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Part One

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Terje Terjesen

Hip arthroplasty

Piroxicam and naproxen in patients with arthrosis in the hip waiting for surgery

Antti Alho, Örnulf Jaer & Ulf Slungaard

Sections of Orthopedic Surgery, Ullevål Hospital, Oslo Kommunale Legevakt, Oslo, and Anker Hospital, Norway

Two NSAIDs, piroxicam and naproxen, were studied double-blind at 15 orthopedic units to compare their clinical efficacy, toleration, and potential influence on previous decisions on surgery in such patients.

Totally, 252 patients on a waiting list (182 females and 70 males) had their previous NSAID therapy, if any, stopped for 2 weeks (paracetamol permitted) before being randomly assigned to either piroxicam 20 mg daily or naproxen 750 mg daily for periods varying from 2 to 5 months. Efficacy parameters were pain and functional capacity assessed by the use of visual analogue scales (VAS) and the Harris' Index (modified by Alho).

Index results showed a significant mean improvement in both treatment groups, piroxicam 39 per cent and naproxen 27 per cent.

Significant effect was also demonstrated by VAS assessments. Efficacy parameters showed differences in favor of piroxicam.

Side effects were reported by 50 per cent of the patients in the naproxen group vs. 37 per cent in the piroxicam group, with withdrawals in 18.4 per cent and 11.0 per cent, respectively. Two serious gastrointestinal reactions (hemorrhage 1, duodenal ulcer 1) occurred, both in the naproxen group. Surgery was postponed in 7 per cent of the patients (piroxicam 9%, naproxen 5%)

LMPCH – low modulus porous polyethylene-coated hip prosthesis – 2 year follow-up

Lars Nistor & Gudmund Gudmundsson

Department of Orthopedics, Kärnsjukhuset, Skövde, Sweden

The long-term results of cemented THR (total hip replacement) and the uncertain outcome of revision surgery make this type of THR questionable for the younger patient with severe hip derangement. Because alternative procedures such as osteotomy or arthrodesis are often not feasible or acceptable to the patient, the cementless THR appears to be a promising solution, although they, given time, undoubtedly will create problems of their own. We have chosen a prosthesis with a low modulus of elasticity to avoid stress-shielding. The bonestock-saving design of the stem does in case of failure facilitate extraction without excessive bone destruction.

We have used the LMPCH prosthesis since 1983 in 41 hips in relatively young patients (aged 48 (32–55) years) with primary and secondary arthrosis. Early complications were few. In one patient operated on bilaterally, fracture lines occurred on insertion in the femur at the tip of the prosthesis, but this did not affect the final results.

The patients have been evaluated with the Harris Hip Score preoperatively and 3, 6, 12, and 24 months after the operation. Pain was the main reason for surgery. The mean pain score preoperatively was 16 and had increased to 42 three months postoperatively, and the patients remained free or almost free from pain at the follow-up examinations. The function score increased correspondingly (mean

value 25 preoperatively and 40 at the 6-month follow-up). Also the range of motion increased, particularly in patients with poor motion preoperatively. The radiographic follow-up showed a small subsidence in some cases, but it was mostly not measurable on plain roentgen films. In all the patients a dense zone of bone developed that surrounds the prosthesis and possibly penetrates into the porous coating. The stable appearance of this zone in absence of cortical bone reaction and pain indicates firm fixation.

Although the follow-up period is short, the excellent results and the absence of any serious problems to date have encouraged us to continue this clinical trial and to widen the indications.

Mathy's noncemented THP in primary and revision surgery

Timo Niinimäki & Jaakko Puranen

Department of Surgery, Oulu University Central Hospital, Oulu, Finland

Mathy's noncemented total hip endoprosthesis (THP) has been in routine use at our hospital since 1983. Our experiences from 183 primary operations are described with special regard to revision operations.

The procedure is a standard THP operation, tools are simple and work well. The proximal femur has in some cases been too tight, the femoral part has not fitted or has fractured. The acetabular part has been replaced in 28 cases with a cemented cup or acetabular ring instead of the original Mathy's polyethylene cup.

The longest follow-up times do not exceed 2 years. The most common complication was luxation. It seems that a very exact position of the prosthesis is needed to avoid it. Two habitual luxations were corrected by elevating the acetabular margin with a narrow rim cut from another cup and fixed with screws.

After operation the common radiographic finding was lines between the prosthesis and the bone, and these vanished after a few months and no marks from stress shielding or protection were seen. The revision models very clearly induced periosteal bone formation when used in connection with fracture or bone defect. This is apparently due to the isoelasticity of the femoral stem. The acetabular cup was not always suitable in revision operations due to the lack of surrounding bone.

These observations confirm the conception that the idea of the noncemented isoelastic prosthetic stem does function. The actual problems with the acetabular component have mostly been solved in a

noncemented way. Nevertheless, the long-term results will reveal the final judgement on the method. The early results of revision operations have been most satisfactory; no osteolytic activity is seen around the stem, and this is encouraging in difficult cases with bone loss.

The Scandinavian multicentric uncemented THR study: Preliminary report with 2 years' result

Henrik Malchau, Peter Herberts & Lars-Martin Wiklund

Departments of Orthopedics and Radiology, University of Göteborg, Göteborg, Sweden

In 1984, the orthopedic departments at Sahlgrenska hospital, Östra Hospital, Huddinge Hospital, Malmö General Hospital, Regional Hospitals in Linköping and Örebro, Central Hospital in Norrköping, Gävle Hospital, Aarhus Municipal Hospital, Haukelands Hospital, Bergen, and The Invalid Foundation, Helsinki, started a prospective, longitudinal study of uncemented total hip replacements in young patients. The purpose of the study is to gain experience about different types of uncemented prostheses and to evaluate indications and complications. In order to obtain a large patient material in a relatively short time, we made a multicentric design of the study.

Patients. The PCA cementless total hip replacement has been used in 260 patients, 145 women and 115 men (mean age 49 years). Indications for operation have been severe disabling hip disease excluding the possibility of osteotomy. The preoperative diagnosis was primary arthrosis in 52 per cent, secondary to childhood diseases in 24 per cent, and posttraumatic in 18 per cent. Totally, 140 patients have been followed for more than 1 year. Of these, 60 per cent were preoperatively sicklisted an average of 12 months.

Results Clinical results were evaluated according to the Harris hip scoring system (0–100). At the latest follow-up, we found 88 per cent excellent or good (80–100), 10 per cent fair (70–80), and 2 per cent poor (below 70). One year postoperatively, 75 per cent were back in full-time employment.

Complications. In 10 patients, we had undisplaced femoral fissures. Postoperatively, we have recorded 14 patients with delayed wound healing, 4 early dislocations, 1 peroneal nerve palsy, and 1 partial ischiadic palsy. Radiographic evaluation has shown remodelling around the tip of the femoral prosthesis in 10 per cent. In 3 patients, we found subsidence of the femoral stem, and in 1 case a revision has been done.

Conclusions. Early results with the uncemented

PCA THR are promising, but the follow-up is very short. The young patient with degenerative hip disease is an orthopedic challenge with many unsolved problems. The intention is to continue with randomized multicentric prospective studies comparing different types of prosthetic designs and concepts.

The Lord uncemented total hip prosthesis: A clinical and radiographic study

Gunnar Follerås, P. Hallgrímsson, Antti Alho & Björn-Olav Thoresen

Orthopedic section, Ullevål Hospital, Oslo, Norway

The Lord uncemented hip prosthesis was inserted in 98 arthrotic hips. The observation time was 27 (18–48) months. Two patients died of unrelated causes and were excluded. The clinical data were recorded as a modified Harris hip score. The pain data were recorded separately. The preoperative, postoperative, and endpoint x-ray films were examined according to a predefined protocol.

Clinical results. Gain in Harris hip score was 41 (3–62) points. Gain in pain score was 24 (10–30) points. Four patients had some activity-related pain, 26 had occasional pain, and 66 hips were completely without pain. The clinical result was in all but 4 cases considered satisfactory.

Radiographic results. On the acetabular side, no tilting or protrusion was recorded. One case with a small resorption zone, and 4 cases with sclerosis were observed. No distal migration of the femoral component was observed; 6 patients with resorption of the calcar were recorded. The bone surrounding the femoral component was divided in 4 zones, and the occurrence of each radiographic parameter was recorded in each zone. Decreased calcification was recorded 123 times, 87 times around the proximal part of the prosthesis, 36 times around the distal part. Sclerosis and thickening of cortex was recorded 5 times proximally and 59 times distally. The conclusion is that load is too often transmitted to the bone through the distal part of the stem, which may lead with time to upper femoral atrophy and stem fracture.

Stress-shielding and stress-induced bone remodelling in the Lord cementless hip arthroplasty

Erik Berg Mathiesen, Mats Dahlborn, Urban Lindgren & Olle Svensson

Departments of Orthopedics and Diagnostic Radiology, Karolinska Institute, Huddinge University Hospital, S-141 86 Huddinge, Sweden

Successful short-term clinical results with total hip arthroplasty using cementless fixation both at the femur and the acetabulum have been reported. However, the difference in the modulus of elasticity between the bone and the implant makes the stress transfer nonphysiologic. This may result in a progressive bone loss at the proximal femur, which may lead to fatigue fracture of the stem of the prosthesis. This complication occurred in one of our patients with a Lord prosthesis. We therefore reviewed 46 hips in 43 patients with uncemented original Lord femoral implants, with a follow-up of 33 (24–54) months. Technetium bone scans were performed in addition to radiography and clinical examination.

Increased tracer activity – considered consistent with high bone remodelling activity – was found in 39 hips, most commonly in the femoral shaft at the tip of the prosthetic stem (34 hips), but also in the trochanteric area (25 hips). However, the increased bone turnover had not always resulted in radiographically detectable changes. Thus, 26 hips showed proximal bone resorption and 25 hips had cortical thickening around the distal portion of the prosthetic stem. In 19 patients these changes occurred concomitantly. Clinically, 19 patients complained about a dull-aching midhigh pain (MTP). All the patients with MTP had a positive bone scan, whereas half of the patients without pain had a negative scan. Also 15/19 hips with MTP had radiographically detectable changes.

