Danish Orthopedic Society

Copenhagen, October 27–28, 1989

Editor: Erik Tøndevold

Department of Orthopedics
Rigshospitalet
Blegdamsvej 9
DK-2100 Copenhagen Ø
Denmark

Hip

Trochanteric fixation in total hip replacement with osteotomy of the greater trochanter

Jacob Stouby Mortensen, Steen Bo Kalms and Henrik Gerner–Smidt

Department of Orthopedics, Viborg County Hospital, DK-8800 Viborg, Denmark

Osteotomy of the greater trochanter in total hip replacement as recommended by Charnley is still the method used in our department. The major problem has been to create a stable reattachment of the trochanter.

In this paper, we compare the results of trochanteric reattachment using monofilament wires (63 patients) and multifilament cables and grip (72 patients) with special attention to the frequency of wire breakage, proximal migration of the trochanter, nonunion of the trochanteric osteotomy, and pain from the area of the greater trochanter. Breakage of the wires occurred in 25 percent of the osteotomies with monofilament wire fixation as compared with 7 percent breakages of the cables in the cable and grip fixation group. Despite this evident difference, the occurrence of proximal migration of the greater trochanter was equal in the two groups (8 percent), Nonunion of the osteotomy occurred in 5 percent of the monofilament wire group and in 7 percent of the cable and grip group. One year after the operation, 8 percent of the monofilament wire group had aching complaints due to breakage of the wires. In 2 patients it was necessary to perform a second operation to remove the broken wires. In 6 percent of the patients with cables and grip, complaints of mild tenderness could be related to the trochanteric grip, and in none of these patients did a reoperation have to be performed.

We find that the use of cables and grip in reattachment of the trochanteric osteotomy means fewer ruptures of the wires, fewer complaints related to the trochanteric area, , and fewer reoperations due to breakage of the wires.

Impacts in patients with hip fractures and in vitro study of the padding effect: Introduction of a hip protector

Jes Bruun Lauritzen and Bjarne Lund

Department of Orthopedics, Rigshospitalet, Copenhagen, Denmark

We studied how padding of the hip may influence the risk of hip fracture.

Patients: Forty patients with a hip fracture were asked about their fall. Fourteen of them were unable to recall the trauma. Two patients suffered indirect trauma to the hip

Autopsy study: The relation between thickness of subcutaneous tissue over the greater trochanter and body weight in 10 women was $Y = \exp(-1.12 + 5.13\ X)$. the energy absorption in relation to thickness of subcutaneous tissue in tissue from pigs was $Y = \exp(4.52 + 0.66\ X)$.

Mechanical study: An external hip protector (12 × 12 × 4 cm, PP; outer shell, plastozote; inner cup, [SAHVA, Stig Jensen]) was designed and molded to protect the greater trochanter from trauma.

Results: In all, 24 patients of 26 with a hip fracture had trauma to the greater trochanter. The thickness and the energy absorption of soft tissue over the greater trochanter was found to be exponentially related to body weight. The hip protector offered total protection against trauma to the greater trochanter in falls from the standing height.

Conclusions: Most hip fractures seemed to be caused by a trauma. Overweight offered substantial passive protection against hip fractures. The use of a hip protector may theoretically prevent over 90 percent of all hip fractures.

Cementless Spotorno femoral stem: Preliminary results after primary total hip arthroplasty

K. Sperling, C. Rude, M. Lohmann, C. Tollund and T. Johansen

Departments of Orthopedics T and TX, Herlev Hospital, University of Copenhagen, Copenhagen, Denmark

Material and methods: From May 1986 through June 1988, 101 primary total hip replacements (92 patients) were performed with the use of a cementless Spotorno femoral stem and a cementless Harris-Galante cup. The median age was 56 (18–66) years, and there were 33 men and 68 women. Ninety-three hips (84 patients), with a median observation time of 1.5 (1–3) years, were checked radiographically and clinically concerning prosthetic position and subsidence, subjective assessment, pain relief, and walking ability.

Results: There were no infections or femoral fractures. One patient was reoperated on because of loosening of the femoral stem. In toto, 18 prostheses were in the varus position (eight out of the first 20 operations). Eight prostheses showed subsidence exceeding 5 mm, and among these, two prostheses were undersized.

According to the Müller hip score, 89 percent of the patients were totally painless and 98 percent were assessed as excellent or good.

Conclusion: The short-term results using the cementless Spotorno femoral stem in patients younger than 65 years old with good bone quality are satisfactory.

Femoral neck fractures treated with the Monk hardtop hemiarthroplasty

Kristian Høy, Carsten Juhl Terkelsen and Kjeld Søballe

Department of Orthopedics, Kolding Hospital, Kolding, Denmark

The purpose of this study was to evaluate the results and complications after Monk hip bipolar hemiarthroplasty 3 years after surgery.

Results: During the period from January 1983 to December 1986, 152 Monk prostheses were inserted in 145 patients. The median age at the operation was 80 (55–96) years. All the prostheses were implanted without cement, and the operations were performed without laminar airflow or antibiotic prophylaxis. Seven minor fractures arose during the insertion of the prostheses, and one of these was later revised to THA. In the immediate postoperative period, 10 prostheses dislocated. Five of these were revised to Girdlestone and three were converted to total hip arthroplasty. Another 10 prostheses were revised to total hip arthroplasty because of mechanical loosening. There were five superficial and no deep infections. At the time of follow-up, 78 patients were dead and 11 could not be traced for clinical evaluation. Thus, 45 patients with 49 Monk prostheses were available for radiographic and clinical evaluation. Pain, walking ability, and hip mobility were 5.5, 3.5, and 4..9, respectively, when assessed with the D'Aubignet's scoring system. The radiographic examinations revealed migration in 61 percent of the femoral stems, and 8 percent of the hips had acetabular erosion.

Conclusions: Our study has demonstrated a relatively high frequency of dislocations resulting in a high rate of Girdlestone using the Monk hardtop hemiarthroplasty in the treatment of femoral neck fractures. In spite of a high incidence of prosthetic migration at 3 years postoperatively, the clinical result was good.

