis to pre-operative pain on a Visual Analog Scale (VAS) and ROM.

Patients and methods: We studied 17 consecutive patients (18 hips) with clinical symptoms and radiographical findings of moderate or severe coxarthrosis. 10 were men (11 hips). The mean age was 70 (46–83) years. Preoperatively the patients were questioned about their pain in the affected hip on a VAS, and the ROM were registered. Pressure recordings were performed on the operating table immediately before surgery using a 0.8 mm cannula inserted into the hip percutaneously with the patient supine on the table. The cannula was connected via saline filled pressure tubing to a piezo-electric pressure transducer, i.e. the recording system was nonvolume consuming. Following pressure registration an attempt to aspirate joint fluid was performed.

Results: We found generally increased intracapsular pressure in the patients. In extended position and neutral rotation the pressure was 50 (0–180) mm, in 45° flexion and neutral rotation 21 (0–60) mm, in extension and internal rotation 106 (53–330) mm and in extension and external rotation 41 (-1–100) mm. The pain score on the VAS was significantly correlated with the pressure in the hip in extended position (neutral rotation) and in neutral position (45° flexion). However, no correlation was found between ROM and intracapsular pressure.

Conclusions: We found a correlation between intracapsular pressure and pain in coxarthrosis. This correlation has been noted in several other diseases of the hip where a reduced ROM is a part of the clinical pattern. The lack of significant correlation between ROM and intracapsular pressure can be explained by contracture of the soft tissues due to long standing disease. We suggest that pathologically increased pressure is a significant pain-contributing factor in our patients, subsequently causing joint contracture and reduced ROM.

48. Experience with surgical resection of heterotopic bone of the hip

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Massive heterotopic ossification (HO) may occur after hip replacement or trauma with sometimes severe loss of function. In high-risk groups (recurrent joint replacement, acetabular fractures, severe head injury) irradiation and non-steroidal anti-inflammatory drugs reduce the incidence and extent of this complication. If massive HO still occurs, surgery is an effective therapy to restore function.

Between 1980 and 1989, 45 hips in 43 patients (30 men and 13 women) with severe loss of function were operated on. The mean age at the time of the first operation was 36 (13-75) years. The etiology included 11 joint replacements, 5 recurrent joint replacements, 8 acetabular fractures, 3 complex pelvic fractures, 2 osteotomies, 2 patients post intramedullary nailing for fractures of the femur, 7 severe head injuries, and 5 patients who received long-term respirator therapy.

The average preoperative range of motion (ROM) was 24° (0°-47°). HO was graded according to Brooker. There were 19 Class III and 26 Class IV ossifications. The mean interval between the first operation and the resection of the ectopic bone formation was 18 months.

According to location of the HO standard approaches to the hip were used. Previous surgery was considered, and often two separate approaches were necessary. In cases of severe posttraumatic arthrosis or avascular necrosis a total joint replacement was immediately implanted after HO removal. Radiation, indomethacin, and early functional treatment following resection were administered for prophylaxis.

The time interval between resection and final follow-up averaged 39 months. On average the postoperative range of motion was 80° (50°-120°). 41 of 45 cases regained functional restitution, 4 cases had a ROM <70°. Complications included two wound sinus, one late infection, one sciatic nerve palsy, one peroneal nerve palsy, one acetabular injury, one avascular necrosis of the femoral head and three recurrences.

Surgical therapy of HO is an appropriate method to restore function in those cases, in which the initial prophylaxis had not prevented a severe formation of ectopic bone.

49. Femoral cortical hypertrophy after hybrid hip replacement

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The clinical and radiographic features of femoral cortical hypertrophy occurring after hybrid hip arthroplasty were studied in 18 patients and compared with a randomly selected control group with the same arthroplasty without hypertrophy.

Both groups were evenly matched for sex, weight, Charnley functional class and for period of follow-up (mean 3.5 years). Patients with femoral hypertrophy were significantly younger than the controls ($p=0.03$) and had a higher Harris hip score ($p=0.02$). The cement mantle was significantly thinner and calcar resorption significantly more extensive in patients with femoral hypertrophy ($p<0.001$).

The combination of marked cortical hypertrophy and calcar resorption suggests abnormal loading and stress shielding. These features may be predictive of early stem failure. Our results highlight the importance of the cement mantle in the normal distribution of stresses following hip arthroplasty.

50. Early and late dislocations in primary Exeter hip arthroplasty

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Several factors have been described as responsible for dislocations after hip arthroplasty. The dislocations may occur in the immediate postoperative period as well as later on. This retrospective study intends to analyse the importance of general factors and of mal-positioning of components.

Material and methods: Dislocations were observed in 37/775 hips operated on with Exeter hip arthroplasty September 1983–October 1991. Seventeen patients were women and 19 were men. One man had bilateral dislocations. The medical records were reviewed concerning age, sex, general medical condition, the type of trauma, the time of the first dislocation and the number of dislocations. The lateral- and anteversion of the acetabular cup and the anteversion of the femoral stem were measured on standard radiograms of the pelvis and hip.

Results: Dislocations occurred in 3.6% in primary arthrosis, in 8.0% in arthritis and 10.8% after failed hip fractures. Three hips with anterior and 19 with posterior dislocations were judged as early dislocations (<6 weeks postoperatively). The first dislocation occurred 14 (1–30) days postoperatively. Late posterior dislocations were

observed in 15 hips, none had anterior dislocation. The time for the first dislocation in this group was 12 (3–48) months. The age at operation in patients with anterior dislocation was 67 (66–69) years. In patients with posterior dislocations the mean age at operation was 74 (56–87) in the early group compared to 65 (41–76) years in the group of late dislocations. In early posterior dislocations retroversion ($>5^\circ$) of the cup was the major reason (12/19) and general medical factors were the causes in 8 hips. In late dislocations increased lateral version ($>45^\circ$) of the cup was observed in 10/15 hips and general factors were contributing in 5. In hips with 1–2 dislocations, retroversion of the cup (11/23) or general factors (9/23) were the main causes. In hips with >2 dislocations an increased lateral version of the cup (9/11) in combination with either general factors (3/9) or retroversion of the cup (4/9) were observed.

Conclusions: The debut of dislocations was mainly depending on the age of the patient, general factors as muscular weakness, trauma, confusion or malpositioning of the cup; in early dislocations a retroverted cup and in late dislocations a steep cup. An uncritical use of the cup introducer without making sure that the patient was correctly placed on the operating table seemed to explain the malpositioning of the cup. In the dislocating hips a steep cup in combination with retroversion or general factors increased the instability.

51. Early failures of cemented and uncemented total hip prostheses—the Norwegian National register for Joint Replacements

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Introduction: Uncemented components have become more common in the last years, but have so far not been proven to be better than cemented.

Patients and methods: Time to revision was studied for 15,094 primary total hip replacements (THR) observed for 0–3.5 years. The failure percentage was estimated with the Kaplan-Meier method. Differences in failure were tested with the log rank test.

Results: After 2.5 years, 5% of THRs with both components uncemented had been revised as compared with 1% of the cemented (both components) ($p < 0.0001$). The difference was less when analysis was restricted to the acetabular components; failure was less than 2% in both groups. Failure rate was 5% for uncemented femoral components and 1% for cemented ($p < 0.0001$). Outcome of the Cox' proportional hazard analysis was significantly worse results for the uncemented prostheses also after adjustment for age, sex, and diagnosis.

Conclusion: Uncemented hip prostheses had a significantly higher rate of early failure than cemented.

52. Induced protrusio acetabuli as an effective method of deepening the dysplastic or hypoplastic acetabulum for the implantation of a cementless prosthetic cup.

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We review the results of the implantation of cementless titanium and ceramic acetabular components in 98 congenital dislocated hips in 89 patients operated on between 1985 and 1992. The average age of the patients was 45 (31–61) years and the majority (90%) were women.