Our results indicate that the stress-induced bone remodelling caused by Lord femoral components may not reach a steady state even as late as 2–4.5 years postoperatively. Consequently, prosthetic failure due to fatigue fracture may be a future problem with the Lord prosthesis.

A prospective randomized study of cemented and noncemented total hip prostheses – preliminary results after 3 years

Anders Wykman & Ian Goldie

Department of Orthopedics, Karolinska Hospital, Stockholm, Sweden

Aim of study. Problems of future loosening of prostheses in total hip replacement have prompted a study, the object of which is to compare the reliability of cemented hips in comparison with noncemented hips. The study runs over 5 years and at present the 3-year results are available.

Method. Cemented: the Charnley prosthesis according to the original standard method as described by Charnley.

Noncemented: The HP-Garches prosthesis with a screwed acetabular ring and a femoral component studded with a pyramidal surface. Posterior approach.

Patients. In total, 150, 77 in the Charnley group and 73 in the HP-Garches group. Age in the Charnley group 70 (52–87) years; in the HP-Garches group 68(32–87) years.

Diagnoses:

Arthrosis:	Total	117 (78%)	
	Charnley	59	
	HP-Garches	58	
Rheumatoid arthritis:	Total	14 (9%)	
	Charnley	7	
	HP-Garches	7	
Miscellaneous:	Total	19 (13%)	
	Charnley	11	
	HP-Garches	8	

Results:	Harris hip score (0–100)			
	Preop	6 mths	1 year	3 years
Charnley	39	86	88	94
HP-Garches	40	74	79	86

Special findings: In the HP-Garches group mid-thigh-pain occurred in 23 patients, relieved after 10 (4–15) months.

Total hip replacement with Müller prosthesis and ICLH double cup

A. Reigstad, M. Brandt & K. R. Hetland

Kronprinsesse Märthas Institutt, Oslo, Norway

A prospective comparative study of patients 60–79 years of age with arthrosis of the hip treated with the Müller total hip prosthesis ($n = 155$) and the ICLH double cup prosthesis ($n = 149$) has been car-

ried out. The groups were comparable in sex, mean age, and body weight. The mean operating time was significantly shorter in the Müller group, whereas the operative blood loss and the operative complications were statistically equal. No deep infection occurred in either group. The patients were followed for 49 (27–75) months. After the operation a dramatic improvement in hip function was seen in both groups. The Müller group had more favorable ratings than the ICLH group for pain, walking ability, hip motion, and total hip score at all follow-ups from 3 weeks to 5 years after the operation. The differences were not significant at all registrations.

Acetabular radiolucency and heterotopic bone formation was equal in the two groups.

No revision operation has been done in the Müller group. Two Müller prostheses have shown radiographic signs of mechanical loosening. Thirteen ICLH prostheses (9%) – all in female patients – have been reoperated. ($P < 0.001$).

Based on this study, we conclude that the clinical results of a double cup prosthesis without radiographic evidence of mechanical loosening are comparable to the results of a mechanically stable conventional hip prosthesis. The disadvantage of the double cup prosthesis is the relatively high frequency of mechanical loosening at 2 to 6 years follow-up.

Complications of total hip replacements correlated with different types of prosthesis

Erik B. Riska

Department of Orthopedics and Traumatology, University Central Hospital, Helsinki, Finland

Totally, 909 total hip replacements were performed between 1967 and 1984. All cases were operated on by the same surgeon and with the same technique. Local Nebocetin application and a hemovac drain were used. Ambulation of the patient started on the second postoperative day and after a week the patients returned home. The age of the patients was 64 (19–87) years and the follow-up time was 5 (2–17) years. The diagnosis was arthrosis in 675 cases, previous fracture in 78, rheumatoid arthritis in 51, congenital dislocation in 58, and tuberculosis in 12. Previous hip surgery had been undertaken in 181 cases. The McKee-Farrar type of prosthesis was used in 315 cases, McKee-Arden in 397, McKee-Riska in 49, ceramic endoprosthesis in 108, Lagrange-Letournel in 23, and Müller in 11.

Loosening of the prosthesis in 92 cases was treated by rearthroplasty. Late infections were treated surgically by debridement and drainage, and finally the

prosthesis was replaced and anchored with gentamycin-palacos cement. A dislocation was reduced and the knee joint was immobilized for 3 weeks. Ectopic bone formation was resected and replaced by fat tissue.

Resorption of bone tissue at calcar femorale and cortex appeared in connection with McKee-Farrar and McKee-Arden prostheses. At the beginning of the period, these were symptomless, but later the prosthesis was found to be loose. In most of these cases, rearthroplasty was indicated. Ceramic endoprosthesis was appropriate, especially in these reoperations.

Reoperations in 108 cases were made in 67 McKee-Farrar prostheses, but also after 24 McKee-Arden type. Late complications appeared in cases following fractures of the hip joint, but also in rheumatoid arthritis. Fracture of, or broken acrylic cement was unexpectedly common, obviously as a result of faulty cementing technique.

Mechanical properties of bone cement with special reference to vacuum mixing and chilling

Lars Lidgren, Bertil Bodelind & Jörgen Möller

Department of Orthopedics, University Hospital in Lund, and the Division of Solid Mechanics, Institute of Technology, Lund, Sweden

Two cement mixing methods were compared: hand and vacuum stirring using high viscosity, high molecular, antibiotic-containing polymethylmethacrylate kept at two different temperatures prior to mixing: 4°C and 21°C.

The mechanical properties were improved by vacuum mixing when compared with hand mixing as well with prechilled (4°C) as room-tempered cement (21°C). The fatigue life was 10 times longer after vacuum mixing. Chilling prior to mixing had no adverse effect, but made the mixing easier and improved the handling characteristics. Vacuum mixing delayed setting time by 1 minute, but also lowered the peak temperature by 5°C. The radiographic study showed reduction mainly of the microporosity, but also of the macroporosity with vacuum mixing. The mechanical properties decreased slightly after 2 months in Ringer solution, but the differences between the mixing procedures remained.

The effects of different stem design on femur loading in total hip replacement

Krister Djerf & Jan Gillquist

Department of Orthopedics, University Hospital, Linköping, Sweden

A total hip prosthesis is designed to transfer static and dynamic loads from the pelvis to the femur. In order to preserve normal bone characteristics after implantation, it is important to simulate the load transfer of the normal hip. Since comparative studies of loading characteristics of different prostheses, especially in the flexed position, seem to be rather few, we decided to perform this study. It involves 11 different designs tested in vitro under conditions simulating a single limb stance with the hip in extension and 45° flexion.

The tested prostheses were selected along the following principles: 1. Cemented designs, straight and curved stem with and without a collar. 2. Noncemented designs, straight and curved stem with and without a collar, and one "isoelastic" design.

At first, a photoelastic test (Photostress[®]) was performed to get the overall strain pattern and to serve as a guide for the placing of the strain gauge rosettes. A total of 36 specimens were tested.

We found marked decrease of strain in the calcar area in all but the "isoelastic" design, which showed a pattern comparable to a normal femur. A collar seemed to increase the strain in the calcar area to about 40 per cent of normal.

According to these test results, a collared prosthesis with reduced stiffness seems to be the most preferable for total hip replacement.

A scanning electron microscopic study of failed Christiansen THR components

A. Ohlin, U. Gedde & T. Eriksson

Lund University, Department of Orthopedics at Malmö General Hospital, Malmö, and Departments of Polymer Technology and of Machine Elements, Royal Institute of Technology, Stockholm, Sweden

In the development of artificial joints, wear of the plastic component has been a major problem with many pitfalls, e.g., the teflon socket of the early Charnley L.F.A. design, the polyester head of the Weber prosthesis, and soft top (polyethylene, PE) hemiarthroplasties of the hip. Christiansen introduced his THR (Chr THR) in order to reduce the friction between the head and the socket, and also to reduce the socket wear rate. During the 1970s, more than 8,000 Chr THR were implanted in Scandinavia.

Of these, 5,000 were implanted in Sweden, and more than 1,000 of these have been exchanged owing to aseptic loosening (1986). No fully accepted explanation of this high loosening rate has been presented yet. Excessive socket wear has often been demonstrated, indicating a tribological mechanism in the chain of events leading to failure. We have studied the articulating surfaces of the prosthesis with scanning electron microscopy (SEM). Compared with other common prosthetic femoral heads, we could demonstrate a rather rough and sometimes even partly unpolished surface. The socket was also examined in SEM after coating the surface with a thin layer of gold (200 Å) and it was found that POM is a very porous material. Such a type of material is less resistant to wear. In most of the voids, we could also see granules that probably when released induced a three-body wear. In comparison, the most common and well-functioning PE socket has in SEM a smeary appearance without porosities.

Conclusion: 1. POM (Delrin) should not be used for implants. 2. Do not rely on machine tests, i.e., friction and wear tests, but also investigate any new material with SEM. 3. Very badly finished prostheses occur on the market.

Acetabular problems in total hip arthroplasty performed for neoacetabular arthrosis following congenital dislocation of the hip.

J. Steen Jensen, Jens B. Retpen & Carl C. Arnoldi
Department of Orthopedic Surgery U,
Rigshospitalet, University of Copenhagen,
Denmark

The purpose was to identify the preferable acetabular technique at total hip replacement in cases with more than 65 per cent chronic dislocation of the femoral head.

A clinical and radiographic follow-up of 65 hips in 46 patients, median age 48 (21–73) years, recorded the need for reoperations and radiographic signs of aseptic loosening.

Direct cementation into the neoacetabulum at the squama resulted in 6/21 revision arthroplasties and 2/21 radiographic loosening after 6 (2–10) years. Cups supported by cortical bone beams were revised in 3/15 and found loose in 3/15 after 5 (2–9) years. The biomechanically most desirable acetabular technique with restoration of the hip rotation center and roof reconstruction with a femoral head graft was also clinically superior with 2/26 revisions and 1/26 loosening signs after 4 (2–8) years.