Second fractures of the proximal femur

Henrik M. Schrøder, Klaus K. Petersen and Mogens Erlandsen

Department of Orthopedics, County and Municipal Hospitals, Århus, and Division of Statistics, University of Århus, Århus, Denmark.

The purpose of the study was to investigate the epidemiology of the second hip fracture.

Patients and methods: We studied 4,171 consecutive hip fractures in patients ≥ 40 years of age who were treated in the municipality of Århus during a 16-year period. Chi-square, McNemar's, and *t*-tests were applied for statistical analysis.

Results: Totally, 266 (6.4 percent) second fractures were found. The female:male ratio was 4.6 versus 2.7 in the first fractures. Ninety-one percent were contralateral fractures. The first and second fracture in patients with two fractures were often of the same type, i.e., 62 percent of the femoral neck and 72 percent of the trochanteric fractures ($P < 0.005$), and marginal symmetry could be demonstrated. The mean interval between two fractures was 3 years (males 2.9 vs. females 3.5, NS) ,with a range of 5 days to 14 years. At the first fracture, these patients were a mean of 1 year younger than those with only one fracture. When calculating the years at risk, the incidence of the first fracture could be estimated to be 1.6 per 1,000 males and 3.6 per 1,000 females, and for the second fracture 15.4 per 1,000 males and 22.2 per 1,000 females. Whereas the increase was highly significant for both sexes ($P < 0.001$), the difference in increase was not.

Conclusion: The second hip fracture is nearly always contralateral, often of the same type as the first fracture, occurs after a mean of 3 years, and has a significantly higher incidence in both males and females.

Erythrocyte sedimentation rate and C-reative protein values following hip fracture

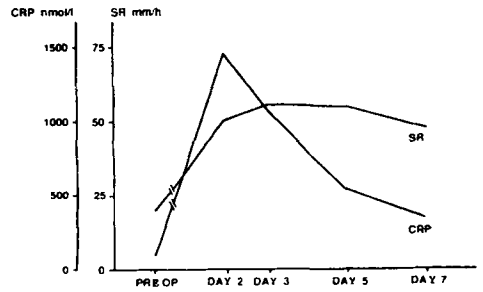
Niels Ellitsgaard, Anders P. Andersson,
Keld Hvitfeldt Jensen and Maja Jørgensen

Departments of Orthopedics and Clinical Chemistry, Bispebjerg Hospital, Copenhagen, Denmark

In the assessment of infection, measurement of C-reactive protein (CRP) has been recommended as an alternative to erythrocyte sedimentation rate (ESR). Both tests are, however, unspecific, and elevated values are seen after trauma and surgical procedures. We have studied the changes in CRP and ESR levels following hip fractures.

Patients and methods: In a prospective study including 140 consecutive patients with a hip fracture, the levels of CRP, ESR, *and the total blood cell count were determined* in addition to urinalysis and clinical examination for infection prior to surgery and on Days 2, 3 5, and 7 after the operation. There were 114 females and 26 males, median age 79 (44–99) years, with 70 femoral neck fractures and 60/10 per/subtrochanteric fractures.

Results: Serial measurements of CRP and ESR in 103 patients who underwent uncomplicated hemiarthroplasty *or sliding screw osteosynthesis are shown in the figure.*



Premorbid diseases with possible influence on CRP and ESR levels did not result in higher levels postoperatively. Neither did the type of fracture influence postoperative levels. Following hemiarthroplasty, CRP values were higher than after sliding screw osteosynthesis ($P < 0.03$). Thirty-seven patients had an infection diagnosed: viz., cystitis 21, pneumonia 8, and 8 other infections. Only patients with pneumonia showed CRP levels higher than *the uncomplicated postoperative levels.*

Conclusion: The rapid decomposition of C-reactive protein makes serial measurements of CRP more suitable than ESR for monitoring during the early postoperative period.

Knee

Knee arthroplasty a.m. Insall-Burstein in the treatment of arthrosis and rheumatoid arthritis: A comparative study at 4–8 years

Jadel Nafei, Niels Martin S. Steinke and Erik Hørlyck

Department of Orthopedics, Holstebro Hospital, DK-7500 Holstebro, Denmark

The aim was to assess the durability and to compare the results obtained using the prosthesis (TCP) in arthrotic (A) and rheumatoid arthritic (RA) patients.

Materials and methods: Totally, 101 consecutive arthroplasties performed a.m. Insall-Burstein over a period of 4 years at our orthopedic department are reported. Fifty-four patients (71 knees) with a mean age of 69 years were in the A group and 21 patients (30 knees) with a mean age 61 years were in the RA group. The average observation time was 5 years. The knee-rating scale from the Hospital for Special Surgery, New York, was used for evaluation.

Results: The rate of serious complications was 3 percent, but none were fatal.

Table 1. A summery of the results showing the distribution of number and percentage of the knees in the examined items (n = 71 A/29 RA)

	Preoperatively		At follow-up	
	A (%)	RA (%)	A (%)	RA (%)
Rating excellent/good	0	0	67 (94)	25 (86)
No/mild functional pain	0	0	69 (97)	26 (90)
Walking ability > 500 m	4 (6)	0	46 (65)	8 (28)
Range of motion > 85°	54 (76)	13 (45)	67 (94)	24 (83)
None/mild instability	20 (28)	14 (48)	67 (94)	25 (86)
Normal knee axis	13 (18)	12 (41)	64 (90)	23 (79)

Conclusions: The TCP achieves the principal goal: viz., pain relief, and 4–8-year prosthetic survival is over 99 percent. The results obtained in the A group were not significantly better than those obtained by the RA group.

Correlation analysis of Genucom measurements performed on Dacron reconstructed cruciate ligament lesions

Henrik N. Andersen and Peter A. Frandsen

Department of Orthopedics, County Hospital, Esbjerg, Denmark

The object of the study was to compare the Lysholm knee score with the Genucom knee analysis system's objective measurement of anterior/posterior laxity of the knee in patients with a reconstructed anterior cruciate ligament (ACL).

Fifty-seven patients with chronic instability due to arthroscopically verified ACL rupture were, from November 1984 to April 1987, operated on with implantation of a synthetic Dacron prosthesis. Their average age was 26 (16–42) years. Forty-three of these patients were followed up using the Genucom analysis system comparing postoperative results with the patient's other healthy knee.