Insufficiency in the depth of the dysplastic or hypoplastic acetabulum was treated effectively by a partial (half circle) osteotomy and ventral advancement of the bottom (induced protrusio acetabuli) in order to achieve enough cover for the prosthesis. In 29 hips, a supplementary bone graft taken from the extracted femoral head was internally fixed to complete the acetabular roof.

The osteotomy of the acetabular bottom created a good covering for the cup but also helped in placing it in the proper anatomical position (40° – 50° inclination). There were no serious local or general complications during or after the operations.

A period of 2–4 months was necessary for the consolidation of the osteotomy, the creation of a new stable acetabular bottom and the bony integration of the prosthesis. Over an average follow-up time of 46 months, all 98 hips were stable and well-functioning with no radiological sign of loosening. A further advancement of 2–4 mm of the cup was noticed in 27 hips, but with good stability achieved even in this deeper position.

This method of induced protrusio is simple and easy, but requires very good and detailed preoperative study, experience with the prosthesis and perfect surgical technique.

53. Femoral component fixation in total hip arthroplasty

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Porous implants rely on mechanical stability and close contact to bone for ingrowth. The early stability of these

components has not been studied *in vivo* using high resolution techniques. The purpose of the present study was to measure the early fixation of cemented, porous and HA coated femoral prostheses using roentgen stereophotogrammetric analysis (RSA).

Patients and methods: The patients were stratified into three groups based on gender, age, weight, presence of primary or secondary coxarthrosis, and radiographic bone quality. In total 62 hips entered the study, 40 in Umeå och 22 in Gothenburg. Nine hips were lost mainly due to poor quality of stereoradiographs leaving 53 hips to be evaluated. All patients received a straight stem femoral prosthesis of the same basic design and a cementless press-fit acetabular cup fixed with screws. The cementless prostheses were coated proximally with titanium beads or HA. RSA examinations were done within 10 days after operation, after 2, 6, and 12 months.

Results: The distal part of the prosthesis was the most unstable regardless of method of fixation. The cemented group displayed the smallest micromotions. Ante-retroversion and prosthetic tip movements were more pronounced in the cementless groups. The porous group also had more varus-valgus tilting. The HA group had lower total hip scores than the cemented mainly because of a combination of decreased walking capacity and thigh pain or discomfort.

Conclusions: Increased postoperative micromovements in the cementless groups may be caused by too small prosthesis-bone contact area. Increasing the coating area might improve the fixation, but may also increase the risk of stress-shielding.

54. Migration of titanium alloy and hydroxyapatite coated femoral components in total hip arthroplasty

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Introduction: Experimental studies on stable unloaded implants have repeatedly documented an osteoconductive effect of hydroxyapatite (HA) coating. Recent studies on loaded and initially unstable implants have confirmed the positive effect of HA coating even in the presence of a motion-induced fibrous membrane around the implant. The purpose of the present study was to evaluate the effect of HA coating on femoral stem migration in the clinical situation.

Material and methods: 27 patients undergoing 28 primary noncemented total hip arthroplasty (THA) were randomly allocated to receive prosthetic components with a plasma sprayed titanium alloy (Ti) coating (n=13) or

hydroxyapatite (HA) coating (n=15) with a collar-less straight stem (Biomet). The femoral components were prepared for roentgen stereophotogrammetric analysis (RSA) by 3 tantalum markers. During surgery 4–6 tantalum markers were inserted into the femoral metaphysis. The patients were allowed protected weight bearing (15 kg) for the first 6 postoperative weeks. Radiographs were obtained postoperatively, and at 3, 6, and 12 months for assessment of migration of the femoral component using RSA. Eleven patients with 11 THA:s were excluded because of technical errors with RSA. One patient died of unrelated reasons. Thus, 15 patients with 15 THA:s, 7 with HA (3 women and 4 men), and 8 with Ti coating (5 women and 3 men) were followed. Mean age at time of operation was 57 (50–65) years

Results: All femoral components had migrated at 3 months (Figure 1). From 3 to 12 months, migration of Ti coated components continued whereas HA coated components had stabilized at 3 months. At 12 months the difference in migration (MTPM) was statistically significant ($p<0.05$). Other parameters from RSA (subsidence, rotation) showed the same trends but no significant differences. Maximum subsidence was 0.2 mm in both groups. Harris hip score and visual analogue scale score was superior in the HA-coated group.

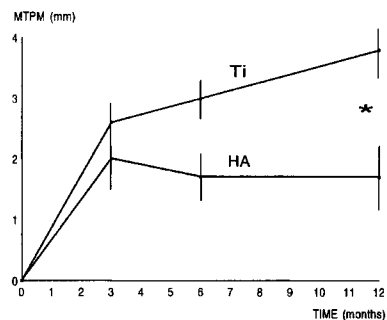


Figure 1. Migration of 8 titanium and 7 hydroxyapatite coated femoral components. * $p<0.05$

Discussion: The results of the present study suggest that HA coating enhances the secondary fixation of the femoral component in THA as compared with Ti porous coating since HA coating inhibited migration of femoral components after 3 months. The improved fixation seems to be mirrored in the superior clinical outcome in the HA-coated group. Our previous experimental studies on HA-coated implants subjected to micromovements in a range corresponding to the clinical situation resulted in membrane formation consisting of fibrocartilage around HA-coated implants whereas fibrous connective tissue was found around Ti-implants after 4 weeks. After 4 months, however, the fibrocartilaginous membrane around HA-coated implants was replaced by bone in contrast to Ti-coated implants where a fibrous membrane was still present after 4 months. These results seem to be comparable with the present study where both Ti and HA-coated femoral components were demonstrated to migrate in the initial

postoperative period. After 3 months, however, migration of Ti-coated components continued whereas HA-coated components had stabilized. These findings suggest that both types of prosthesis initially were surrounded by a fibrous membrane which later was replaced by bone around the HA-coated prostheses whereas a fibrous tissue membrane was still present around Ti-coated components.

Biomet. Inc. kindly supplied the prostheses used in this study.

55. Femoral bone remodelling after THR—a comparison between HA-coated, sand-blasted and cemented stems

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THR creates biomechanical changes in the femur including redistribution and concentration of stress. Both cemented and uncemented stems have a stiffness that exceeds that of the femoral bone. Prosthetic designs and surface texture are factors that influence the adaptive bone response.

Material and methods: We have studied radiographically the bone atrophy due to stress shielding, the distal cortical hypertrophy and the radiolucencies developed around 68 Landos corail HA-coated femoral stems, 60 Zweymüller sandblasted titanium stems and 59 Landos cemented stems 4 months, 1 year and 2 years after implantation using the 3-week radiograph as reference. All prostheses were asymptomatic and considered well-bonded radiographically.

Results: No statistical significant difference in proximal bone atrophy between the 3 types of implants were seen. Distal cortical hypertrophy and proximal radiolucent lines were apparent in 57% and 45%, respectively, of the hips with sandblasted prostheses. Around the cemented prostheses distal cortical hypertrophy was seen in one hip. None of the HA-coated prostheses developed distal cortical hypertrophy. Radiolucent lines were not observed around the cemented and HA-coated prostheses.

Conclusion: The bone changes around an entire HA-coated femoral stem are similar to those around a cemented stem. The stress transfer around the HA-coated stems seems to be more evenly distributed than around the sandblasted stems.

56. Clinical results of an HA-coated THR

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The clinical results of uncemented THR have been reported inferior to the results of cemented prostheses. A relative high rate of early revisions of uncemented THR has been demonstrated in several studies. Application of hydroxyapatite on titanium by plasmaspraying provides the orthopedic surgeon with an osteoconductive implant. Several experimental studies have shown the superiority of HA to other coatings, but the clinical experience with HA-coated hip prostheses is still limited.

Patients and methods: In January 1989, the HA-coated Landos corail THR was adopted in our department. The acetabular component is a hemispheric screw cup with PE-inlay. The femoral component is modular and HA-coated on its entire stem. Until January 1990, 68 coxarthrosis hips were replaced with this prosthesis. There were 54 women and 14 men and their mean age was 59.8 (35–70 years). There was a 3-month postoperative nonweight-bearing period.