Charnley arthroplasty in arthrosis secondary to unreduced or incompletely reduced congenital dislocation of the hip

Frank Linde & Jörn Jensen.

Department of Orthopedics, Orthopedic Hospital,
University of Aarhus, Aarhus, Denmark

A follow-up study was made to evaluate the conventional Charnley arthroplasty technique in patients suffering from arthrosis secondary to unreduced or incompletely reduced congenital dislocation of the hip. By means of the survivorship method, the time-dependent prognosis was estimated.

Reexamination was made in 124 of 129 operated on hips (96%) 9 (3–16) years after operation. The male/female ratio was 10/1 and the age at the time of operation was 50 (23–77) years. The preoperative degree of dislocation was classified according to Eftekhar. There were 76 stage B (incomplete type) and 47 stage C (complete type) dislocations. Stage A (dysplasia) was not included in the study. The relationship between revision rate, the rate of socket loosening, preoperative degree of dislocation and lack of lateral bone support of the socket was analyzed.

Deep infection occurred in 3 cases (2.4%). One of these was later converted to a Girdlestone hip because of persistent infection. Radiographic loosening or peroperatively demonstrated loosening of the socket was observed in 24 cases (19%). The revision rate was 11% (including the 3 infected cases). The survival rate of the prostheses was 93 per cent after 5 years, 89 per cent after 10, and 80 per cent after 15 years. Revision arthroplasty was made significantly more often in stage C dislocation (19%) than in stage B dislocation (7%) ($P < 0.01$). This difference was probably caused by a higher frequency of socket loosening following inferior bone support of the socket in stage C than in stage B dislocations ($P < 0.001$). The overall result (including the result of a revision arthroplasty) was excellent in 101 (81%) of the cases at the time of reexamination (the patient's judgement).

Intraosseous pO_2 and pCO_2 levels in normal and arthrotic femoral heads

K. Harry Sørensen, Thomas Kiaer & Jørgen Grønlund

Department of Orthopedics, Odense University
Hospital, Odense, Denmark

One of the pathologic and physiologic changes found in subchondral bone in primary arthrosis is a dis-

turbed vascular pattern. One effect of this is a raised intramedullary pressure ascribed to obstruction of the venous drainage. The influence of this on the nutrition of the bone is obscure. In order to clarify the changes in intramedullary pressure and the possibility of ischemia of subchondral bone, we have measured the intraosseous oxygen and carbon dioxide tensions together with the intramedullary pressure in the femoral heads of patients with unilateral arthrosis of the hip. The measurements were performed with a technique based on mass spectrometry in connection with total replacement operations. All patients were closely examined to exclude disease in the opposite hips, which were used as controls.

Ten paired measurements showed intramedullary pressures of 41.2 ± 4.2 (mean \pm SE) mm Hg in the arthrotic femoral heads and 23 ± 3.5 mm Hg in the normal femoral heads. The measurements by mass spectrometry revealed a pO_2 of 40 ± 6 mm Hg and 60 ± 6 mm Hg in the diseased and in the normal femoral heads, whereas the pCO_2 levels were 50 ± 3 in the arthrotic and 47 ± 3 mm Hg in the normal femoral heads.

The differences in intramedullary pressure and in partial pressure of oxygen were highly significant ($P < 0.005$), whereas the difference in partial pressure of carbon dioxide was not significant. These results demonstrate effects of the disturbed vascular structure.

Two- to nine-year follow-up of exchange arthroplasty with gentamicin cement of infected total hip replacements

Lennart Sanzén, Åke Carlsson, Göran Josefsson & Lars Lindberg

Departments of Orthopedic Surgery, Malmö, Gävle and Kristianstad, Sweden

We reviewed the results of exchange arthroplasty in 110 infected total hips. The diagnosis at the primary THR was arthrosis in 81 hips, CDH in 9, femoral neck fracture in 9, rheumatoid arthritis in 6, and miscellaneous in 5 hips. The age at the exchange operation was 64 (21–81) years. After a minimum follow-up of 2 years, 102 hips remained. The infections healed in 77 hips (75%). Eight still infected hips were exchanged a second time and five of them healed, indicating a final healing rate of 82/102 (80%). The healing rate for infections with aerobic Gram positives was 51/62, aerobic Gram negatives 9/11, anaerobes 14/18, and mixed flora only 3/11, $P < 0.01$. There were three relapses of the infection in patients with initially healed infections 32, 51, and 62 months postoperatively. In 9/25 of the persistent infections

after the first exchange arthroplasty, a new bacteria was cultured. This may represent an "infection rate" at the exchange operation of 9/102 (9%).

Radiographic loosening was evaluated in 76/77 hips with healed infections after an average follow-up of 71 ± 24 months (24–117). In 14 hips the stem had subsided; in 4 the socket had migrated; and in 5 both components were loose. Another eight hips had already been revised for loosening (6 stems and 2 both components). Thus, the total loosening rate was 31/76 (40%).

Infections after total hip arthroplasties

S. Mäisalo, K. Österman & M. Ylikoski

The Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

In order to find out whether the overall postoperative infection rate correlated with that of endoprosthetic surgery in our hospital as well as to study the results of treatment, all postoperative infections during 1972–1983 were analyzed retrospectively and statistically compared with the infections after total hip replacements.

During the follow-up period a total of 401 postoperative infections arose (mean infection rate 1.4%), 60 of which were after hip arthroplasties (mean infection rate 2.0%). In both groups, two thirds of the infections were deep. The annual infection rate remained stable in the whole group. Instead, in the last 4 years, the infection rate after total hip arthroplasties decreased to 1.2 per cent. The yearly infection rate in both groups was highest in september. Although there were similarities in the infection profile, no evident influence of the other orthopedic infections on endoprosthetic surgery could be verified.

The final result after infection was bad in the whole group in 11 per cent and in the total hip replacement group in 25 per cent. Half of the infected endoprostheses needed at least one reoperation and 13 per cent needed three reoperations. The overall time of hospitalization decreased during the follow-up period from 22 to 12 days. The mean time of hospitalization after infection was 60 days. After an infected arthroplasty, the treatment time was 81 days and 31 per cent of the patients were treated at hospital over a hundred days. From this material it can be seen that an infected endoprosthesis still leads to a heavy and long treatment and to big economic losses.

Ipsilateral femoral shaft fractures after hip arthroplasty

J. Steen Jensen, Gunnar Barfod, Dirck Hansen, Eilif Larsen, Frank Linde, Henrik Munck & Bent Olsen

Departments of Orthopedic Surgery, University of Copenhagen and University of Aarhus, Denmark

The purpose was to identify the preferable principles of treatment for fracture around femoral stems in hip arthroplasty.

In a series compiled from five departments, 139 fractures were treated in 74 noncemented and 65 cemented arthroplasties. The patients were followed clinically and radiographically until union of the fracture or a steady clinical state was obtained.

In firmly fixed prostheses spiral fracture extending distally from the area around the stem predominantly occurred in loose cemented prostheses or non-cemented designs without loosening. The location or comminution of the fracture did not influence the results significantly.

Long-stem revision arthroplasty resulted in good clinical results (no pain, restored walking ability) in 11/16 firm and 12/16 loose prostheses and further revision in 2/34 cases. Traction treatment was followed by 13/24 good results in firm and 4/11 in loose prostheses and 3/38 were revised. Consequently, the long-stem revision arthroplasty is considered the treatment of choice; also because the hospitalization time is reduced.

Internal fixation with the prosthesis in situ showed good results in 16/44 firm and 4/11 loose prostheses, but secondary revision was needed in 12/58 cases. No difference in relation to the choice of fixation method was found. Removal of the femoral component and internal fixation should not be considered because 7/9 had to be reoperated on with a new prosthesis later on.

Hip fracture

Garden's classification of femoral neck fractures: An assessment of the interobserver variation in Garden's classification

Peter A. Frandsen, Erik Andersen, Frank Madsen & Thomas Skjødt

Departments of Orthopedic Surgery and Diagnostic Radiology, Esbjerg Central Hospital, Esbjerg, Denmark

During the last decades, Garden's preoperative classification of femoral neck fractures has been widely adopted. Although Garden's classification seemingly consists of four well-defined stages, a precise distinction has not been made between the different stages. The purpose of this study was to determine the interobserver variation when examining an identical series of radiographs to classify them into their respective groups according to Garden's classification.

Radiographs of 100 randomly chosen femoral neck fractures were studied by 8 different observers.

Results. The radiographs were classified identically by all 8 observers in only 22 cases. Another 45 cases were classified either as an undisplaced fracture (stages 1 and 2) or as a displaced fracture (stages 3 and 4) by all observers. Between the different observers, the number of displaced fractures varied from 63 to 89.

Conclusion. The results of our study have shown that a panel of 8 observers had a relatively poor ability to delineate the various stages of Garden's classification as the description of the classification in many cases left room for a different assessment by different observers.

Roentgen stereophotogrammetry in femoral neck fractures: Report of 7 cases

Jon Invar Ragnarsson, Lars-Ingvar Hansson, Johan Kärrholm & Göran Selvik

Department of Orthopedics, University Hospital, Umeå, and Department of Anatomy, Lund University, Lund, Sweden

Fracture stability is of great importance in the treatment of femoral neck fracture. We have used roentgen stereophotogrammetric analysis (RSA) to measure fracture movements in the postoperative period.

Seven patients with intracapsular hip fractures operated on with Hansson hook-pins were studied. At the operation, 3-5 tantalum balls were inserted on both sides of the fracture. The fractures were clas-

sified by the Garden classification. $^{99m}\text{Tc-MDP}$ scintimetry was performed 9–14 days after surgery. RSA was done regularly up to 9 months after fracture.