Of the 14 patients who discontinued the study, 10 had prosthetic ruptures before the Genucom measurement was possible and 4 patients did not wish to participate or had moved.

Through computerized test analyses performed with the Genucom, the differences in the patient's knee joints were accurately measured in millimeters. These results were correlated with a clinical investigation using the Lysholm score.

The statistical analysis was performed with Spearman's rank sum test. The results show a significant correlation (> 99 percent) between AP laxity at 90° flexion and 30° flexion measured by the Genucom machine (rho = 0.59). On the other hand, no similar variation was found between the Lysholm score and the Genucom investigations (rho = 0.10). Finally, a good correlation (> 95 percent) was seen between the manually performed drawer test and the corresponding Genucom AP laxity at 90° in the individual patients.

The study emphasizes the frequently observed discrepancy between drawer laxity and subjective knee function.

Effect of functional bracing, quadriceps and hamstrings on anterior tibial translocation in anterior cruciate ligament insufficiency

Jens Bagger, Jesper Ravn, Peter Lavard, Peter Blyme and Christian Sørensen

Department of Orthopedics and Biomechanical Laboratory, Gentofte Hospital, DK-2900 Hellerup, Denmark

With a computerized goniometer (Acufex KSS®), we have tested 6 patients with an arthroscopically verified lesion of the anterior cruciate ligament. The anterior tibial translocation (ATT) is measured in relation to the unaffected knee, and on the affected knee partly braced with a 4-point functional brace (Donjoy 4-P®), partly under the influence of maximal quadriceps force and partly under the influence of maximal hamstrings' force. We used the Student's *t*-test for the statistical analysis.

We found a significant increase in laxity at 15° of flexion (Lachmann's test) in the affected knee compared with the nonaffected knee.

The ATT was significantly reduced by the use of both maximal quadriceps' and hamstrings' forces at 15°, 45°, and 90° of flexion. The 4-point brace significantly reduced the ATT at 15° and 45° of flexion but not at 90° of flexion.

Ankle/Foot

Wound complications after Achilles tendon repair

Niels Henrik Maagaard Mortensen and Bent Pedersen

Department of Orthopedics, Odense University Hospital, Odense, Denmark

Therapy for rupture of the Achilles tendon continues to be discussed. Supporters of conservative therapy decry the high frequency of complications from surgical therapy. In the literature, the frequency of serious wound complications from surgical therapy including deep infection, fistulae, and major skin necrosis is around 6 percent (1).

The purpose of this study was to evaluate the influence of the patient's age, age of the lesion, type of anesthesia, use of tourniquet, suture technique, type of suture in the tendon, paratendon and subcutis on the complication frequency. Further, postoperative elevation for 7 days, a treatment practiced by one of our departments, was tested for effect.

This retrospective study is based on review of 247 patients treated with simple suture technique over a 6-year period. Five patients were reoperated on because of skin necrosis and deep infection. One patient developed a fistula, which closed after 2.5 months of conservative treatment. Final wound healing was obtained after a mean of 5 (3–6) months. In all of the deep infections, *Staphylococcus aureus* was the causative agent. Of the minor complications, six were small skin defects, two were superficial infections, and two were secondary skin lesions following primary wound healing. One patient was reoperated on because of tendocutaneous adherence. All the minor complications healed within 2 weeks except one, which healed after 4 weeks. Four tendons (1.6 percent) reruptured. Three healed after repeat surgical repair, and one healed after conservative treatment.

Conclusions: We did not find any parameter disposing to wound complication. The deep infection frequency was in this patient sample 2.4 percent, which is lower than the average reported in the literature.

Reference

Nistor. *J Bone Joint Surg* 1981; 63-A: 394-8.

Separation of tendon ends after Achilles tendon repair: A prospective randomized study

Niels Henrik Maagaard Mortensen, Jan Sæther, Henrik Stæhr, Martin Steincke and Søren Mikkelsen

Department of Orthopedics, Holstebro, Herning Hospital, and the Århus County Hospital, Århus, Denmark

Separation of tendon ends after tendon repair is a problem connected with increased callus formation and delayed collagen maturation. Ejeskär and Irstam (1) have shown the correlation between elongation and clinical outcome in profundus tendon repair. The purpose of this study was to describe the separation between tendon ends after Achilles tendon repair and to compare the separation after applying two different techniques.

Fifty-eight patients with subcutaneous Achilles tendon rupture were randomized to the Mason technique or a reinforced technique named CSSS (continuous six strands' suture).

After repair, small metal markers were placed in the tendon ends. During the 7 weeks in a plaster of Paris cast and finally at the 1-year control, standardized radiographs were obtained.

The separation between the markers followed a biphasic course, with an end separation of a mean 12 (1–26) mm in both groups. At the 1-year control, the strength of plantar flexion was examined in 30 patients with an isometric strain gauge. We found a poor correlation between the end separation and the strength during plantar flexion, but also between separation and the range of motion in the talocrural joint. One patient with a small separation (1 mm) and 1 patient with a large separation (26 mm) developed a "dorsal shift" in the range of motion of 10° and 5°, respectively. We found no significant difference between the two groups.

Conclusions: A reinforced suture technique cannot reduce the separation between Achilles tendon ends. With our method of measurement, a poor correlation between the size of separation and the clinical outcome was found.

Reference

1. Ejeskär A, Irstam L. *Scan J Plast Reconstr Surg* 1981; 15: 61–8.

Fibrin fixation of displaced osteochondral fractures of the talus

Peter Angermann and Per Riegels-Nielsen

Department of Orthopedics, Central Hospital, Næstved, Denmark

Six osteochondral talar fractures in 5 patients were fixed with fibrin sealant (Tisseel). All the lesions healed uneventfully. After 1 year, 4 patients had no or only limited ankle discomfort. One patient had pain after walking for longer distances and pain when running. Three of the 4 athletes in the study resumed their sports activities at the same level as before their accident.