Results: No major operative and postoperative complications occurred. One patient with 2 operated hips died during the follow-up period of causes unrelated to surgery. The remaining 66 hips were controlled 4 months, 1 year and 2 years after implantation. No revisions have been performed, and no prosthetic component has been considered loose radiographically. The clinical results were graded according to Merle d'Aubigne/Postel. The mean scores for pain after 4 months, 1 year and 2 years were 5.9, 6.0 and 6.0, respectively, and the scores for walking ability were 5.7, 5.9, and 5.9, respectively. No patient suffered from thigh pain.

Conclusion: The clinical 2-year results of this entirely HA-coated prosthesis are excellent.

57. Early clinical and scintigraphic results in noncemented hydroxy-apatite coated ABG-hips

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Introduction: To secure a reliable long term good result of a THP, the function and behaviour of the implant-bone interface will be crucial. It is either bonded, loose or a combination of both. Until now only few data are available about the process of ingrowth of hydroxy-apatite coated (HAC) implants. Because bone metabolism plays an essential role in this process, patients were not only

followed-up by serial radiographs, but also by bone radiosintigraphy.

Patients and methods: Between June 1990 and February 1992, 100 primary THP with noncemented HAC ABG system were implanted in 87 patients. Mean age of the patients was 63.5 yrs. Some technical problems were encountered in the first 20 hips: dislocation (2x), 2x deep infections, which healed completely by immediate débridement and Gentamycine loaded cement chains. All patients were included in a prospective follow-up study. Before and after surgery, each patient was evaluated using the Merle d'Aubigné score. Radiograms were evaluated using Gruen zones for endosteal bone formation, calcar atrophy, bone resorption, subsidence, reactive line formation around HA-coated and noncoated parts of the stem, interface deterioration and ectopic bone formation according to Brooker's classification. 25 patients were prospectively studied with 3 phase bone scanning at 1, 3, 6 and 12 months postoperatively.

Clinical results: The clinical outcome from the first 50 patients at 3 months was good (22x) and excellent (28x) with improvement to (5x) good and excellent at 6 months. One dislocation was treated by closed reduction while the other dislocation was treated with a hooded cup and a longer neck. 14 of the 50 patients showed a calcar rounding off at 6 months. There were 30 patients with more than one year follow-up (25x excellent and 5x good), inclusive the 2 dislocations and 2 infection cases. Radiographically, there was a reactive line at the tip of the stem in 26/30 patients. No patient showed any reactive line around the HAC portion of the stem and acetabular cup. According to Engh's criteria (1) there was complete osseointegration of both components in all patients from the very beginning.

Scintigraphic results: The perfusion phase was normal in 100% at 6 months while the bone phase showed slower decrease of uptake ratios in the HAC regions, pointing to more prolonged osteoblastic activity.

Reference

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58. Prevention of pulmonary embolism by oral anticoagulation after total hip arthroplasty

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Thromboembolic episodes are still claiming lives following total hip arthroplasty. Many forms of prevention have been reported, with varying degrees of success: low dose heparin,

mechanical measures, antimalaria drugs, high molecular solutions, antiplatelet drugs, low molecular heparin and oral anticoagulation drugs, to name but a few. The aim of the majority was to prevent venous thrombosis, and that was verified by costly and sometimes dangerous methods, such as venography, radionuclide venography and thrombo-scintiscans and ultrasonography.

We applied the use of oral anticoagulants (Sintrom) in a consecutive series of THA performed by two surgeons. No patient was exempted, regardless of predisposing factors for VT, even if PE was present in the patient's history. A total of 176 THA procedures were performed in 157 patients, 128 women and 29 men, with ages ranging from 20 to 80 years (mean 60).

The patient was started with a loading dose of 4mg Acenocoumarol a day usually for 2 days, starting from the first PO day. Prothrombin time was examined and the dose was regulated at 1.2-1.5 of control with a 7-10 days check for 3 months. Where clinically suspected VT was present venography was performed, but no alteration was made in the form of treatment, regardless of the result. If the patient showed any signs suggesting PE, regardless of severity, blood gases were counted repeatedly and if pO₂ was found below 85% then perfusion/hematisis lung scan was performed.

Our investigations detected no PE in any case. There were 5 cases that had clinical suspicion, all within a week of operation, and in 3, lung scans were performed but were all negative. We had only one case of wound hematoma, in a patient who inadvertently took a triple dose of the drug, which was absorbed without an operation. There was also a suspected case of GI bleeding which resolved without discontinuation of treatment.

We believe that this method of PE prophylaxis is very effective and safe, due to the low prothrombin time that is sufficient for adequate protection. The duration of three months covers the dangerous period of post-THR PE. The method is very cost effective, since no monitoring of VT is necessary, and the only disadvantages are the fact that the collaboration of the patient and some kind of anticoagulation clinic are required.

59. The value of low molecular weight Heparines in hip and knee joint arthroplasties

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During the past year (1991) we studied 141 patients, divided into three groups according to the kind of disease, the type of low molecular weight Heparin and the kind of anesthesia used.

The first group consisted of 74 patients suffering from hip osteoarthritis, 21 with knee osteoarthritis and 46 with femoral neck fracture.

The second group contained 100 patients who were treated with FRAXIPARINE® and 40 who were treated with CLEXANE®.

The third group consisted of 95 patients who were operated on under epidural anesthesia and 56 operated on under general anesthesia.

Of the total of 141 patients, 98 underwent total arthroplasty (hip or knee joint) and 43 patients had partial hip replacement. Phlebography was used in 61 of these patients.

Deep vein thrombosis was proved in 25 percent of the patients: mostly in those with femoral neck fracture, less in those undergoing total hip replacement, and much less in those undergoing total knee replacement. Pulmonary embolism was proved in 9 patients and was fatal in 2 (shown by post mortem examination); 8 patients died from other causes. The incidence of pulmonary embolism was higher in those patients who had epidural anesthesia. There was no significant difference between FRAXIPARINE® and CLEXANE® regarding the incidence of deep vein thrombosis.

From this study, we conclude that the continuously developing low molecular weight heparines may have satisfactory results in many cases, but that they still remain inadequate for the effective prevention of deep vein thrombosis and its consequences.

60. Operative treatment of coxarthrosis by using original compressive fixator of the proximal end of the femur

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During the period 1966–1991 in the Red Cross Clinical Hospital in Kaunas 292 patients with coxarthrosis were operated on with intertrochanteric osteotomy and fixation of the fragments by using an original internal fixator of our construction. The fixator consists of a threaded upper part, intended for screwing intramedullary into the proximal fragment and a curved metallic plate (thickness from 5–7 mm) for fixation to the lateral surface of the femur. Compression of the fragments was carried out by a special screw. This fixator ensured good stability and allowed early (in 3–5 days) movements of the hip joint, walking (4–6 weeks after the operation) and promoted a better consolidation.

The results in 270 patients were studied after 1–20 years. Good and satisfactory results were achieved in 258, unsatisfactory (nonunion) in 12 cases.

61. 15-21 years follow-up on the Charnley THA in patients of 55 years or younger

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Between October 1968 and July 1974, 241 Charnley LFA's were implanted as a one surgeon series (K.H.S.). The procedure followed strictly Charnley's recommendations. A conventional operating theatre was used, no antibiotic or antithrombotic drugs were given prophylactically. In 1990 surviving patients were reviewed clinically and radiologically, and records and radiographs from examinations after 1/2, 2, 5 and 10 years' postoperative controls reassessed. In deceased patients records and radiographs were reassessed. Of the 240 primary hips in the series, 107 (44.4%) had survived, and 100 of these (93.5%) were available for reexamination. 52 hips were implanted in patients 55 years of age or younger (34–55, median 51). The remaining 189 patients in the series thus being older than 55 years (56–79, median 64) at the time of surgery. The median observation time for the young patients were 17 years (15–20.6) for the old 17.7 (15.1–20.4). 29% of the young patients and 59% of the old were deceased at the time of reexamination. The deceased young patients had lived median 10.8 years postoperatively, while the deceased old patients had lived median 12.5 years. During the observation period 20 hips (8%) had been revised. In the young patients 5 out of 52 hips (10%) and in the old 15 of 189 hips (8%) (N.S.). 5 patients had fracture of the femoral stem, one of these in the young patients. 8 had aseptic loosening of one or both components, 3 (6%) in the young patients and 5 (3%) in the old (N.S.). The mean time to aseptic loosening in the young patients was 9.5 years, in the old 8.3 years. All infections in the series—1 primary and 4 late—occurred in the old patients. Charnley scores of pain, function and movement preoperatively, at 1/2, 2, 5 and 10 years postoperatively and at follow-up did not differ between the groups.