Two patients with Garden type II fracture displayed mainly a posteriodistal displacement (maximum posterior and distal displacement; 6 and 3 mm, respectively) during the first postoperative month. The postoperative femoral head ratios were 2.5 and 4.2, respectively. In 5 patients with Garden type III or IV fractures, the distal translations were more pronounced (up to 8 mm 1 month after the operation), whereas the posterior displacements were rather equal to the two type II fractures. Fracture compression (total translation) of about 1 cm was observed 1 month after the operation in cases with femoral head ratios of both 0.7 (Garden type III) and 2.5 (Garden type IV). Rotations of the femoral head were less than 3° in all but 1 patient.

RSA enables a detailed analysis of the efficiency of the osteosynthesis and the influence of femoral head vitality on postoperative fracture compression and consolidation.

Radionuclide scintimetry for prediction of the healing course after femoral neck fracture

Karl Akke Alberts, James Hindmarsh, Hans Ringertz & Mats Dahlborn

Departments of Orthopedics, Södersjukhuset, Stockholm, and Diagnostic Radiology, Huddinge Hospital, Huddinge, Sweden

Forty-five patients with with fresh femoral neck fractures were included in a prospective clinical, radiographic, and sequential scintimetric study. The aim was to identify the factors predisposing to healing complications (redisplacement/nonunion or late segmental collapse) as compared with fractures resulting in uneventful union.

Striking changes in radionuclide uptake over the entire hip region on the fracture side were found during the first 5 postoperative months. Fractures that healed without subsequent complications showed the highest femoral head uptake at 1 week and a peak value at 6 weeks, followed by a gradual decline at the subsequent examinations. Fractures resulting in complications showed a lower initial uptake and more gradual increase and only a slight tendency towards increased uptake after 3 months. The accuracy of scintimetric examination alone is almost equally high at 1 and 6 weeks in predicting nonunion as combined scintimetric, radiographic, and clinical assessment more than 3 months postoperatively.

However, in clinical practice – in which, among other things, economic considerations and the early mortality rate are relevant factors – it would not seem feasible to perform scintimetry in other patients than those without radiographic signs of redisplacement, but with persistent weight-bearing pain more than 3 months postoperatively.

Why does femoral head collapse occur after undisplaced cervical fractures?

Björn Strömqvist, Hans Wingstrand, Niels Egund, Torbjörn Gustavsson, Lars T. Nilsson & Karl-Göran Thorngren

Departments of Orthopedics, Diagnostic Radiology, and Nuclear Medicine, University Hospital, Lund, Sweden

Introduction. In cervical hip fractures with minor displacement, segmental femoral head collapse occurs in 5–10 per cent of the cases. In single cases, traumatic osteosynthesis has been shown to be the reason, but the complication occurs also when atraumatic osteosynthesis is used. This investigation studies whether hip hemarthrosis may be the pathogenetic mechanism in these cases.

Material and methods. Eight patients, aged 63–87 years, admitted after hip joint trauma during 1 year. In 4 cases, undisplaced cervical fractures were radiographically evident on admission; in the remaining 4 cases, follow-up radiographs have confirmed the same diagnosis. $^{99m}\text{Tc-MDP}$ scintimetry, radiography, computed tomography, and intraarticular pressure measurements were performed.

Results. On admission to the hospital, all the patients had decreased femoral head vitality according to scintimetry; and CT-scans demonstrated intracapsular hematomas. Intracapsular pressure recordings (mm Hg) were performed, showing 175 ± 103 with the hip in extension and neutral rotation, 278 in inward rotation, and 26 in semiflexion. After joint aspiration (0.5–36 ml) the hip pain was markedly reduced; computed tomography showed reduction of the hematomas and scintimetry showed a restitution of the isotope uptake. In a short-term follow-up, no radiographic avascular changes of the femoral head have been revealed.

Conclusions. In undisplaced cervical hip fractures, hemarthrosis may cause intracapsular pressures exceeding the arteriolar pressure of the intracapsular vessels supplying the femoral head. This may be a contributory mechanism in the development of segmental femoral head collapse.

Cannulated screws versus spring loaded single nail in cervical hip fractures: A prospective randomized trial

Ingemar Sernbo, Per Edwards, Olof Johnell & Lars Bååth

University of Lund, Departments of Orthopedics and Radiology at Malmö General Hospital, Malmö, Sweden

This is a prospective randomized trial of two methods of osteosynthesis in cervical hip fracture.

Material and methods. All cervical hip fractures from 1982 to 1983 (300 patients) were randomized into two groups that were operated on either with the Rydell spring-loaded single nail or with three cannulated screws. The prefracture background factors were recorded and the patients were followed clinically and radiographically for 2 years after osteosynthesis. The mean ages of the female and male patients were 79 and 76 years, respectively; 73 per cent were women, and 65 per cent were living in their own homes at the time of the injury. The mortality after 1 year was 26 per cent and after 2 years 38 per cent. There was no difference between the two groups with regard to their vital statistics, walking capacity, general morbidity, or fracture classification according to Garden.

Results. After 1 and 2 years, there was no significant difference in social rehabilitation, mortality, and walking capacity between the two types of treatment. After 2 years, there was a nonsignificant difference between the two groups when comparing the total number of complications (early sliding or dislocation, necrosis of the femoral head, or femoral neck psuedarthrosis) – 36 per cent in the Rydell nail group and 30 per cent in the three screws' group; reoperation was performed in 20 per cent of the Rydell nail group and in 16 per cent of the three screws' group. One of the surgeons who was also the principal investigator performed 36 per cent of the operations and had significantly fewer reoperations and other complications than were seen in the remaining patients who had been operated on by 28 different surgeons.

Two versus three von Bahr screws in femoral neck fractures: A cadaver study

Torstein Husby, Arne Høiseth, Erik Fønstelien & Antti Alho

Section of Orthopedics and Department of Roentgenology, Ullevål Hospital, University of Oslo, Oslo, Norway

In the present study, vertical subcapital osteotomies were performed in 18 cadaveric femoral necks (68–90 years). To correct for the effect of varying bone density, computed tomography was done through the femoral condyles prior to the experiments. In group A the osteotomies were fixed with two screws distally and one proximally. Group B was fixed with one distal and two proximal lag screws, and group C with one distal and one proximal screw. All the distal screws rested on the medial calcar in the femoral neck. There were six femora in each group. The specimens were submitted to mechanical testing (Instron, TTMM, Universal Material Testing Machine). Continuously increasing axial compression was applied with a constant speed of 5 mm/min, load and deflection being registered on an x-y writer.

Using the load/CT ratios at 2 and 5 mm displacement and at maximal load there were no significant differences between group A and B (Wilcoxon test). Group A plus group B compared with group C did not show any significant difference in the measured parameters either.

Investigations testing all three groups for rotational stability are in progress and the results will be presented. According to our primary results, there seems to be no biomechanical advantage in using three von Bahr screws instead of two.

Sliding screw plate versus four ASIF cancellous bone screws in the treatment of displaced femoral neck fractures

Frank Madsen, Frank Linde, Erik Andersen, Hanne Birke, Inge Hvass & Torben D. Poulsen

Department of Orthopedics, Esbjerg Central Hospital, Esbjerg, Denmark

The frequency of nonunion is a major problem in the treatment of displaced femoral neck fractures. However, only in a few studies patients with displaced femoral neck fractures have been randomized to osteosynthesis with various devices. During the last decade, sliding screw-plate osteosynthesis has been

widely adopted in the treatment of femoral neck fractures.

We present a prospective study of 104 consecutive cases of displaced femoral neck fractures randomly allocated to either sliding screw-plate osteosynthesis or to osteosynthesis with four ASIF cancellous bone screws. The patients were followed for 2 years.

The cumulated chance for union in the sliding screw-plate group was 65 per cent and in the four ASIF cancellous bone screws' group 86 per cent ($P < 0.05$). There was no difference in the rate of late segmental collapse after fracture union in the two treatment groups.

These results favor osteosynthesis with four ASIF cancellous bone screws as opposed to sliding screw-plate osteosynthesis.

Reoperations for hip fractures

Peter Lühje & Esko Partio

Section of Surgery, Regional Hospital Jokilaakso, Jämsä, and Section of Orthopedics, Central Hospital of Middle Finland, Jyväskylä, Finland

The majority of healing complications after hip fractures occur during the two first postoperative years. The purpose of this study was to investigate the indications for and frequency of reoperations in patients with hip fractures.

Between 1973 and 1982, 1,063 patients with a hip fracture were treated operatively in the area of the Central Hospital of Middle Finland. All the reoperations after this fracture were studied.

Reoperations after cervical hip fractures occurred in 25 per cent, after trochanteric fractures in 7 per cent. About 60 per cent of the reoperations were performed during the first year postoperatively. The average time spent in the hospital because of the reoperation was 12 days, and the average age of the patients was 73 years. The main reasons for reoperation after cervical hip fractures were in 28 per cent of the cases perforation of the femoral head caused by the nail, in 28 per cent nonunion of the fracture, in 19 per cent technical failure, and in 11 per cent segmental femoral head collapse.

In conclusion, 20 per cent of the patients with a hip fracture had to be reoperated on.

Social and clinical 5-year results after femoral neck fracture nailing

Lars T. Nilsson, Björn Strömqvist & Karl-Göran Thorngren

Department of Orthopedics, University Hospital, Lund, Sweden

Introduction. The aim of this study was to determine the results after internal fixation with a four-flanged nail (Rydell) in a large consecutive series from one department.

Patients and methods. During 1977-1980, femoral neck fractures were routinely operated on with a four-flanged nail at our department. Files on all but 2 patients were retrieved and the patients were interviewed by telephone if alive. In cases with hip pain, a clinical examination was offered. Thus, 502 patients, 50 years or older at the time of fracture, were followed for 5 years.

The mean patient age was 78 years and the male:female ratio was 1:3. Twenty-five per cent of the fractures were undisplaced (Garden I and II).