Hand surgery

Functional casting in the treatment of metacarpal fractures

Lars Konradsen, Poul T. Nielsen and Elisabeth Albrecht-Beste

Department of Orthopedics, County Hospital, Hillerød, Denmark

Diaphyseal or subcapital fractures of the second through fifth metacarpals are often treated with a dorsal or ulnar plaster- cast immobilizing the wrist and the fingers of both the fractured and the neighboring metacarpals.

The object of this study was to compare this treatment with that of a short functional bandage of Deltalite® leaving the wrist and the digits a free range of motion. To control rotation, the finger of the broken metacarpal was strapped to the adjacent finger with Velcrotape.

Fifty patients were randomized to either form of treatment. Fracture reduction was done, if necessary, under local anesthesia whenever volar angulation or rotation was present. Oblique radiographs were taken of both hands before and after reduction, and after cast application and upon removal of the casts after 3 weeks using a pillow with symmetrically sloping sides. Fracture angulation was calculated as the angulation on the fractured side minus the angulation as measured for the contralateral side.

Reduction and plaster-cast immobilization did not alter the initial fracture angulation. In contrast, reduction and functional splintage reduced fracture angulation by 50 percent. Restriction of movement in the wrist and finger joints was more frequent ($P < 0.01$) after cast splintage. Sick leave could be reduced by 64 percent in the functionally treated group.

We conclude that functional splintage results in better reduction, less restriction of joint movement, and shorter sick leave when compared with plaster-cast immobilization.

The results after nonrigid fixation of Colles' fracture Older type IV

S. M. Mikkelsen, B. E. Lindblad and M. B. Mikkelsen

University Department of Orthopedics, Århus County Hospital, Århus, Denmark

Patients and methods: Seventy-two patients were treated over a 2.5-year period from January 1985 through May 1988. At the time of follow-up, 4 patients were dead and 14 patients refused to participate in the investigation. Fifty-five patients (48 women, 7 men) were examined clinically and radiographically. One patient had a bilateral Colles' fracture. The mean age was 69 (34–88) years. The observation time was on an average 29 (7–51) years. Forty-three

fractures were osteosynthesized with K-wires and 13 fractures with a Rush pin.

Results: At the time of follow-up, the position was good in 43 cases, acceptable in 11 cases, and unsatisfactory in 2 cases. In all, 24 patients were without pain, 17 patients had little to moderate pain, 9 patients had frequent and severe pain, and 5 patients had constant and severe pain. Two patients were treated for reflex dystrophy. The mobility on the fractured side as compared with the healthy side was dorsal/volar 102 vs. 130 ($P < 0.05$), ulnar/radial 36 vs. 45 (NS), and supination/pronation 123 vs. 152 (NS). Twelve wrists showed no signs of arthrosis, 23 wrists had minor changes, 19 wrists had moderate arthrosis, and 2 wrists had severe arthrosis.

Conclusions: The Colles' fracture Older type IV is difficult to reduce and retain. By internal fixation of the fracture, the fracture can be retained in an acceptable position; and in 40 patients out of 54, a satisfactory result was attained.

Radiographic examination in the diagnosis of scaphoid fractures

Johnny Frøkjær, Bo Munk and Lilla Rasmussen

Department of Orthopedics and Radiology, Haderslev Hospital, Haderslev, Denmark

Technical advances have made it possible to produce high-quality scaphoid radiographs. Since 1978, we have used Kodak Orthoma mammographic films with a Lanex-Fine reinforcement screen in the diagnosis of scaphoid fractures. It was our purpose to record whether or not primary radiographic diagnoses were confirmed by a secondary clinical or radiographic examination after 10–14 days immobilization. Lateral- and posterior-anterior projections supplemented by two scaphoid projections were used. All the radiographic diagnoses concerning scaphoid examinations were recorded in the period January 1983 through August 1989, with an overall 857 diagnoses. When no fracture was seen on the primary radiographs, a secondary radiographic examination was performed if indirect pain and pain in the snuffbox was present. No radiographs were taken if a clinical examination excluded a fracture.

The primary diagnoses were as follows: fracture of the scaphoid—133; no fracture of the scaphoid—689; and radiographic suspicion of a fracture—35. The last two groups are of interest.

Of 689 examinations with a "no fracture" diagnosis, 518 were evaluated clinically and a fracture was excluded. Totally, 171 patients had a secondary radiographic examination by which three fractures were diagnosed. Two of these were retrospectively visible on the primary radiographs, and the last fracture was doubtful. Nineteen of 35 fractures with a primary "suspected fracture" had a second radiographic examination by which three fractures were diagnosed. Clinical evaluation excluded a fracture in 13 cases.

Conclusions: Because the secondary clinical and radiographic examinations are in accordance with the primary radiographic diagnoses, the investigation shows that with the technique described here scaphoid fractures are diagnosed at the primary radiographic examination. Only when the primary radiographic findings are doubtful, a secondary radiographic examination is necessary after 10–14 days of immobilization.

Intraosseous pressure in Kienböck's disease

Claus Hjorth Jensen

Department of Orthopedics, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark

To clarify the hemodynamics of the carpal bones in Kienböck's disease, 9 consecutive patients operated on for lunatomalacia were investigated with measurement of the intraosseous pressure.

The study comprised 4 women and 5 men. The median age was 28 (21–44) years and the median duration of symptoms 2 (1.5–3) years. All the patients were in advanced stages of the disease according to Ståhl's classification.

Measurement of the intraosseous pressure was done before surgery. A cannula (gauge 14) was percutaneously tapped into the lunate bone, its proper position being controlled by the image intensifier.

After flushing with heparin in a saline solution, the cannula was connected to a strain gauge using rigid polyethylene tubes. For reference measurements, similar set-ups were made in the capitate bone and the styloid process of the radius.

In the lunate bone a median pressure of 55 (41–70) mmHg was found. The corresponding value in the capitate bone was 44 (17–58) mmHg. Thus, the pressure in the lunate bone was significantly higher than the pressure in the styloid process of the radius, while the difference from the capitate bone was not found to be significant.

The results indicate venous engorgement rather than arterial insufficiency in the fully developed lunatomalacia.

Shoulder

Arthroscopy of the shoulder

Steen Bo Kalms and Jacob Stouby Mortensen

Department of Orthopedics, Viborg County Hospital, DK-8800 Viborg, Denmark

Arthroscopic investigation of the shoulder joint has developed into an important diagnostic tool during the last 10 years.