The overall results in this series support the view that the cemented Charnley THA has excellent results even with the now obsolete design, without prophylactic drugs, laminar airflow or refined cementing technique. Also, in the controversial group of patients of 55 years or younger, with high demands on their arthroplasty, the long term results of the Charnley THA are comparable with the results in older patients except for a slightly nonsignificantly higher rate of aseptic loosening. The results were better than in uncemented designs with shorter observation time. We therefore recommend the use of the Charnley LFA also in the young patients.

62. A 12–18-year radiological follow-up study of 95 Charnley low-friction arthroplasties

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In a 12–18 year follow-up study of 95 Charnley low-friction arthroplasties, we found a statistically significant correlation between the location of the centre of rotation of the total hip replacement (notably the horizontal distance from cup to tear drop) and long-term unfavourable radiological signs, such as acetabular and stem demarcation, cup wear, cup migration, subsidence of the stem and calcar resorption.

Small differences, as little as two millimeters, in the placement of the cup in relation to anatomic landmarks were responsible for the above findings.

A logistical regression analysis showed that the horizontal distance from cup to tear drop was also the most significant parameter influencing long-term unfavourable radiological signs of a total hip, in comparison with the parameters age, sex, diagnosis and body weight.

63. Acetabular cup loosening with time in low-friction arthroplasty

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Purpose: To analyze the different patterns of cup loosening in relation to time of onset and to identify objective radiographic parameters in the early postoperative stages that could predict later failure before the resulting bone destruction jeopardizes reconstructive procedures.

Material and methods: 680 low-friction arthroplasties performed between 1971 and 1979 in 598 patients were analyzed (average follow-up 12.7 years). 60% of the hips were followed at least 11 years. Clinical failure was defined as revision of the socket and/or presence of pain (grade 4 or less on the Merle D'Aubigné scale). Radiographic loosening was defined by the presence of radiolucent lines greater than 2 mm wide in all DeLee zones and/or migration of the cup (changes in the acetabular angle, medial protrusion, and vertical migration). The amount and rate of migration was recorded. Acetabular wear was measured using the Cupic method. Two types of time-dependent radiographic loosening were established: early loosening (within 10 years after operation), and late loosening (more than 10 years after operation). Survivorship analysis was used to estimate failure rates.

Results: 61 cases of radiographic cup loosening was found after 18 yrs (19% in the survival study), 29 cases were early loosening and 32 cases late. Early loosening was associated with bone insufficiency in the bone structures of

the acetabulum: congenital dislocation of the hip, acetabular fractures, and acetabular protrusion ($p < 0.01$ in all instances). Late loosening was associated with the depth of acetabular wear, 56% of the cases with over 2 mm wear showed radiographic loosening ($p < 0.00001$). In early loosening migration was the most frequent finding and its rate of progression was higher than in late loosening ($p < 0.001$). In late loosening, bone-cement radiolucency greater than 2 mm in all DeLee zones was the most frequent finding. Clinical failure was seen in 76% of the early loosening cases and 28% of the late loosening cases ($p < 0.01$).

Conclusion: This study suggests two different patterns for cup loosening: early loosening (within 10 yrs after the operation) which is related to the quality of the bone structure of the acetabulum, shows progressive cup migration and extensive bone resorption. Late loosening (more than 10 yrs after the operation) which is related to polyethylene wear, shows slow migration and has little clinical relevance.

64. Migration of the Link V-type cementless acetabular screw-in cup in THR

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The purpose was to evaluate the clinical outcome and to assess the cup migration.

Material: A total of 106 primary arthroplasties in 98 patients operated upon with the Link V-type cementless acetabular screw-in cup were evaluated. On the femoral side the cup was combined with a cemented Müller straight stem in 16 hips, a link ribbed stem in 5 and a cementless AML porous coated stem in 85 hips. There were 35 women and 63 men. The age of the patients at surgery was 21–79 years (mean 55 years). The indication for operation was osteoarthritis in 88 patients, arthritis in 8, fracture sequels in 5 and sequels of pediatric hip disease in 5 patients. Charnley classes of function were A: 71, B: 25 and C: 10 hips. The mean follow-up time was 58 months ranging from 46–84 months.

Methods: The clinical evaluation was performed according to Harris' Hip Score (HHS) system. The assessment of cup migration was made on unilateral anterior radiographs taken 6 weeks postoperatively and at the latest control. Radiographic loosening was defined as definite by the presence of migration of 5 mm or more, change of inclination of 5° or more or continuous radiolucent lines around the implant. Probable loosening was present when migration was measured to 2–4 mm or 2–4° or progressive radiolucent lines in any zone.

Results: Two cups have been revised and two are scheduled for revision. At the latest control the average

HHS were 87 ranging from 39-100. Eighty-four hips were rated good or excellent (HHS 81-100). In 44 hips we found radiographic loosening of the cup. Probable loosening was seen in 35 hips and in 25 hips the cup was stable. Two cups were revised. From the intermediary radiographs we found that the migration had been slow but continuous.

Conclusion: The clinical results have been acceptable although not quite satisfactory, but the frequent and continuous migration is unacceptable.

grafts are important in force transmission. Resorption of the grafts was not radiographically nor clinically important.

Conclusion: Supero-lateral bone grafting using this technique has important advantages. Thanks to the relatively small size of the grafts and the use of cancellous chips under and between the grafts structural integration and load transmitting of the grafts are usually achieved. The creation of living acetabular bone stock during primary or revision hip replacement in acetabular dysplasia not only improves the survival of the sockets but is also of value for any future revision operation.

65. Supero-lateral bone grafting of acetabular deficiency in total hip replacement

H.-M. Schuller and R. K. Marti

66. Ten years follow-up examination of

by a UVX radiometer calibrated for 254 nm (UVP Inc., San Gabriel CA, USA), and the UVC exposure of staff evaluated. The orthopedic surgeons feeling of comfort in UVC and a CH, respectively, was tested by using a visual analogue scale test (VAS). The wound healing in rats, after exposure to UVC or ordinary lamp light, was evaluated by testing the wound tensile strength after 7 days. To make an occupational risk assessment with regard to exposure of volatile anesthetics (Isoflurane and Enflurane) to UVC, an experimental study was performed. Halothane was used as a reference substance as it is known to photodecompose when exposed to UVC. The UVC air-cleaning method was compared to a CH enclosure as regards the economical aspects. The fixed and running expenses were divided between 100 operations per year, assuming a survival time of the equipment of 10 years and a 5% interest rate. Since Oct 1989 a total of 160 THR procedures have been performed in the UVC room at the Department of Orthopedics, Östra Hospital, Göteborg, Sweden.

The majority of clothing materials were not penetrated by UVC, but some materials allowed UVC transmission and some were not sufficient barriers to UVC even when applied in two layers. The surgeons feeling of comfort in the UVC and the CH system did not show any significant difference. No difference was found as regards the wound tensile strength in rats after exposure to UVC or to lamp light. The volatile anesthetics Isoflurane and Enflurane showed no degradation when exposed to UVC, while Halothane showed a degradation of 5–10% by UVC exposure. The UVC air-cleaning method was 34 times less expensive than the CH unit (CH=2084 SEK per operation, UVC=62 SEK per operation). The general impression of the UVC air-cleaning method after 160 THR procedures is positive, but the crucial point is a thorough education of staff, anesthesiologists and surgeons before their entering to a UVC operating room.