Social results. Mortality was 11 per cent at 4 months, 21 per cent at 1 year, and 53 per cent at 5 years. Sixty-three per cent of the patients were admitted from their own home. One year later, 41 per cent were still in their own home, and at 5 years 30 per cent. Corresponding figures for those living in an old people's home were 24 per cent, 17 per cent, and 9 per cent, respectively. Eleven per cent were institutionalized before fracture and 15 per cent 1 year later. Of patients coming from their own home, 82 per cent of the survivors were at home at 4 months after fracture and 76 per cent at 5 years.

Clinical results. Subtrochanteric fractures through the nail entrance occurred in 1 per cent and infections in 3 per cent. Secondary prosthetic replacement was performed for nonunion/redisplacement in 3 per cent of undisplaced and 19 per cent of displaced fractures and for segmental collapse in 3 and 6 per cent, respectively.

Summary. In a 5-year follow-up after femoral neck fracture nailing, the majority of the survivors had returned to their prefracture habitat. Secondary prosthetic replacement because of healing complications was performed in 21 per cent of the total material.

Consequences of different programs for rehabilitation after femoral neck fracture

Karl-Göran Thorngren, Sven Holmberg, Berit Jakobsson, Gun-Britt Jarnlo, Lars T. Nilsson & Björn Strömqvist

Department of Orthopedics, University Hospitals in Lund and Danderyd, Sweden

The rehabilitation of two consecutive series of patients with femoral neck fracture from Stockholm and Lund were compared. Of the patients, 79 per cent were admitted from their own home in the Stockholm area, whereas in Lund 62 per cent came from their own home and 25 per cent from old people's homes. The majority of the patients had returned to their prefracture habitat within 6 months in Stockholm, many using geriatric hospitals for secondary rehabilitation after leaving the acute hospital. Great differences between various centers were found. Patients treated in general surgical units stayed longer in the acute hospital and utilized more secondary rehabilitation resources than those treated in orthopedic units.

In the Lund area, the majority of the patients had returned directly from the acute hospital to their prefracture habitat within 2 months from the fracture. All of these hip fractures were uniformly treated at an orthopedic department with standardized treatment procedures and a rapid rehabilitation program.

Using the average day cost for the different treatment levels, the cost can be calculated. If 100 cervical hip fractures were treated in Stockholm with the same program as in Lund, 3.6 million Swedish kronor would be saved during the first 4 months after the fracture. Just about 1,000 cervical hip fractures occur each year in the Stockholm area and around 7,000 in Sweden. Thus, the economic consequence of applying standardized optimized treatment schemes for this resource-consuming type of fracture is obvious.

Prognostic-based rehabilitation of hip fractures

Margareta Thorngren, Lars T. Nilsson & Karl-Göran Thorngren

Departments of Community Health Science and Orthopedics, University Hospital, Lund, Sweden

In Lund, Sweden, a rapid rehabilitation program with mobilization in the orthopedic department and direct rehabilitation at home with a minimum of secondary institutionalized rehabilitation has been ap-

plied to patients with hip fractures. Most of the patients have returned to their homes within 2 weeks. Even so, a small group of patients, who by experience have a bad prognosis for returning home, have been referred to geriatric care for further rehabilitation.

To optimize the outcome for this group of patients with intensified rehabilitation within geriatric units, a standardized prognostic scheme based on significant variables performed by multiple linear discriminant analysis was used as selection criteria for admittance to geriatric care. The prognostic variables were walking ability and activity of daily life at 14 days after the fracture, living alone or not, type of fracture, and age. Prognosis was made for all hip fracture patients and those with a bad prognostic score were referred to the geriatric hospital at an early stage for intensified rehabilitation efforts.

During 1984, 38 patients (approx. 10%) were referred. The outcome of rehabilitation was followed for 6 months after the hip fracture. Most of the patients had other serious diseases, i.e., cerebrovascular disease, senile dementia, multiple fractures, or Parkinson's disease. Of the 38 patients, 18 came from their own home and 20 from old people's homes. Within 6 months, 21 (55%) had returned to independent living. Six had died and 11 still required continuous hospital care. The rehabilitation results reached an optimum at 4 months. After 6 months, no additional patients returned to their prefracture habitat.

Knee

Antiflogistics after arthroscopic meniscectomy

Mats Bauer, Darrel Ogilvie-Harris¹ & Paul Corey²

Department of Orthopedics, University of Lund, Malmö General Hospital, Malmö, Sweden, ¹Toronto Western Hospital, Division of Orthopedics, University of Toronto, Canada, and ²Department of Preventive Medicine and Biostatistics, University of Toronto, Canada

Methods. The postoperative course after arthroscopic meniscectomy was studied in a prospective randomized double-blind study. An active treatment group was given naproxen sodium 550 mg two times daily for 6 weeks and a control group was given placebo tablets. Informed consent was obtained from all patients. Follow-up was performed 1, 3, 6, and 12 weeks postoperatively.

Methods. In all, 139 patients completed the study. Patients who had taken the antiflogistic drug had less pain, less synovitis and swelling, and regained

mobility and quadriceps function more rapidly. They also returned to work and to sports activities earlier. The difference between the groups diminished with time, which indicates that the end result is probably the same. One patient in the active treatment a group dropped out of the study due to gastrointestinal side effects.

Conclusion. The use of antitrogistics in the postoperative phase enhances the recovery after arthroscopic meniscectomy. Muckle has previously shown this after traditional open meniscectomy, and our findings are also supported by Arvidsson in a recently published study.

References.

Muckle D. S. (1984) Open meniscectomy. Enhanced recovery after synovial prostaglandin inhibition. *J. Bone Joint Surg.* **66-B**, 193–195.

Arvidsson I. (1985) A study of rehabilitation after knee surgery with special emphasis on pain inhibition on voluntary muscle activation. Thesis. Karolinska Institute.

Total condylar knee replacement in gonarthrosis. Four to six years' follow-up

Ivan Hvid, Jon-Oddvar Wethelund & Otto Sneppen
The Orthopedic Hospital, Aarhus, Denmark

The purpose of this study was to analyze the 4–6 year results of total condylar knee arthroplasties performed as primary intervention for gonarthrosis between April 1979 and January 1982.

One hundred and fifteen consecutive arthroplasties in 97 patients were evaluated. Five patients (5 knees) died during the period of follow-up. One knee had an arthrodesis after a pyarthron. Eight knees in 6 patients were lost to follow-up. The remaining 101 arthroplasties were carried out in 85 patients (69 women and 16 men) with a mean age of 70 (49–80) years.

All patients were evaluated preoperatively and postoperatively by the New York Hospital for Special Surgery Knee Rating Scale. The maximum is 100 points subdivided in 6 categories. A score of 85–100 points was regarded as an excellent result, 70–84 as a good result, 60–69 as fair, and less than 60 as poor.

Based on the total score, the overall results were rated excellent or good in 89 per cent at follow-up. Pain on walking was present preoperatively in 92 per cent grouped moderate or severe; at follow-up 92 per cent had none or slight pain. Walking distance more than 500 meters preoperatively in 13 per cent increased to 84 per cent at follow-up. In 81 per cent, the range of motion at follow-up was better than or equal to the preoperative range, most markedly im-

proved in patients who had a preoperative range of motion less than 80 degrees. Normal alignment (3° – 11°) was present in 22 per cent preoperatively, improving to 88 per cent at follow-up. Thirty-four early and three late complications were recorded in 28 patients (29 per cent). Among these 7 cases (7 per cent) were serious pulmonary embolism (3), cerebral insult (2), toxic renal insufficiency (1), and deep knee infection (1).

The total condylar knee prosthesis used seems effective in relieving pain and provides a good functional result in patients with gonarthrosis as evaluated by the 4–6 years' results.

Total knee replacement with an uncemented prosthesis (AGC 2000)

S. Solgaard, K. Rechnagel & M. Rasmussen

Departments of Orthopedic Surgery and Radiology, Hillerød Hospital, DK-3400 Hillerød, Denmark

Thirty-five patients with 39 total knee replacements using the AGC 2000 (Anatomically Graduated Components) were evaluated clinically and radiographically after 15 (11–21) months. In 33 knees the prosthesis was uncemented. There was one superficial infection and 3 patients developed deep venous thrombosis.

The results were evaluated using the scoring of the Hospital of Special Surgery. The average preoperative score was 49 points and the average postoperative score was 88 ± 10 (SD). The difference between patients with cemented and uncemented replacements was not significant. The loss of points from the maximum score (100) was mainly due to lack of flexion (average knee flexion 104 degrees), whereas the score for pain, strength, deformity, and instability was maximal. The patients' assessment was in agreement

The average hip-knee-ankle axis was 8 degrees of valgus determined by clinical examination, averaging 3 degrees of valgus at radiographic examination. In 32 knees a sclerotic zone under the tibial plateau was noted, and a similar zone could be seen under 24 of the femoral and 12 of the patellar components. There was no correlation between the score at follow-up and the radiographic appearance. In 1 case the tibial component was radiographically loose. This patient had a postoperative score of 97 points.

Unicompartmental knee arthroplasty: A prospective consecutive series followed for 6–12 years

Sven-Erik Larsson & Sune Larsson

Department of Orthopedics, University Hospital, S-581 85 Linköping and S-901 85 Umeå, Sweden

Gonarthrosis is primarily a single compartment joint disease. Unicompartmental arthroplasty therefore seems to be a logic procedure of treatment and an alternative to high tibial osteotomy. Still, opinions differ as to the long-term results and which procedure should be preferred.

During the years 1973–1979, a consecutive series of 102 unicompartmental arthroplasties were performed (S.-E.L.) in 90 patients using the St Georg endoprosthesis. Strict indications, standardized operative procedures, and postoperative regimes were used. Mean age was 66 (51–80) years. The arthroses were of grades II–IV. At follow-up, 15 patients had died from unrelated causes (17%), but results were obtained from the medical records. The remaining 86 arthroplasties in 75 patients were *all* reexamined clinically and radiographically (S.L.).