In our department during the past year, we performed 14 arthroscopic investigations of the shoulder joint, which are analyzed retrospectively in this paper.

The material includes 9 males and 5 females with an average age of 36 (15–59) years and an average duration of symptoms of 5 months.

The indications for arthroscopy were in all the cases persisting pain and a decreased range of motion despite physiotherapy. In 5 cases, major labral injuries were found; these patients were treated with an operation using the Bankart technique. In 2 other cases, we found minor labral lesions, which were treated by arthroscopic resection.

Further, in 4 patients, we found synovitis with adhesions. One patient had a severe injury of the cartilage of the humeral head; in 2 cases no intraarticular lesions were found.

We found that shoulder arthroscopy is a valuable supplement to the clinical investigation and to the treatment of certain shoulder disorders; moreover, that arthroscopy should be used in the early stages of shoulder disorders if the disorders are resistant to physiotherapy, and especially in traumatic disorders.

Pediatric orthopedics

Frequency of late diagnosed CDH in Jutland, Denmark, 1976–85, in comparison with 1937–54, before early diagnosis and treatment were introduced

Hans Emnéus

Palma de Mallorca, Spain

Von Rosen (1962) reported that he had almost eliminated late diagnosed cases of CDH. Palmén found that late diagnosed CDH in Sweden was reduced from 0.0008 in 1948–53 to 0.0005 in 1973–79. Bjerkreim (1987) found a frequency of more than 0.001 in southern Norway in 1975–79, and Heikkilä in Finland found 0.00076 in 1965–75.

Until 1951, Århus was the only orthopedic center in Jutland. During the period 1937–54, there were 360 children with 499 luxated hips. There were approximately 550,000 live births in Jutland during these 18 years, which means a frequency of 0.00065. This is low compared with Sweden and Norway.

In 1988–89, I collected the late diagnosed CDH cases in Jutland for the 10-year period 1976–85 and found 73 cases (5 boys and 12 bilateral). The rate of live births during this period was 296,676, i.e., 0.00024. Among those diagnosed at birth, there were 9 who later required surgery, for instance, open reduction, derotation, or pelvic osteotomy. These 9 cases must be added to the 73, i.e., 82/296,676 = 0.00028. It appears that we have succeeded in reducing the frequency of classical CDH from 0.00065 to 0.00028.

Open physiodesis for treatment of slipped capital femoral epiphysis

F. Stig Jacobsen

Department of Orthopedics, Marshfield, Wisconsin, U.S.A.

Ten patients with 14 hips with a slipped capital femoral epiphysis were treated with open physiodesis. The severity of the slip corresponds to other reports.

The operating time was 120 minutes per hip, and the average blood loss was 330 cm^3 per hip. There was one complication: 1 patient developed myositis ossificans without any loss of range of motion. All the slips fused on an average of 2 months. None of the patients developed further slippage.

Open physiodesis can be recommended for a slipped capital femoral epiphysis, especially of moderate to severe slips where placement of screws or pins are difficult. There are few complications, and later operations for removal of the hardware can be avoided.

Basic science and pathology

Synovitis and regional glycosaminoglycan changes in macroscopically normal patellar cartilage

Elith Bjarne Olsen, Klaus Trier and Henrik Møller

Department of Orthopedics, Frederiksberg Hospital, and Department of Dermatology (with Connective Tissue Research Laboratories), Rigshospital, University of Copenhagen, Copenhagen, Denmark

Patellar cartilage samples were obtained at the time of surgery from 5 patients: 4 with normal and 1 with slight macroscopic cartilaginous degeneration of the medial parts of the patella. All the cases showed synovitis and medial femoral condylar pannus formation. From each patient, biopsies were obtained from the medial, central, and lateral parts of the patella. The glycosaminoglycans were separated by cellulose acetate electrophoresis, and the relative content of major glycosaminoglycans were measured by optic scanning. The total content of glycosaminoglycans was estimated by uronic acid analysis. Biopsies from macroscopically normal cartilage from the medial parts of the patella showed a significant decrease in the uronic acid

content as compared with the lateral parts. Biopsies from the medial part of the patella with macroscopic cartilaginous degeneration showed a decreased uronic acid concentration in the medial and also in the macroscopically uninvolved parts of the patella, indicating general changes of the patellar cartilage.

All the cartilage samples showed only slight changes in the relative distribution of the individual glycosaminoglycans.

Interlocking nailing of experimental fractures in growing bones

Gerhardt Teichert, Jens Ole Søjbjerg, Ivan Hvid and Adel Nafei

Departments of Orthopedics, Holstebro Hospital, Holstebro, and Århus University Orthopedic Hospital, Århus, Denmark

Earlier studies have shown that fractures and cortical drilling can stimulate growth in rabbit femurs. Interlocking nailing is a much more complex stimulus, including medullary reaming and crossing the trochanteric apophysis.

Thirteen white rabbits were operated on at 8 weeks of age and killed 8 weeks later. Seven of them were plated and 6 were nailed. A midshaft osteotomy was made with an oscillating saw. Reaming was done before nailing.

Length measurements were made on the operated on and the control femur by x-ray contacts.

There was no significant growth acceleration of the operated on femur in the plated or in the nailed group. Further, there was no difference between the two groups.

Only one of the nails produced an apophysiodesis on the trochanter, but this did not inhibit the total growth of the femur, and there was no change in the femoral neck angle. One of the plates produced a distal physiodesis because of a too close relation of the plate to the growth plate.

Conclusions: Interlocking nailing of experimental fractures does not seem to affect the total growth of the rabbit femur. Crossing the trochanteric apophysis may destroy it, but this does not affect the femoral length or the angle of the femoral neck.

Dynamic hematocrit and the relative distribution of microspheres and plasma tracers in bone: Plasma skimming or arteriovenous shunting?

Ebbe Stender Hansen, Kjeld Søballe, Dorthe Kjølseth, Tine Brink Henriksen, He Shu-Zheng, Vibeke Elisabeth Hjortdal, Jens Bülow and Cody Bünger

Department of Orthopedics and Institute of Experimental Clinical Research, University of Århus, Århus, Denmark

The role of plasma skimming and arteriovenous (AV) shunting in the bone microcirculation was studied in dogs.