68. Biological fixation in PCA cementless total hip arthroplasty

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Purpose: To evaluate the type of fixation and its change over time in PCA cementless total hip arthroplasty with regard to the prosthesis position.

Material and methods: 113 consecutive PCA cementless total hip arthroplasties (1984–1988) in 90 patients were analyzed (average follow-up 4.7 years). Average age was 50 yrs (24–71 yrs), and the average weight was 71 kg (49–79 kg). Diagnoses were: primary osteoarthritis in 35% of the hips, avascular necrosis in 26%, developmental abnormality arthrosis in 14%, inflammatory arthritis in 13% and posttraumatic arthrosis in 11%. All operations were performed using a Harding approach. Radiographic fixation

was classified according to Engh et al.: osseointegration, fibrous stable fixation and unstable fixation. The cup was classified according to initial position: 81 (72%) cups were neutral (acetabular angle between 40°–50°) and 32 (28%) cups were vertical (acetabular angle greater than 50°). No horizontal cases (acetabular angle less than 40°) were seen. Stem position was classified in: 55 (49%) stems were neutral with a good fill of the canal. 32 (28%) were neutral with a poor fill of the canal, and 26 (23%) were in varus with a poor fill of the canal. Survivorship analysis was used to estimate failure rates.

Results: The clinical results were good in 86% after 7 years in the survival study - pain in the thigh was present in 34% of the cases, although unrelated to the size or the position of the stem. 8 prostheses were revised (8 cups and 4 stems) (6% of neutral cups after 7 years and 19% of vertical cups in the same period of the survival study, $p < 0.01$). Around the cup, radiolucent lines greater than 2 mm were regressive (progressive in vertical cups, $p < 0.05$). Sclerosis and migration were progressive. According to the Engh criteria, osseointegration was found in 59% of the neutral cups after 2 years, and in 49% at the end of the follow-up, while unstable fixation was found in 52% of the vertical cups after 2 years and in 55% at the end of the follow-up. Good clinical results were found in 98% of the osseointegrated cups and in 76% of unstable cups ($p < 0.01$). Around the femoral stem, neck corticocancellisation, calcar resorption, cortical hypertrophy, cancellous hypertrophy and pedestal were not progressive. Round-off and porosis of the neck were progressive and femoral metaphyseal osteoporosis was related to a stem size greater than 13 mm ($p < 0.05$). After 2 years, osseointegration was found in 72% of the stems, and instability in 23%, unrelated to stem position. 20% of these osseointegrated stems had become unstable at the end of the follow-up.

Conclusion: Early bone remodelling had no clinical relevans in PCA cementless total hip arthroplasty. Vertical cup position was frequent and was associated with a poor result. In the femur poor results were unrelated to the stem position. Biological fixation type changed over time in a small number of cases, but this must be confirmed in longer follow-up studies.

69. Effects of age and sex on the early failures in 15,094 primary total hip replacements

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Inferior results of total hip replacement (THR) are often reported for young male patients who also are the typical candidates for uncemented prostheses.

Patients and methods: In the Norwegian National Registry for Joint Replacements, data of 15,094 primary THRs have been collected. The effects of age and sex on the early results (0–3.5 years) have been evaluated. Survival of the prostheses were estimated by the Kaplan-Meier method and differences in failures were tested with the log rank test.

Results: No differences were found between the two sexes regarding age or diagnoses. Young men had, however, more often been operated on with uncemented implants than others. We have previously shown that the short-time results for uncemented THRs in Norway are inferior to cemented.

When all THR-patients were considered together, early failure was more common in younger as compared with older patients ($p < 0.001$). On the other hand the same comparison showed no significant differences when cemented and uncemented prostheses were considered separately.

In the whole THR-material men had more failures than women ($p < 0.001$). A small sex-difference was also found for the cemented prostheses, but not for the uncemented.

Conclusion: Young male patients with THRs have more early failures than others. The explanation is, at least in part, that young men are operated on with uncemented hip prostheses.

70. Early loosening of femoral components revised with cement—a roentgen stereo-photogrammetric study

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Introduction: By roentgen stereophotogrammetric analysis it is possible to detect most cases of prosthetic migration within the first four months postoperatively. In this study the early migration of cemented femoral components revised for mechanical loosening was investigated, and the influence of preoperative bone loss, type of stem used for revision and cementing technique was evaluated.

Patients and methods: Twenty-four hips revised for loosening of the femoral component were examined with RSA one to two years following surgery. The median age of the patients was 70 (45–87) years. The preoperative bone loss classified according to Gustilo and Pasternak was Type I in 9 hips and Type II in 15 hips. Postoperatively, radiographs were analysed with regard to the presence of a distal cement stopper, cement leakage through cortical perforation and the presence of radiolucencies.

Results: In 21 of the 24 femoral components definite migration was seen during the observation period. All of these migrating components subsided 0.2–5.5 mm in the femoral canal. The prosthetic head migrated 0.4–5.3 mm medially in seven hips, 0.7–2.2 mm laterally in six hips; and was displaced 0.7–11.2 mm posteriorly in 16 hips. There

was a tendency for greater migration in hips with more bone loss at revision: after one year the mean subsidence was 0.6 mm in the patients with Type I loosening, and 1.5 mm in the patients with Type II loosening. The mean subsidence was 0.4 mm in seven hips operated with a thick stem after one year compared with 1.4 mm in the 18 operated with a regularly sized stem. In six of the eight hips with adequate filling of the proximal femoral canal the prostheses subsided on average 0.8 mm; whereas 15 of the 16 hips with inadequate filling the prostheses subsided on an average 1.5 mm during the first postoperative year.

Conclusion: Loosening of the femoral component is considerably more common after a revision than after a primary arthroplasty. Surgical revision before the femoral canal becomes too wide and improved surgical technique—including adequate cement-filling and the use of a thick-stemmed femoral component—seem to be the best recommendations.

71. Factors influencing the results of Lubinus IP and SP prostheses

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Introduction: Many studies have reported on the results of cemented femoral prostheses of various designs. However, the possible influence of an anatomical design of the femoral stem has previously not been completely documented.

Patients: During a two year period (1982–1984) 351 cemented Lubinus IP (straight stem) and SP (anatomically designed stem) were inserted. Follow-up was made 5.6 (4.3–7.0) years after the operation. 116 hips were lost to followup (dead 80, unable to attend due to poor health 29 and revised hips 7). Patient related factors and surgical technique were recorded from case records and from follow-up examinations. Bone quality, prosthetic positioning and signs of prosthetic migration were measured on pre-postoperative and follow-up radiographs using a digitizer.

Results: Clinical results after 5–6 years were negatively influenced by patient related factors (high age $p = 0.0023$, multiple joint disease $p = 0.0001$) and prosthetic position (increased valgus of the stem $p = 0.014$). Signs of loosening (subsidence > 5 mm and/or radiolucent bone-cement zone $> 50\%$) occurred more often in hips with a short postoperative vertical distance between the tip of the greater trochanter and the femoral head centre (CTD) ($p = 0.0009$), when an IP prosthesis had been used ($p = 0.002$) and when a pronounced femoral neck resection had been performed at the operation ($p = 0.022$). In patients with a primary arthrosis IP-design ($p = 0.002$), a low CTD value ($p = 0.007$) and a low age at the operation ($p = 0.009$) were associated with radiological loosening of the femoral component.

Conclusion: The clinical outcome of the operation was mainly influenced by patient factors (Charnley group, age) and to some extent femoral stem position. Prosthetic positioning and design was of importance for the incidence of radiological loosening.

72. Surveillance cultures in total arthroplasties

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Introduction: Postoperative deep prosthetic infections are commonly assumed to be the result of preceding intra-operative wound contamination by pathogenic bacteria during the procedure. The aim of this investigation was to study whether such contamination could be regarded as a definable risk factor for postoperative wound infection.