Medial compartment arthroplasty was performed in 80 per cent and lateral in 20 per cent of the cases. During that period, they constituted 71 per cent, bi-compartmental 24 per cent, and hinge 5 per cent of all knee arthroplasties. One uneventful wound infection and one vein thrombosis were early complications, and late complications were one deep infection with resulting arthrodesis, two loosening (one traumatic and one due to neuropathy) that were revised and two that were treated conservatively.

Knee function score (Hospital for Special Surgery) at the average follow-up of 8 years was 77 (42–97) compared with 43 (28–60) preoperatively. When grouped according to the year of operation, similar scores were obtained with no tendency to impairment after up to 12 years' observation. Most patients experienced lasting pain relief (only 12/81 had moderate pain). The effect on extension defect, instability, and range of movement remained good. Subjectively, 68/81 patients were good-very good, 9/81 not so good, 4/81 bad (the complications). Radiographically, the opposite compartment remained healthy for the age, i.e., 79/81 showed grade 0–I arthrosis, 1 grade II, and 1 grade IV.

Patella problems after ICLH replacement of the knee joint

A. Hellgren, L.-Å Broström, I. Goldie & V. Söderlund

Departments of Orthopedics and Diagnostic Radiology, Karolinska Hospital, Stockholm, Sweden

Between 1978 and 1982, the two-part ICLH prosthesis was used to replace the knee joint in 42 patients. In 1985, 36 patients, 21 of whom had rheumatoid arthritis and 14 arthrosis, were reexamined with special interest focused on stability and problems concerning the patella.

Three patients were reoperated on with an arthrodesis because of deep infection. Results of the remaining 41 arthroplasties with a minimum follow-up of 2.5 years, mean 4 years, were assessed clinically using the BOA knee function chart. Radiographic examination included measurement of mechanical axis, HKA angle, and degree of patellar dislocation at 30, 60, and 90 degrees of flexion.

Resection of the patella was performed in 18 and lateral release in 14 knees. Seven patients were enthusiastic, 24 satisfied, 9 noncommittal, and 1 was disappointed with the operation. A general improvement in pain, range of motion, and walking ability was seen in all but 1 patient with severe RA and persistent instability. Mean score was 44 points out of a maximum 55 points. There was pain remaining in 9 knee joints, all of which were unstable and with subluxation of the patella. Clinical subluxation of the patella was seen in 30 knees, 25 of which not operated on with a lateral release. Instability was staged for 14 knees, 12 of these in patients with RA. Except for instability, no major difference was seen between patients with RA or OA. Resection of the patella did not influence the result, but a lateral release seemed to prevent patellar dislocation and is considered of importance for the outcome. Three reoperations were performed. In all the patients, the indication was pain and patellar subluxation. Lateral release in 2 and patellectomy in 1 gave functional improvement. Radiographic examination of position and degree of dislocation of the patella confirmed the clinical findings and further emphasized the importance of lateral release to prevent dislocation when using a two-component ICLH prosthesis for replacement of the knee joint.

Loosening is the normal prosthetic behavior in arthroplasty of the knee!

Leif Ryd, Anders Lindstrand & Göran Selvik

Department of Orthopedics, University Hospital and Institute of Anatomy, University of Lund, Lund, Sweden

Rigid fixation of prosthetic components to bone has been regarded as a prerequisite for lasting good results in joint replacement surgery. Radiographic findings, such as radiolucencies and migration, suggesting deficient fixation to bone may occur also in clinically successful knee arthroplasties. Such case have rather ambiguously been said to suffer from asymptomatic loosening.

To investigate the quality of the bond between the tibial component and the tibia, roentgen stereophotogrammetric analysis (RSA) was used in 100 cases of knee arthroplasty for gonarthrosis. The prostheses used were the Marmor and a modified Marmor with metal backing, the Total Condylar, the Kinematic, and the PCA. The latter prosthesis was inserted fully ($n = 7$) or partially cemented ($n = 10$) or completely without cement ($n = 13$). Seven cases were regarded as failures, only 1, however, with prosthetic loosening. The displacement of the tibial component was followed longitudinally with time, i.e., migration, and, after 1–2 years, in response to external forces: inducible displacement.

Inducible displacement was found in 98 cases. For cemented prostheses the mean inducible displacement was 0.4 mm, the corresponding value for uncemented prostheses being 0.7 mm ($P < 0.01$). All cases in the material showed migration. For cemented prostheses the migration was 1.0 (0.2–3.2) mm after 2–5 years, whereas the uncemented prostheses migrated 2.4 (0.5–5.0) mm after 2 years ($P < 0.01$). A majority of the prostheses migrated only initially and remained stable after 1 year; a minority migrated continuously during the period studied.

Ninety-eight out of 100 prostheses were detachable from their resting position, and all of them were detached from the original postoperative position. From a technical point of view, all of these prostheses were thus loose. Continuous migration requires a biological process including bone remodelling, and such prostheses are biologically loose. One prosthesis, which initially migrated continuously, became symptomatic and was thus functionally loose.

Hemitibia osteotomy in genu varum and valgum

Mohammed Zayer

Department of Orthopedics, Ängelholm, Sweden

Mayer (1851) described different types of tibial osteotomies, and Langenskiöld (1964) used curved tibia osteotomy combined with oblique osteotomy of the fibula in case of Mb Blount. Stören (1970) reported his technique on a 13 year old girl with Mb Blount and Roy et al. (1970) on 3 children older than 5 years.

Material and method. Four cases (4 knees) were treated by hemitibia osteotomy with elevation of the medial or lateral tibial plateau and plugging with a whole thick wedge transplant from both crista iliaca and fixation with a plaster cast.

A 19-year-old boy with progressive juvenile Mb Blount since 8 years of age, and 40° genu varum at 15 years of age when the operation was performed. Excellent result.

A 16-year-old girl with progressive juvenile Mb Blount since 12 years of age and 30° genu varum at 14 years of age when the operation was performed. Excellent result.

A 45-year-old-man who at age 42 had been operated on because of severe lateral tibial condyle fracture by open reposition + bone chips + AO screw and 3 Rissler pins. Reoperated on 6 weeks later by hemitibial osteotomy. Fair result.

A 60-year-old woman who at age 57 had been operated on because of severe medial tibial condyle fracture by open reposition and fixation with a screw. Reoperated at aged 58 by hemitibial osteotomy. Poor result.

Primary suture of fresh anterior cruciate ligament tears in patients involved in contact sports.

Torbjörn Strand

Department of Orthopedics and Traumatology, Haukeland Hospital, University of Bergen, Norway

We have previously reported good long-term results after primary suture of fresh anterior cruciate ligament tears by the Palmer technique. However, a considerable number of our patients had a moderate or low activity level postoperatively.

The results of similar repairs in a group of 63 patients involved in soccer, handball, and basketball were evaluated after 2–10 years. No major instabilities were found among 15 patients who chose not

to return to their previous sports, whereas 40 per cent of those who attempted or actually did return revealed major instabilities. Only 24 per cent of the total series returned to their previous level of performance without symptoms. Most patients with ACL insufficiency had to give up their sports, and 60 per cent of these had episodes of giving-way during daily activities.

In conclusion, the failure rates by the Palmer technique is unacceptably high in this high-risk group. Augmentation techniques may possibly give better results.

Three-12 years' results after early treatment of posterior cruciate ligament injuries

Magnus Lindh, Jack Lysholm & Jan Gillquist
Department of Orthopedics, University Hospital,
Linköping, Sweden

Early repair of a torn posterior cruciate (PCL) is considered to give a good functional result. It has been our experience, however, that a moderate posterior drawer often remains, although knee function is excellent. This fact may jeopardize the result in the long run.

Material and methods. Totally, 55 patients (73%) were treated in the first 3 weeks' phase after an injury to the PCL.

In 12 patients (22%) the ligament was torn off the tibia with a piece of bone. Seven (13%) had partial tears. Thirty-six (65%) had total substance tears. In 65 per cent the PCL tear was combined with other lesions. The medial meniscus was torn in 20 per cent and the lateral in 7 per cent.

All partial tears were treated conservatively. A suture repair (Palmer, 1938) was done in 25 patients, primary reconstruction in 5, and reduction and fixation of an avulsed bone fragment in 12. Six patients with a total tear were treated conservatively.

A follow-up was conducted in all the patients 5 (2-12) years after the injury. Eighteen patients with more than 6 years' follow-up had a standing radiographs including patellofemoral axial views. The functional result was evaluated by means of a knee score, activity rating, a knee function test, and Cybex-II measurements. In addition to this, a clinical stability examination was done.

Results. Seventy-four per cent of the patients were rated good or excellent (knee score 83-100). Eighteen patients had an earlier follow-up using the same knee score with similar results. Patients with combined injuries had a significantly lower score and test performance than the others. The median activity

level was 5. Patients with PCL tears in combination with a torn anterior cruciate (ACL) had a significantly lower level of activity (median 2) than the others. Most patients showed a moderate (1+) posterior drawer sign. This was common even among those with partial tears or avulsions. Forty-five per cent of those who had a radiograph had early signs of arthrosis; 6/7 patients in the radiograph group who had had medial meniscectomy were included among these 45 per cent.

Conclusions. The functional result was good after early treatment of the torn PCL, although a slight to moderate posterior instability was common. In patients with more than 6 years' follow-up, early signs of arthrosis were common especially in those who had had a medial meniscectomy.

Extra-articular reconstruction of the anterior cruciate ligament

Hans Chr. Blom & Asbjörn Roaas
Martina Hansen's Hospital, Sandvika, Norway

The surgical repair of the anterior cruciate ligament-deficient knee is controversial. The present study is a long-term follow-up of commonly used procedures.

From 1977 to 1982, extraarticular reconstruction of the torn anterior cruciate ligament was performed in 52 patients. The procedures utilized were pes anserinus transfer (Slocum), transfer of the iliotibial tract (Ellison), iliotibial "sling and reef" (Losee), biceps tendon transfer, and combinations of these. All 52 patients have been reexamined with a median 5-years' follow-up.