Experiment 1: The dynamic hematocrit (Hct) of bone, calculated from the distribution volumes of ^{51}Cr-erythrocytes and ^{125}I-fibrinogen, varied from 0.25 in patella and cortical bone to 0.08 in the sluggishly perfused metaphyseal cancellous bone adjacent to regions of growth, indicative of intraosseous plasma skimming.

Experiment 2 compared the bony uptake of 15-μm microspheres (MS) with that of bolus-injected intravascular plasma tracer when both tracers were injected intracardially and the circulation arrested for 15 seconds after injection of the plasma tracer. Good agreement was found between the fractional uptake of the two tracers in patella, cortex, and subchondral epiphyseal bone, but the uptake of the plasma tracer was twice that of 15-μm MS in central epiphyseal bone, 4–5 times higher in bone marrow, and up to 8 times higher in metaphyses, which is consistent with both plasma skimming and AV shunting in the bone microcirculation.

Experiment 3: The overall uptake of 50-μm MS in bone was lower than that of 15-μm MS, which indicates that plasma skimming occurs already in larger central arterial trunks. However, uptake of 50-μm MS in the metaphyseal cancellous bone adjacent to the zone of growth was 2–3 times higher than that of 15-μm MS, which is consistent with a theory of AV shunting in metaphyseal cancellous bone immediately adjacent to growth plates.

The polymerization temperatures for two different types of bone cement

Soeren Harving, Kjeld Søballe and Cody Bünger

Århus University Orthopedic Hospital, Århus, Denmark

Necrosis of bone tissue due to thermal injury during polymerization of bone cement has been mentioned as the cause of later mechanical loosening of prosthetic components.

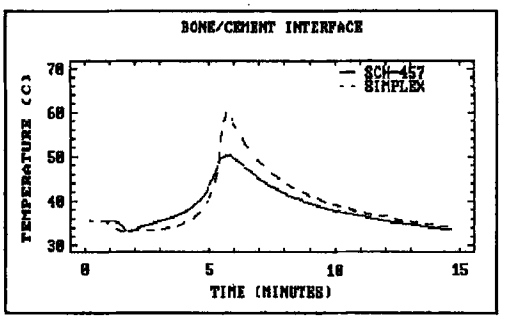
A new bone cement, SCH-457 (Essex), is claimed to produce lower peak temperatures than standard cement types. The aim of this study was to compare temperatures at the bone-cement interface during polymerization of two different types of bone cement:

1. SCH-457, LVC + Gentamicin, Essex
2. Simplex, Howmedica

The aim of the experimental set-up was to approximate the clinical use of bone cement.

Material and methods: The operation was performed on 12 isolated pig femurs heated to a temperature of 38 °C. In the medial femoral condyle, a 12 × 17-mm canal was made over a 1.6-mm guide pin. Through two separate canals, eight thermocouple electrodes were introduced into the bore hole and by sight placed close to the bone. Two additional electrodes were looped around the guide pin to

measure core temperature in the cement plug. After stirring for 90 seconds, the hole was filled with cement and a standardized compression was applied.



Results: SCH-457 immediately developed heat, and after 5 min 40 sec a maximum temperature of 50.3 °C was reached. Simplex initially gave off no heat, but reached an average peak value of 60.6 °C after 5 min 40 sec ($P < 0.05$). The initial temperature for bone and cement was equal for both.

Conclusions: SCH-457 develops a significantly lower peak temperature than Simplex cement. The difference in temperature is so pronounced that it presumably will influence the protein denaturization and bone regeneration around the cement.

The effect of hydroxyapatite during unstable mechanical conditions

Kjeld Søballe, Ebbe S. Hansen, Helle B. Rasmussen and Cody Bünger

Århus University Orthopedic Hospital, Institute of Experimental Clinical Research, Institute of Pathology, and Department of Connective Tissue Biology, University of Århus, Århus, Denmark

Finite element analyses of rigidity fixed tibial trays have predicted that differences in elasticity modulus between cancellous bone and metallic porous materials would cause displacement incompatibilities of as much as 150 microns at the periphery of the resected tibial plateau.

We studied the influence of 150-micron movements between porous-coated titanium and hydroxyapatite-coated implants.

Material and methods: A dynamically loaded unstable device producing 150-microns axial translation of the implants during each gait cycle was developed. Mechanically stable devices served as controls. Stable and unstable devices with *porous titanium* (Ti) and *hydroxyapatite* (Ha) coating were inserted into the weight-bearing regions of the medial femoral condyles in 14 mature dogs.

Results: Histologic analysis after 4 weeks showed a thick fibrous membrane surrounding both Ti- and HA-coated implants subjected to micromovements, whereas bone ingrowth was obtained in mechanically stable implants. Histologic analysis of the membranes showed islands of fibrocartilage surrounding unstable HA-coated implants, whereas fibrous connective tissue surrounded unstable Ti implants. Collagen determination of the fibrous membranes showed significantly increased collagen content around unstable HA-coated implants when compared with those of Ti implants ($P < 0.05$). Shear strength of unstable Ti- and HA-coated implants was significantly reduced compared with the corresponding mechanically stable implants ($P < 0.01$). However, shear-strength values of unstable HA-coated implants was significantly greater than those of unstable Ti implants ($P < 0.01$), but also that those of stable Ti implants ($P < 0.05$). The greatest shear strength was obtained by stable HA-coated implants, which was increased tenfold as compared with the stable Ti implants ($P < 0.001$).

Discussion and conclusions: This study demonstrates that movements of 150 microns between bone and implant inhibit bony ingrowth and lead to development of a fibrous membrane. The stronger fixation of unstable HA implants may be ascribed to the presence of fibrocartilage and the higher collagen content in the membrane around HA-coated implants. An interesting finding was the better fixation of unstable HA implants compared with stable Ti implants. The best anchorage and the greatest amount of bone ingrowth was obtained by mechanically stable implants coated with hydroxyapatite.