Methods: Cultures were obtained from all primary total arthroplasties (hip, knee, shoulder) at Borgarspítalinn from October 1, 1990 to Sept. 30, 1991. Samples were obtained in a standardized fashion from the bone prior to and after the actual insertion of the prosthesis, from the fascia and irrigation fluid container at the time of wound closure. Wound dressings were changed on POD 1, 5 and 12, and culture swabs obtained from the wound when necessary. Operations were performed in a positive pressure OR with 12 air exchanges/hr. Patients were prepared with pre-operative chlorhexidine bathing x 2, povidone/iodine scrub and perioperative prophylaxis with cefazolin or cloxacillin. Gentamicin cement was used in all procedures. The OR was locked during the operation. The patients have been followed for 5–17 months.

Results: Cultures were obtained from 112 patients. Cultures from 61 operations were negative and no deep postoperative prosthetic infections were documented in that group (95% confidence interval (CI_{95%}) 0–5.9%). Cultures were positive from 51 operations, with one deep prosthetic joint infection (2%; CI_{95%} 0.1–11.0%). That was a case of an elderly debilitated woman with RA treated with methotrexate and prednisolone who developed a *S. aureus* infection in a prosthetic shoulder 11 months after surgery. A surveillance culture positive for *S. epidermidis* was obtained after insertion of the prosthesis. In this group, 15 bone cultures prior to insertion were positive, 10 after implantation, 18 from the fascia and 23 from the irrigation fluid container. Culture negative erythema (<0.5 cm) was present in 5 wounds, clear discharge (1 culture positive) in 4, purulent discharge (1 culture positive) in 3. Positive cultures from >1 site were obtained from 15 patients. All wounds healed within 14 days. The most common organisms isolated were *S. epidermidis* (41 patients, 54 sites), *S. aureus* (9 patients, 12 sites), alpha-hemolytic streptococci (2

patients), diphtheroids (2 patients), *Bacillus* sp. (2 patients), enterococci (1 patient).

Conclusion: The colonizing organisms isolated from the surgical wounds were all typical of normal skin flora, whether originating from the patient or the surgical staff. According to these data, although the numbers are small, surveillance cultures during prosthetic joint implantation procedures are not useful in predicting early deep post-operative prosthetic infections. The presence of potentially pathogenic organisms in the surgical wounds is of concern, however, interpretation of its ultimate significance awaits longer patient follow-up.

73. Cortical bone reaction to polymerization heat and toxicity of a conventional PMMA bone cement compared to a new MMA-DMA-IBMA bone cement

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Introduction: We developed a canine model in which it was feasible to distinguish the effects of polymerization heat and toxicity from PMMA bone cement. We analyzed and compared the tissue reactions in tubular bone by means of a histological technique enabling evaluation of bone necrosis, bone remodelling, direct approximation of vital bone, and fibrous membrane formation.

Material and methods: The significance of polymerization heat was evaluated in a paired study, the tibia diaphysis was intramedullary cemented with PMMA cement within a monomer tight membrane of PVA/polyurethane on one side - on the control side the bones were filled with an inert bone wax in a similar membrane (9 dogs, 4 weeks' observation). The toxicity of hot leaking monomer was evaluated by filling one tibia in PMMA in monomer tight membrane and the contralateral side with PMMA cement in the usual fashion (6 dogs, 4 weeks' observation). A new low exotherm, low monomer leaking methylmethacrylate/n-decylmethacrylate/isobornylmethacrylate (MMA-DMA-IBMA) bone cement was compared to PMMA bone cement (6 dogs, 4 weeks observation) and a negative control like inert bone wax (6 dogs, 4 week's observation).

Results: The experiments revealed that the polymerization heat in itself had no effect on the cortical bone remodelling (NS) and the periosteal apposition did not differ between bones exposed to polymerization heat or inert bone wax (NS). Hot monomer, however, inhibited remodelling in cortex as a whole ($p=0.04$). The remodelling activity was primarily depressed in the inner 2/3 of the cortex. Histomorphometric analysis of the new MMA-DMA-IBMA bone cement demonstrated significant increase in osteoid bone in direct contact ($p=0.031$), less fibrous membrane formation ($p=0.031$), more cortical remodelling

($p=0.031$) and periosteal apposition ($p=0.031$) compared to conventional PMMA bone cement. The new MMA/DMA/IBMA bone cement revealed no significant differences compared to inert bone wax.

74. Rates of total hip arthroplasty in the County of South Jutland, Denmark—age and sex specific incidences of primary operations

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In order to estimate the need for primary total hip arthroplasty (THA), as a consequence of demographic changes in Denmark for the coming decades, we calculated the age and sex specific incidences of primary THA.

Patients and methods: The age and sex specific incidences of primary THA were calculated on the basis of the operations performed in a steady state situation in the County of South Jutland from 1988-90. In this period 614 THAs were performed (female/male = 324/290). The demand for primary THA in Denmark was estimated using the age and sex specific incidences. The estimates were extrapolated to the Danish population for future decades to the year 2030 using a population forecast for different age groups.

Results: The incidence of primary THA increased from less than 1 per 100,000 residents in the male age group below 40 years to 485 per 100,000 residents, in the female age group 70-79 years (Table 1). The incidences for the age groups 40-69 years were higher for men compared to women but not significantly.

Table 1. Age and sex specific incidence of primary THA per 100,000 residents

Age groups (years)	Female	Male	Total
0-39	2.5	0.5	1.5
40-49	9.6	24.0	17.0
50-59	95.7	126.2	110.9
60-69	260.3	315.5	287.2
70-79	485.3	410.4	453.0
80>	222.6	251.7	232.8

For future decades the total number of primary THA in Denmark is expected to increase from 4013 in 1989 to 5307 in 2020 (32%). From 2020 to 2030 the number of THA is estimated to remain unchanged. The age groups 60-69 and 70-79 are expected to cause a high increase in the number of THA in 2010 and 2020, respectively.

Conclusion: As a consequence of demographic changes in the Danish population, and unchanged age and sex specific incidences of primary THA, we estimate that the

demand for primary total hip arthroplasty will increase by 35% (from 4013 to 5307 THAs) during the next 30 years. The figures will be even higher if more THA are being used in the management of hip fractures in the future.

75. Inflammatory response to infected total hip replacement and in common loosening

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We studied the tissue response of periprosthetic, pseudo-synovial tissue in seven patients with a purulent endoprosthetic infection (two early and five late infections) using cell-subtype specific monoclonal antibodies or heteroantisera in avidin-biotin-peroxidase complex or peroxidase-antiperoxidase staining. Proline 4-hydroxylase positive fibroblasts dominated the stroma of the vascularized periprosthetic connective tissue whereas diffuse or in parts dense local infiltrations of mononuclear cells characterized the cellular histological overview. In spite of accumulation of pus in the cavity, granulocyte associated antigen positive (CD15) and lactoferrin-immunoreactive neutrophils were conspicuously rare in tissue specimens perhaps due to the chronic nature of the infection and longlasting therapy with antibiotics. Local cellular response consisted of CD11b and MHC locus II coded Ia antigen positive immunoreactive monocyte/macrophages, and of T lymphocytes of mostly CD4 subset. Only a few CD25 positive cells could be detected. No distinct morphological or cellular differences were detected between early and late onset of infection. The local cellular response in six patients with common loosening of the prosthesis was mild showing a sparse diffuse and/or perivascular infiltration of CD11b and Ia positive monocytes/macrophages and CD4/CD8 positive T lymphocytes in a proportion of 2:1. Only occasional CD15 or lactoferrin positive neutrophils and CD25 positive activated lymphocytes could be detected. Our results from infected arthroplasties suggest that neutrophils rapidly migrate from the circulation to the "pseudojoint" cavity whereas local chronic tissue response regardless of age, consists of mononuclear inflammatory cells, which reproduce the dichotomy observed in other arthritides.