Preoperatively, 49 of the patients had a positive pivot shift test. At the examination, 70 per cent were functionally stable, though half of them still had a slightly positive pivot shift test. The Lachman test and the anterior drawer test in flexion were positive in all 52 patients at the reexamination. Only 2 of the patients asked for a new operation for their knee instability.

The study shows that the extraarticular reconstructions do not correct the anatomic instability of a torn anterior cruciate ligament. The procedures have to a great extent eliminated the functional instability.

Reconstruction of chronic ACL insufficiency with a vascularized anatomic graft: A preliminary report

P.-O. Kroon, L. Gustafson, U. Järvholm & L. Peterson

Department of Orthopedics, Östra Hospital, University of Göteborg, Gothenburg, Sweden

Reconstruction of the anterior cruciate ligament (ACL) insufficient knee is an orthopedic challenge, and there is no definite consensus of which method to use. A new, anatomic vascularized reconstruction has been designed. The medial third of the patellar tendon is enhanced with a portion of the medial longitudinal retinaculum, which gives additional strength and vascular supply to the patellar tendon graft. This technique substitutes the posterolateral and anteromedial bundles of the ACL.

The first 20 patients operated on with this technique were evaluated. Twelve patients also had collateral ligament insufficiency and/or meniscal injuries treated simultaneously. At follow-up 18 (12–24) months postoperatively, subjective evaluation, functional scoring with the Lysholm score and clinical examination including a knee laxity tester (Stryker) was done. The subjective results were excellent or good in 15 patients, fair in 2, and 3 remained poor. Fifteen patients participated at their preinjury level of sports. The Lysholm score improved from 60 (33–90) points to 89 (66–100) points at follow-up. The Stryker knee laxity test showed a minor increase of anterior drawer at 20 and 90 degrees of knee flexion compared with the healthy knee. Half of the patients had a slightly increased Lachman test (1+) and anterior drawer sign. The pivot shift sign was still positive in 4 patients, of whom 2 probably had graft ruptures due to new trauma.

Good or excellent results were found in 75 per cent of the patients and preinjury sport activities could be resumed. Though this follow-up is short and not all the patients were totally stable, we find this method promising for reconstruction of chronic ACL insufficiency.

Results of revision of infected knee arthroplasty

Sten Bengtson, Kaj Knutson & Lars Lidgren

University Hospital, Department of Orthopedics, Lund, Sweden

Sixteen revised infected knee arthroplasties were followed for 9–115 (average 49) months. There were nine recurrences of infections resulting in four arthrodeses, two fistulating and painful prostheses, one resection arthroplasty, and one above-knee amputation. In one knee a second successful revision was carried out. Of the remaining seven revisions, four resulted in functioning prostheses, one in arthrodesis due to mechanical loosening, and two in nonfunctioning prostheses with stiff and painful knees.

The results of revision of infected knee arthroplasties were discouraging, especially for hinged and stabilized prostheses. Infected hinged or stabilized prostheses should be treated with arthrodesis. Infected compartmental prostheses should be treated with a two-stage procedure using tricompartmental prostheses.

Rearthroplasty of the knee joint in chronic deep infection: Results after 2–8 years

Anders Wigren

Department of Orthopedics, University Hospital, Uppsala, Sweden

In failure of a knee arthroplasty, arthrodesis, rearthroplasty, or resection arthroplasty are different alternatives. From 1977 to 1985, 56 knee revisions were performed at our department. Fifteen knees were referred because of a chronic deep infection. Fourteen of these patients had RA and one OA. There were 14 women and 1 man. The pathogenic bacteria were mainly *Staphylococcus epidermidis* and *S. aureus*. Seven infections were hematogenous or were spread by the lymph from a distant focus. A long delay of adequate surgical treatment was common. The primary prostheses were 1 Marmor, 1 Deane, 2 ICLH, and 11 hinges. The reoperations were made as two-stage procedures in 14/15 knee joints, and the patients are receiving permanent antibiotic therapy. Revision prostheses used were 12 spherocentric, often customized, 2 Freeman revision prostheses, and 1 PCA revision prosthesis. Of three knee joints with severe soft-tissue defects, two failed. The follow-up is 4 (2–8) years.

Eleven knee joints have good function, are without

pain, and are free of infection. One prosthesis was extracted owing to soft-tissue failure; one needed extraction for the same reason; 1 patient has a stiff painful joint; and 1 patient died at the second revision of a cardiac infarction. There have been two fractures of the femur close to the prostheses. Both were technically solved with a long-stem prosthesis.

Rearthroplasty in chronic deep infection of the knee is technically very demanding and often troublesome for the patient. The procedure seems justified in multiple joint disease to preserve the activity of daily living. In single joint disease an arthrodesis is preferable. If severe soft-tissue defects are present, the revision will probably fail. Lifelong antibiotic therapy is necessary. With these reservations, the functional results are good; the joint is without pain; and the infection is controlled. Fractures close to the artificial joint can be resolved by a long-stem prosthesis. In a progressive infection, resection and an orthosis are alternatives to fusion.

Orthopedic infections due to *Serratia marcescens*: A report of 7 cases

Olle Svensson, Per-Arne Parment¹ & Gudmund Blomgren

Department of Orthopedics, Karolinska Institute, Huddinge University Hospital, and ¹Department of Infectious Diseases, Östra Hospital, Göteborg, Sweden

Infections due to *Serratia marcescens* have been reported mostly from institutions with a heavy use of broad spectrum antibiotics. In Scandinavia, only a few cases have been reported. However, the increased use of prophylactic antibiotic therapy in orthopedics may raise the incidence of infections due to multiresistant microorganisms also in Scandinavia.

We report on 7 patients with arthritis or osteomyelitis caused by *S. marcescens*. All the cases but 1 were probably of nosocomial origin, and previous antibiotic therapy was apparently a predisposing factor. The clinical courses were generally protracted, often requiring repeated surgical interventions. Also, in several cases, adequate therapy was delayed as *S. marcescens* was considered to be a nonpathogenic saprophyte. Multiresistance to antibiotics was a major clinical problem. However, the third generation cephalosporins are often effective against *S. marcescens*, and the harmful effects of the aminoglycosides may thus be avoided.

Lower leg

Peroneal nerve entrapment

Martti Vastamäki

Orthopedic Hospital for the Invalid Foundation, Helsinki, Finland

Twenty-four patients with peroneal nerve entrapment neuropathy involving 27 legs were analyzed. Other types of peroneal nerve involvements, such as traction and contusion palsies, were excluded. There were 15 male and 9 female patients with a mean age of 44 years. The average time between the onset of symptoms and the operation was 17 months and that of follow-up 16 months.

There was complete peroneal paralysis in 11 cases; a paralysis of the muscles supplied by the deep peroneal nerve in 4 cases, resulting in drop foot; and varying degree of paresis in 12 cases. The factor provoking entrapment symptoms was an operation around the knee in 12 cases, a tibial fracture in 2, and ankle sprain in 2, working in the kneeling or cross-legged position in 4, excessive walking or climbing in 2, and a slight compression injury in 1 case. In 4 cases, no provoking factor was found. In 3 fracture cases, a plaster cast compression was found. There were no diabetics or alcoholics. The mean motor conduction velocity measured between the popliteal space and the ankle on the affected side was 38 m/s and on the unaffected side 50 m/s. In all the cases, the treatment was operative. The operation consisted of carefully liberating the nerve and dividing the tendinous arch of origin of the peroneus longus from the fibula.

Fifteen legs suffered severe paralysis. Six showed complete recovery immediately or within some days, two with some weeks, and five within 1 year. Two did not recover within 18 months. In these cases, the time between the onset of symptoms and the operation was 7 and 8 years. There was a slight peroneal paresis in 12 legs. Nine recovered completely immediately or within a couple of days, and two recovered within a few weeks. One paresis without any obvious etiology had lasted 3 years and did not recover within 18 months.

Peroneal entrapment neuropathy should be treated operatively if no or very slow recovery has been observed. The operation is simple, quick, and harmless, needs no special treatment afterwards, and provides rapid recovery in most cases.

Biodegradable versus metallic fixation in the treatment of displaced fractures of the ankle: A prospective, randomized study

Ole Böstman, Seppo Vainiopää, Kimmo Vihtonen, Antero Mäkelä, Jarmo Vuorinen, Pertti Törmälä & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, and Laboratory of Polymer and Fiber Technology, Tampere University of Technology, Helsinki and Tampere, Finland

Use of biodegradable implants in fracture fixation abolishes the need to remove the fixation material. In common fractures, like those of the ankle, this is of considerable economic importance. The development of suitable implants, however, has proved to be difficult, and this study marks the first large-scale clinical application of biodegradable implants in fracture fixation. The cylinder-shaped implants of polylactide-glycolide copolymer (polyglactin 910) were developed by our research group (described by Rokkanen et al. in *Lancet* I, 1422-1424, 1985).

In a prospective clinical study, 60 consecutive patients with a fracture of the lateral malleolus (30 patients) or a bimalleolar fracture (30 patients) showing an initial displacement of 2 mm or more, but without a total rupture of the distal tibiofibular syndesmosis were randomly allocated to two groups. One group was treated with biodegradable implants and the other with conventional AO osteosynthesis. The biodegradable rods were driven in predrilled channels from the tips of the malleoli after reduction of the fractures and the fixation was reinforced with polylactide-glycolide sutures. Postoperatively, the ankle was immobilized for 6 weeks in a below-the-knee plaster cast in both groups.

The demographic data of the patients and the severity of the initial fracture displacement of the two groups were similar. The mean age of the patients was 39 years.

Assessed from the immediately postoperative radiographs an exact reduction of the fragments was achieved in 53 patients. In 7 (3 in the biodegradable and 4 in the AO group) displacement of 1-2 mm remained. A secondary displacement of 1-2 mm occurred in 3 (2 + 1) patients while slipping on crutches, but none necessitated reoperation. A wound infection was seen in another 3 (2 + 1) patients. The early functional results were equal in the two groups.