Bone tumors

Characterization of bone and connective tissue sarcoma

Elith Bjarne Olsen and Bjarne Lund

Departments of Orthopedics, Rigshospital, University of Copenhagen, Copenhagen, Denmark

The diagnosis of sarcoma rests upon clinical, radiologic, and histopathologic findings. However, there is a great morphologic variability among the tumors, even within individual lesions. The heterogeneous morphology sometimes causes diagnostic problems (1, 2, 3, 4). Hence, there is a need of better characterization of this tumor entity.

Recent studies of human breast carcinoma (5) have found changes in the relative distribution of the individual glycosaminoglycans (GAG) with decreased dermatan sulfate, increase chondroitin sulfate and an increase in the total GAG content.

To assess the diagnostic value of GAG analysis in sarcoma, we obtained at the time of surgery tumor-tissue samples from 10 patients, and in general, it confirmed the histopathologic assessment.

References
1. Lichtenstien L. *Cancer* 1950; 54: 120–138.
2. Dorfman, H D. In *VIIth National Cancer Conference Proceedings*. Philadelphia. J B Lippincott Co. pp 901–913, 1973.
3. Mirra et al. *Cancer* 1976; 37: 2,005–2,014.
4. Merryweather et al. *J Bone Joint Surg* 1980; 62-B: 381–384.
5. Olsen et al. *Acta Obstet Gynecol Scand* 1988; 67: 539–542.

Adjuvant chemotherapy in high-grade sarcomas of bone

Otto Sneppen, Aksel Nordentoft and Olaf Myhre Jensen

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

Fifteen patients with high-grade malignant bone sarcomas stage IIB (13 osteosarcomas and two malignant fibrous histiocytomas) were treated with MAP chemotherapy (13 preoperatively and two postoperatively). The regimen was given monthly, and was continued for 4 consecutive months unless disease progression occurred earlier. The three drugs were given sequentially beginning with Mitomycin (8 mg/m^2) followed immediately by Doxorubicin (40 mg/m^2), both drugs administered by i.v. injection. Cisplatin (60 mg/m^2) was administered as a 2-hour i.v. infusion.

After 4 months, the histologic tumor response was evaluated, and definitive surgery was performed.

An excellent tumor response was found in 4 cases and less than excellent in 9 cases. The surgical treatment was wide amputation in 8 cases and wide resection in 6. The median follow-up was 23 (9–40) months . The overall survival was 10/15, and the metastasis-free survival was 8/15. One patient developed local recurrence in addition to distant metastasis.

The response of high-grade sarcomas of bone to MAP chemotherapy was unsatisfactory.

Epidemiology

Accidental poisoning in the home

B. E. Lindblad and C. J. Terkelsen

University Departments of Orthopedics at Århus County Hospital and Randers Central Hospital, and Accident Analysis Center, Århus, Denmark

Material and methods: Out of 4,357 home accidents, a total of 79 cases of accidental poisoning were registered prospectively during a 1-year period at Århus County Hospital and Randers Central Hospital.

Results: The female-male ratio was 1:1.5. In all, 72 of the poisonings occurred in children aged 0–14 years. Sixty-four were children aged 0–4 years. Forty-three poisonings occurred in the 1–2 year age group. The incidence was 26 per 100,000 and was significantly higher among children aged 0–14 years. Twenty-five patients were hospitalized, of which 22 were small children. The average inpatient time was 2.4 (1–4) days. The survey revealed that 27 cases of accidental poisoning were due to medicine, 20 to organic solvents, 8 to chemicals, 22 to poisonings, and 2 to asphyxiation. The delay between poisoning and arrival at the hospital was 1.25 (0.33–13) hours. In Denmark as a whole, a total of 1,300 cases of accidental poisonings were estimated to occur during a 1-year period. Most of the accidental poisonings were due to lack of attention by the parents. It is concluded that the special legal regulations about packaging and labeling are not sufficient when storage of the potential poison is not safe enough.

Handball injuries

B. E. Lindblad, C. J. Terkelsen, H. E. Helleland, K. Høy and C. J. Terkelsen

University Department of Orthopedics, Randers Central Hospital, Randers, Denmark

During a 1-year period, a total of 1,839 sports accidents were registered prospectively in the casualty ward. Of these, 570 were handball injuries (31 percent).

Results: Totally, 381 (67 percent) were women (in the entire material 40 percent), and the mean age was 21 years— in women 19 (6–43) years and in men 23 (9–48) years. Fractures accounted for 12 percent of the injuries (14 percent of total material) and 62 percent of the lesions were localized to joints (58 percent of total material). In all, 3.7 percent were admitted primarily, and an additional 3.4 percent were admitted later from the outpatient clinic (9 percent of total material). The severity of the lesions was estimated according to the Abbreviated Injury Scale (AIS). In 32 percent of the injuries, AIS ≥ 2 (45 percent of total material). AIS according to question of guilt and rate of fracture is shown in the following table.

Table

Organization			Question of guilt			
AIS ≥ 2	*n*	%	AIS ≥ 2	*n*	%	Fractures
Club	173	33	Patients own guilt	112	35	39
Company	5	38	Another person (not breaking rules)	9	29	43
School	4	17	Another person (breaking rules)	25	38	38

Conclusions: Compared with the total material, the handball injuries were characterized by the same mean age, more women, less severe injuries, and fewer inpatients.

Incidence of ski injuries among Danes in Austria

Annette Sylvest, Niels Anker Lund, Jes Bruun Lauritzen, Jens Hegnhøj and Bjarne Lund

Department of Orthopedics, Rigshospitalet, Copenhagen, Denmark

About 3–400,000 Danes go skiing in Scandinavia and the Alps each year. We have recorded the total number of ski lesions among Danes in Austria during one winter.

Material: All the Danes who went skiing in Austria in the period November 1986 through April 1987 and were treated in a medical institution in Austria were recorded in the Europaeiska Forsikrings Selskap. Totally, 1,123 patients had lesions related to skiing: sex ratio 1:1. The total number of skiing guests in the winter was 66,298. The chi-square test was used, $P< 0.05$ (*).