76. Total hip reconstruction in acetabular dysplasia—the effect of superolateral augmentation on load transfer—a study using the finite-element method

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In congenitally dysplastic or dislocated hips the acetabular bone stock is smaller than usual. Fixation of the acetabular component of a total hip prosthesis may be difficult. Several retrospective studies have shown that lack of lateral coverage of the socket is correlated with early aseptic loosening.

The importance of bony socket containment and the widespread use of acetabular roof reconstructions have directed our interest to the following questions: what is the mechanical importance of the lateral part of the acetabular roof in a patient with a total hip prosthesis? What happens when this lateral rim is lacking? What is the effect of a supero-lateral roof reconstruction?

In the present study, a three-dimensional finite element model is used to analyse the load transmission and calculate the stresses which occur on the pelvic side of a total hip prosthesis in normal and dysplastic hips (acetabuli), as well as in dysplastic acetabuli which have been augmented using supero-lateral grafts.

Results: The superior acetabular wall was found to make an important contribution to load transfer of the pelvic bone. It takes care of the transfer of the joint force from the cup to the cortical shell covering the iliac bone. Apart from the cup, in all materials the highest stresses occur in the superior acetabular rim area, indicating the importance of this area in the load transfer mechanism of the pelvic bone. If part of the socket of a total hip prosthesis is not covered by load transmitting bone, a significant increase of material and interface stresses occurs, especially in the cement, in the subchondral and trabecular bone and the cement-bone interface. At the cement-bone interface, the tilting component of the shear stress increases dramatically, whereas the torsional component is hardly affected; thus, ruptures of the cement-bone interface are likely to occur by tilting.

The use of supero-lateral bone grafts brings back most of these stresses to normal levels. Bone grafts are mechanically superior to a cement buttress.

77. Inhibition of heterotopic or orthotopic osteogenesis in rats by a local bioerodible indomethacin delivery system

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The purpose of the present work was to evaluate the effect of a local indomethacin delivery system (Alzamer® polyorthoester) on: demineralized bone matrix (DBM) induced heterotopic bone formation (study I); or healing of radial defects (study II) in rats.

Materials and methods: In study I, two separate series were conducted in a total of forty-eight Wistar rats. In both series, one of two types of implants was placed in the abdominal muscle: group A (experimental group), polyorthoester with 5% indomethacin and DBM; or group B, control group, polyorthoester and DBM. In the first series, host-tissue responses and osteoinduction were evaluated at two, three and four weeks histologically. In the second series, bone formation was quantified by ⁸⁵Sr uptake at week four. In study II, 45 Wistar rats were randomized in three equal groups. A 3.5 mm osteoperiosteal diaphyseal defect was created in the right radius in each rat. In groups A–B, the defect was filled with: group A, 20 mg polyorthoester with 5% indomethacin; or group B, 20 mg polyorthoester without drug. In group C, no implantation was done. The rats were killed 50 days postoperatively. Bone formation in the defects was quantified by computer-assisted area measurements on radiographs of the forelimb. Host tissue response was evaluated by light microscopy. In both studies, blood samples were obtained from random rats at weeks 1–4 and indomethacin in plasma was assayed by a specific High-Performance Liquid Chromatographic method.

Results: The local indomethacin polyorthoester delivery system inhibited both DBM-induced heterotopic bone formation (study I) and healing of the radial defects (study II). Polyorthoester without drug caused no significant inhibition of healing (study II). In both studies, the polyorthoester, with or without drug, caused little tissue reaction and was mostly resorbed. Indomethacin could not be detected in any blood sample.

Clinical relevance: In some clinical situations, inhibition of bone formation is indicated. While such inhibition may be produced by implantation of bone wax, methylmethacrylate and silicone-rubber, such nonresorbable foreign materials may induce chronic inflammation, predispose for infection and require a second operation for removal of the implant. The results of the present study suggest that the polyorthoester may be used as a local bioerodible indomethacin delivery system to inhibit heterotopic and orthotopic bone formation without tissue reaction, unresorbed carrier or systemic effects.

78. Particles accumulate within cement voids

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While performing in vitro experiments on vacuum mixing of bone cement, we noted a strong association between voids in the cement and the accumulation of cement particles. Spheres of methylmethacrylate-methylacrylate copolymer, approximately 25–50 µm in diameter were always observed within cement voids. Furthermore, smaller phagocytosable particles, often less than 10 µm in diameter, were seen immediately adjacent to the larger acrylic particles. Cement particles have been associated with a foreign body response and osteolysis. Vacuum mixing is known to reduce the number of voids and improve the mechanical properties of bone cement. By decreasing the porosity of bone cement, a second advantage may be evident, namely the reduction of particles.

79. Comparison of 24 versus 48 hours urinary catheterization in elderly patients after total hip or knee replacement

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Introduction: Micturition problems after hip or knee replacement are a potential cause of increased morbidity. A catheter for 24 hours is better than intermittent catheterization in preventing urinary bladder retention without increased risk or urinary infection. The aim of this investigation was to study whether there was a difference in terms of bacteriuria and retention in using a catheter for 24 versus 48 hours in an elderly population after total hip or knee replacement.

Methods: One hundred patients 67 years or older undergoing total hip or knee replacement at Borgaspítalinn were included in this study. The patients were divided into two groups according to whether their birthdays fell on an even or uneven day of the month without regard to sex, urinary symptoms, previous genitourinary treatment or previous post surgical urinary tract problems. Group I were patients with uneven numbered birthdays and urinary catheter for 24 hours, and group II patients with even numbered birthdays and catheter for 48 hours. The catheter was inserted on the morning of surgery for both groups. Preoperative evaluation included urine analysis and culture. Urine cultures were subsequently obtained on POD 1, 2, 7 and 12. The patients received antibiotic prophylaxis with either cefazolin or cloxacillin. Gentamicin cement was used

in all procedures. All urinary problems after catheter removal were recorded. Significant bacteriuria (SB) was defined as $> 10^5$ organism/ml.

Results: There were 44 patients in group I and 56 in group II. There was no difference between the groups regarding to age (average 74 years), sex, diagnosis or joint operated on. Urinary retention after catheter removal occurred in 3/44 in group I and 2/56 in group II (NS). Preoperatively 10 (10%) patients had SB. In group I two patients had SB on POD 1 and 2 but none in group II, whereas on POD 12 three patients in each group had SB. The most common organism preoperatively and on POD 12 was *E. coli*.

Discussion: The duration of urinary catheterization, 24 versus 48 hours, in this study thus did not affect the rate of urinary complications in elderly patients after total hip or knee replacement. Therefore we conclude that an urinary catheter can be safely used for 48 hours in elderly patients undergoing total hip or knee replacement without increased risk for urinary complications.

80. Stability of uncemented, femoral long-stems in revision total hip arthroplasty—a roentgen stereophotogrammetric study

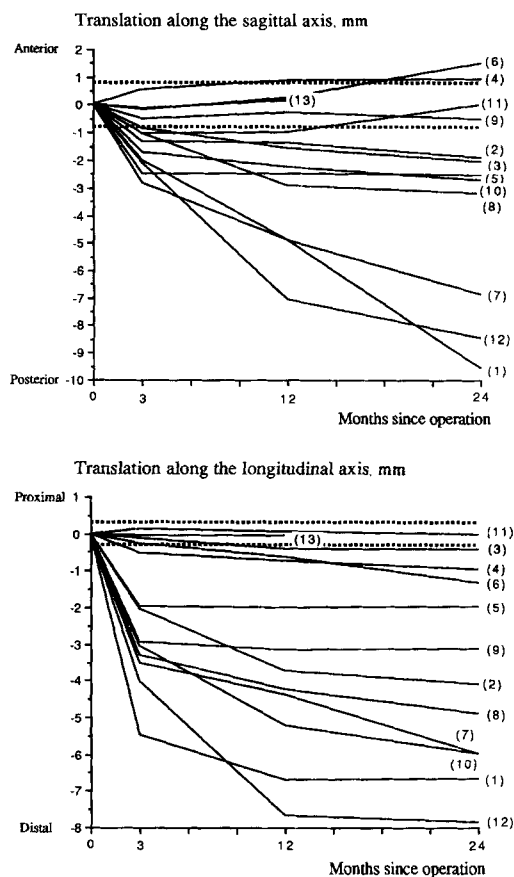
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Introduction: Since 1987 we have used the BIAS (Zimmer) femoral prosthesis in revision cases with marked femoral bone loss. This titanium alloy stem has a proximal triangular body suitable for press fit, a long antecurved intramedullary stem and is supplied with anterior and posterior pads of pure titanium fibre mesh. Our aim was to, prospectively, evaluate the in vivo stability of this prosthesis using roentgen stereophotogrammetric analysis (RSA).