No significant difference between the treatment groups emerged in this study. Consequently the advantage of avoiding the removal procedure asso-

ciated with metallic implants renders the ultimate outcome in favor of the biodegradable fixation method.

Closed versus open treatment of Weber type B ankle fractures

Mats Bauer, Björn Bergström¹, Anders Hemborg² & Jan Sandegård²

Department of Orthopedics at Malmö General Hospital, and Departments of ¹Diagnostic Radiology and ²Orthopedics, Östersund Hospital, Östersund, Sweden

In a prospective randomized study, 100 Weber type B ankle fractures were randomly allocated to treatment by closed reduction and plaster cast fixation or by open reduction and internal fixation. The patients were followed for an average of 7 years.

Results. Operative treatment of type B fractures resulted in better reduction, more rapid decrease in swelling, and more rapid gain of motion than closed reduction. Some fractures could not be adequately reduced by closed methods alone. In spite of better reduction, arthrosis developed also in operated cases and could occur also in ankles that had been reduced to an exact position. Seven years after the injury, pain and discomfort were present in about one third of the patients with both types of treatment. The long-term results showed minor differences between the two forms of treatment.

Long-term follow-up of osteochondritis dissecans in the ankle

Mats Bauer, Kjell Jonsson & Bjarne Lindén

Lund University, Departments of Orthopedic Surgery and Diagnostic Radiology at Malmö General Hospital, Malmö, and Department of Orthopedic Surgery, Eksjö-Nässjö Hospital, Eksjö, Sweden

Osteochondritis dissecans of the femoral condyle has a different long-term prognosis in children compared with adults. If osteochondritis dissecans in the ankle joint also behaves like the femoral condyles is not known.

Thirty-one ankle joints with osteochondritis dissecans were evaluated at an average of 21 years after the initial diagnosis.

In five joints involved when the patients were children, there were no complications in later life that could with certainty be attributed to the os-

teochondritis dissecans. The lesions were healed in 4 cases and unchanged in 1. These 5 patients had no symptoms from their ankles.

In 26 adults, twenty-five lesions were unchanged in size. The majority of the patients had but minor symptoms from their ankles at the follow-up, but 1 patient had had an arthrodesis due to pain. One patient had developed mild and 1 severe arthrosis.

Osteochondritis dissecans in the ankle joint thus differs from that in the knee joint where late arthrosis is frequent.

Long-term results after surgical treatment of sprained ankles in children

Brynjolfur Mogensen, Jon Gudmundsson¹ & Yngvi Olafsson

Departments of Orthopedics and Traumatology, and ¹Radiology, Reykjavik City Hospital, University of Iceland, Reykjavik, Iceland

Sprained ankles in children are usually treated conservatively. Very unstable ankles, especially if osteochondral fragments are revealed on radiographs, can be treated surgically, but no long-term results are available.

We treated operatively 47 children with ankle sprains. Of these, 39 were available for clinical follow-up and 7 by questionnaire. Five of those included in the follow-up had been reoperated on for instability. There were 34 girls and 12 boys who were at surgery aged 14 (11–16) years. The follow-up time was 7 (5–12) years. Only 14 were injured in sports. Of these, 7 were boys. Indication for surgery was instability on clinical examination. In 17 a radiographic stress test was performed. At surgery the anterior fibulotalar ligament (FTA) and capsule were torn in 22; and FTA, capsule, and fibulocalcaneal ligament in 14. Osteochondral lesions were seen in 4. Five had partial FTA lesions, but other lesions were more rare. All ruptured ligaments were sutured and bone avulsions reattached. In 4 some form of reconstruction was also performed. There were no postoperative complications. The average immobilization time was 36 days.

At follow-up, 1 had an ugly keloid formation in the lower part of the scar and another a broad scar with large hemosiderin skin discoloration around it. Thirty-eight patients had minimal or no complaints at follow-up, but 5 had moderate and 3 major complaints. Thirty-four were stable at follow-up and 4 very unstable, but 3 of these were satisfied. Three patients had sprained their ankles again and were unstable but satisfied.

Preoperative radiographic examination revealed

five new and three old osteochondral lesions. At follow-up, 23 ankles were considered normal radiographically. In 11, unhealed osteochondral fragments were seen; four had osteophytes and in one slight arthrosis was revealed. Totally, the results were satisfactory in only 76 per cent at follow-up. We now treat surgically only those ankles that are very unstable and have osteochondral lesions.

Interlocking intramedullary nailing of femoral shaft fractures

Bertil Romanus, Jon Karlsson & Olle Lansinger
University of Göteborg, Department of Orthopedics, Östra Hospital, Göteborg, Sweden

The benefits of acute fixation of fractures in multiple injured patients have been reported by several authors during the last decade. Since 1983, we have used the interlocking intramedullary nailing according to Grosse-Kempf for treatment of severe femoral fractures. This method has eliminated the need for long periods of traction or extensive surgical exposures for plating of fractures.

Material. Forty-one patients were operated on. In 2 patients corrective osteotomies were performed. Thirty-eight patients were operated on for fractures. Half the fractures were in the distal third of the femur and one third were in the proximal part. Half the fractures were segmental or comminuted. Almost two thirds were operated on within 8 hours after the injury. In two thirds of the cases the fractures were the results of a major trauma.

Method. Intramedullary nailing has previously been routine and performed by most surgeons at the department. In all but 7 cases, the interlocking nailing was performed by two trained orthopedic surgeons. Altogether, 22 surgeons took part in the procedures. All except 1 patient were operated with intramedullary reaming and nailing after closed reduction. Locking with distal screws was performed in 50 per cent of the cases, proximal screws in 35 per cent, and at both ends (static) in 15 per cent.

Results. Two patients died within 11 days postoperatively from pneumonia and cardiac arrest, respectively. One patient had a nonfatal pulmonary embolus. No infections occurred. All the fractures except one healed within 6 months. One patient was reoperated on with exchange to a shorter nail and 2 were operated on for myositis at the proximal end of the nail.

Conclusions. For surgeons trained in intramedullary reaming and nailing, interlocking with screws proximally and/or distally is simple. The indications for immediate internal fixation have increased to in-

clude the central 4/6 of the femoral shaft and has shortened the immobilization and hospital stay for patients previously treated in traction or with long plates. The method is well suited for immediate fixation of most femoral fractures, especially in multiple injured patients.

Intramedullary nailing versus AO-plate fixation in femoral shaft fractures

Svein Svenningsen, Olav Nesse, Vilhjalmur Finsen, Ole Björn Harnes & Pål Benum

Department of Orthopedic Surgery, Trondheim University Hospital, Trondheim, Norway

The interlocking nail has extended the indications for intramedullary nailing of femoral fractures. We have compared the results of intramedullary nailing with a selected group of femoral shaft fractures treated with AO-plate fixation. The plated fractures have been operated on before the introduction of the interlocking nail in our department, and all of them might have been, according to the present policy, treated with this method. Thus, the two groups seemed to be comparable.

Thirty-four fractures in 32 patients (mean age 23 years) were treated with an intramedullary nail. In 27 patients, closed reduction was performed and 25 nails were locked. Fifteen patients had other injuries.

Thirty-five fractures in 34 patients (mean age 30 years) were treated with AO-plate fixation. Nine patients had other injuries.

The patients were reexamined at least 1 year after the injury. In addition to the clinical examination, muscle function tests were performed with a Cybex II+ isokinetic dynamometer in patients with no other injury of the lower limb.

In the nailed group, all fractures healed, and the mean time to fracture union was 15 weeks and to full weight bearing 8 weeks. There was 1 patient with superficial infection, 8 with more than 15° malrotation and 1 patient with a superficial infection, 8 with more than 15° malrotation, and 1 patient with a leg shortening of 2.5 cm.

In the plated group, there were six nonunions/plate fractures. The mean time to fracture union was 18 weeks and to full weight bearing 15 weeks. There was 1 patient with superficial and 1 patient with a deep infection.

Quadriceps function was significantly better in the nailed than in the plated group.

Thus, the advantages of intramedullary nailing compared with plate fixation seems to be an uncomplicated healing, shorter healing time, shorter time until full weight bearing, and better quadriceps function. The main disadvantages were malrotation and shortening.

A comparison between Ex-Fi-Re external fixation and previous procedures in the treatment of displaced tibial shaft fractures

Nils J. Andersson & Per Helland

Fylkessjukehuset in Ålesund, N-6017 Åsestranda, Norway

Ex-Fi-Re (external fixation and reduction) is a new system for reduction and fixation of displaced fractures. In our department, all displaced tibial shaft fractures in adults have been treated by this method over the last year. Twelve patients with an average age of 33 (17–55) years were available. Four fractures were open, and six were regarded as high-energy injuries.

The results were compared with the 33 patients with an average age of 36 (17–66) years treated in 1981 to 1983 in the same hospital. The treatment in this group was closed reduction and cast in 23 cases, screw fixation and cast in 3 cases, intramedullary nail in 4 cases, and Hoffmann external fixation in 3 cases. The groups were comparable as far as type of injury and skin lesions are concerned, but the control group had four segmental fractures, whereas the Ex-Fi-Re group had none. In the Ex-Fi-Re group, the time to full unprotected weight bearing was 14 (8–27) weeks and the median was 10 weeks compared with a median of 14 weeks in the control group. The difference is statistically significant ($P = 0.02$). There was no nonunion in the Ex-Fi-Re group compared with 5 in the other group. This difference is not statistically significant ($P = 0.19$). In the control group, 5 patients had shortenings exceeding 1 cm and 3 had angular deformity exceeding 5 degrees. Two patients in the Ex-Fi-Re group had pin tract secretion and 1 was treated with antibiotics. Both recovered after pin removal.

We consider the Ex-Fi-Re treatment as a good method in the treatment of displaced tibial shaft fractures. Exact and atraumatic reduction and early axial dynamic weight bearing can be obtained. The free function of the muscles and joints during treatment shortens the rehabilitation period. Pin tract infection has not been a significant problem.