Patients and methods: Twelve patients with a mean age of 67 years had 13 revision total hip arthroplasties using the BIAS femoral stem. Trabecular autografts were routinely used. Five to nine tantalum ball markers with a diameter of 0.8 mm (Industrial Tectonics) were inserted into the proximal femur at the time of surgery. RSA examinations were performed with the patient in the supine position, using the uniplanar technique (Selvik 1974). Prosthetic movement was calculated as the displacement of the centre of the prosthetic head in relation to the femoral bone markers. The precision of RSA in this application was determined from one double exposure of each hip. The standard deviations in mm from the expected zero were 0.15, 0.08 and 0.25 for the transverse, longitudinal and sagittal axes, respectively. Correspondingly, the limits for significant translations with a 99% confidence interval were ± 0.5 , ± 0.3 and ± 0.8 mm for the transverse, longitudinal and sagittal axes, respectively. RSA examinations were performed postoperatively and at 3, 12 and 24 months.

Results: One stem was stable at 12 months; none at 24 months. At 24 months, 11 of 12 stems had subsided 3.9 (0.4-7.9) mm and eight had migrated posteriorly 4.6 (1.9-9.5) mm.



Discussion: Posterior translation of the femoral head in cemented revisions has earlier been found by Snorrason (1990). Nistor (1991), in a study of the uncemented LMPCH femoral prosthesis, found large internal rotations. We assume that the posterior translations found in our study could be attributed to internal rotations. Gross instability, in combination with poor clinical results, have led us to abandon this concept in revision hip arthroplasty.

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81. Osteoarthritis of the hip treated by intertrochanteric osteotomy—latest results

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During the last fifteen years, hip arthroplasty has led to a great reduction in interest as far as osteotomy is concerned. As a result, while the literature is full of research concerning arthroplasty, in the last decade there have only been a few reports dealing with the effects of osteotomy in osteoarthritis of the hip.

We studied the results of osteotomies performed in the Orthopedic Department of Athens University during the years 1969 to 1987. Among these cases there are, of course, a number that do not have the required indications according to today's criteria, since in the early seventies total hip arthroplasty was only performed in very select cases.

Intertrochanteric displacement osteotomy was performed in 241 patients (250 hips), of which 118 involved the right hip, 114 the left, while in 9 cases osteotomy was performed bilaterally. Out of the 241 patients, 85 could be found and so included in this study. In 5 cases osteotomy was performed bilaterally, making the number of hips 90. Seventy patients were women and 14 men, while the age at operation ranged from 21 to 66 years (mean 47.7). The 85 patients were examined 5–22 years postoperatively and our findings at the last follow-up are presented.

82. Histologic observations of the loosening process in cemented hip arthroplasty

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We report the histological findings in 17 cases of revision of cemented hip arthroplasties. In 12 cases, the indication for revision was aseptic loosening, while in the remainder there was no evidence of loosening or infection and the patients were reoperated because of technical failure of the arthroplasty.

The histologic picture in both loosened and nonloosened cases was similar and was characterised by the presence of a synovial-like membrane at the side corresponding to the joint cavity or abutting the implant, underneath of which there were aggregates of histiocytes and foreign body giant cells within a dense fibrous matrix. The main foreign material in all cases was fine granules or larger cement particles. A few polyethylene fibres were also observed in some cases, while metal deposits were found in only 3 cases with a titanium implant and extensive loosening.

The most interesting finding in this series was the opportunity we had to study the progressive development of the synovial-like membrane and the first appearance of the

cement granulomas in nonloosened cases. The first signs of the synovial membrane appeared as soon as 2.5 months postoperatively, while 7 months after primary operation the first cement debris was observed, while the synovial membrane was already fully developed and did not differ histologically from that in cases with loosening.

Rheumatoid arthritis

83. Our up-to-date experience with use of cementless Parhofer's hip prosthesis in rheumatoid disease

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The cementless total hip prosthesis devised by Parhofer was implanted for the first time in our department in 1987 in an 18-year-old woman suffering from juvenile rheumatoid arthritis. April 1987–June 1991 this procedure was carried out on 66 patients (42 women and 24 men), age 34 (18–54). 83 hips have been operated on because of rheumatoid arthritis and 23 hips due to ankylosing spondylitis—bilaterally in 41 patients. Follow-up ranged from 7 months to 4 years and 10 months, mean 2 years.

In 107 THR in patients with rheumatoid disease, the results were favorable, especially with regard to pain and range of motion. Only in one case with persistent femoral pain, aseptic loosening of the stem is suspected. A transient femoral nerve paresis, probably due to stretching, was observed in one patient. In one case, a perforation fracture of the femoral cortex, and in another, a fissure of femoral shaft occurred during surgery; twice there were fractures of the trochanter—all fractures healed uneventfully.

We concluded that the Parhofer cementless THR is a valuable method in surgical treatment of rheumatoid hips, provided the procedure is carried out accurately and by experienced surgeons.

84. Long-term results after knee replacement with different types of prostheses in rheumatoid arthritis patients

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The aim of the study was to define: a) the long-term results depending on the type of prosthesis, b) the most useful type

of prosthesis in the survival aspect, c) the method of management of the failure cases.

During the years 1967–1991, we operated on 609 knees with 16 types of prostheses in 505 patients affected by rheumatoid arthritis. Only 433 knees in 358 patients with 5–24 years follow-up were taken into consideration—101 (23.3%) knees in 77 patients were reviewed. 28 patients had died, 35 had changed their address and 218 did not respond. The examined patients were divided into 3 groups, depending on period of operation: group I: 1967–1975, 18 knees in 18 patients; group II: 1976–1980, 38 knees in 29 patients; group III: 1981–1986, 45 knees. There were 62 women and 15 men, the mean age at the time of operation was 46.

The Knee Society Rating System and radiographic assessment were employed. The cumulative survival calculated for the constrained and nonconstrained types of prostheses was similar—38% and 41%. Failure of the prosthesis was also similar—24% and 26%.

The most useful prosthesis in the survival analysis seems to be the condylar type (in our study Kinematic) and the semiconstrained (in our study GSB).

After aseptic loosening of a sledge prosthesis it seems possible to change to a condylar or semiconstrained knee prosthesis if the bone quality is good.

85. Uncemented Freeman-Samuelson total knee arthroplasty in rheumatoid arthritis

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Introduction: Long-term results of total knee arthroplasty have in several studies been reported to be good. Due to concern about the long-term adverse effects of PMMA several attempts of uncemented fixation have been developed. We have in Göteborg followed prospectively patients with rheumatoid arthritis who have been operated on with uncemented Freeman-Samuelson total knee arthroplasty. The aims of the study were to evaluate these arthroplasties: 1) clinically, 2) radiographically and 3) with roentgenstereophotogrammetric analysis (RSA).

Material and methods: 102 consecutive knee arthroplasties in 86 patients were followed. The mean age at operation was 60 (22–78) years. There were 69 women and 17 men and the mean follow up was 5 years. The clinical data were prospectively computerized pre- and post-operation and thereafter annually. The Hospital for Special Surgery score was used for evaluation. Preoperative and postoperative alignment and prosthetic positions were measured radiographically.

Radiographic early signs of tibial loosening are difficult to detect because the interpretation is dependent on the projections. Therefore roentgen stereophotogrammetric