Results: Forty-three percent of the women were treated for distorsion of the knee, and 24 percent of the men (*). Contusion of the head had occurred in 8 percent of the women and 12 of the men (*). The third most common lesion was contusion of the limbs: 6 and 7 percent for women and men, respectively (NS). More distorsions of the ankle joint were seen in women, and more fractures of the shafts of the tibia and fibula were found in men. The incidence of ski injuries was estimated to 2.5 per 1,000 skiers per day. The highest rate of ski injuries was found on the 3rd to the 5th day of the holiday.

Conclusions: The incidence of ski injuries among Danes was not found to be different as compared with citizens of skiing nations. Men had a higher frequency of lesions related to high-energy traumas.

Soccer injuries: A prospective, epidemiologic study concerning traumatology and economics

Kristian Høy, Carsten Juhl Terkelsen, Haakon Einar Helleland, Bent Erling Lindblad and Christian Juhö Terkelsen

Department of Orthopedics, Randers Central Hospital, Randers, Denmark

Material and methods: During 1 year, 715 soccer injuries (39 percent of all the sports injuries) were prospectively registered and treated in the casualty ward of Randers Central Hospital. Afterwards, questionnaires were sent to all the participants: three times if necessary. Totally, 584 patients (82 percent) returned the questionnaires.

Results: The women accounted for 10 percent of all the injuries. Twenty-six percent occurred during the weekends. For men the mean age was 23 years and for women 19 years. Contact with another player was the most common accident mechanism for both men and women: 64 and 58 percent, respectively. Twenty percent of the accidents were due to breaking of the rules of the game. According to the AIS, 46 percent were classified as moderate and 43 percent as minor injuries. Thirty percent of the injuries were located in the skin and 49 percent in joints. Fractures constituted 17 percent of all the recorded injuries. Of these, 46 percent were found in the upper limbs and 46 percent in the lower limbs. Sprains and contusions were the most frequent injuries, accounting respectively for 38 and 25 percent. About 63 percent had no further treatment, 20 percent were treated as outpatients, and 8 percent were checked by a general practitioner. Seven percent were admitted to the hospital immediately, whereas 2 percent were admitted later from the outpatient clinic. In the group of hospitalized patients, 89 percent stayed in the hospital for 1–7 days, and 12 percent remained for more than 2 weeks.

Thirty-one percent of all the soccer players seen in the emergency room were absent from their work due to illness and 12 percent were subsequently absent for more than 3 weeks. This caused a loss of income in 8 percent of the injured soccer players. Forty percent of these had a financial loss between 0 and 1,500 DKK, 40 percent between 1,500 and 4,500 DKK, 7 percent between 4,500 and 7,500 DKK, and 14 percent more than 7,500 DKK.

Conclusion: Soccer injuries comprise the major part of sports injuries seen in the emergency room.

Burns

Niels Henrik Maagaard Mortensen and Eivind Underbjerg Poulsen

Department of Orthopedics, Århus County Hospital, Århus, Denmark

An account of burns in a well-defined population has previously been published for the Copenhagen area for the years 1965 and 1975 (1). We present a similar account of patients treated for burns in the casualty ward at Århus County Hospital in 1986 (catchment area: 155,000).

Totally 485 patients (284 males and 201 females) were treated. Scalds caused 51 percent of the injuries, contact burns 24 percent, fire 18 percent, corrosion 6 percent, and electricity 1 percent. The material consists of 25 percent-first-degree, 72 second-degree, and 3 percent third-degree burns. Totally, 97 percent of the burns affected less than 5 percent of the body surface. Twenty-five percent of the injuries were located in the head/neck area, 10 percent on

the trunk, 40/44 percent on the right and left arm respectively, and 14/12 percent on the right/left leg.

Fifty-nine percent of the injuries occurred in the home and 26 percent at work. Children below the age of 6 years were overrepresented, with 18 percent of all the casualties, while this group only represents 7 percent of the population. Infant burns took place in the home, and were caused primarily by scalds from hot coffee/tea and contact burns on oven doors/hot-plates. Most home injuries took place between 4 p.m. and 8 p.m. Of the injuries at work, the largest group (12 percent) was caused by welding. Eighty-eight percent of the patients were treated with cold-water cooling, and 63 percent in addition with gloves (2) or occlusive dressings after revision, if any. Ten patients were hospitalized because of severe burns. Many patients had started treatment with cold water immediately after the injury, but 65 percent of the first-degree burns were further cooled in the ward.

Conclusion: Arrangement in the home to prevent the many burns in infants are needed. More public information about the value of cooling with cold water is desirable.

References

1. Thomsen M, Björn L, Sørensen B. *Burns* 1978; 5: 72–78.
2. Frandsen P A, Overgaard-Nielsen H, Sommer J. *Burns* 1977; 4: 20–27

The primary consumption of hospital resources for hip fractures in Århus County, Denmark

B. E. Lindblad, T. Lind, A. Michaelsen, K. Døssing, F. Weile, J. Skafte, S. M. Mogensen, B. W. Jakobsen and J. Jensen

Departments of Orthopedics, Århus County Hospital, Århus Municipal Hospital, Silkeborg and Randers Central Hospitals, and Odder, Skanderborg, Grennaa and Ebeltofts City Hospitals

Material and methods: During 1987, 935 fractures were registered prospectively at all the hospitals in Århus County, where the incidence of hip fractures has been shown to rise exponentially with age.

Results: The total consumption of hospital bed days was 22,352 (24 days/patient) for the primary treatment of hip fractures and occupied 13 percent of all the orthopedic beds in the county. The estimated consumption of hospital bed days in Århus County will be 26,000/28,000 in the years 2000/2010 and 17/18 percent of the hospital beds in the orthopedic departments will be occupied. Seventy-two percent of the patients lived in their own home, 23 percent lived in nursing homes, and 5 percent lived in warden care homes. F ty-three percent lived alone, 29 percent lived with their partner, 23 percent lived in nursing homes, and 5 percent were taken care of by their family. The inpatient time for those who lived alone was 31 (0–211) days and higher than those living in nursing homes 10 (0–194) days.

Conclusion: In order to comply with this demand on consumption of hospital beds, rehabilitation must be improved.

Financial benefits from implementing continuous registration procedures in relation to complications in orthopedic surgery

Jørgen Gottlieb, Hans Henrik Noer, Leif Panduro Jensen, Jacob Stouby Mortensen, Steen B. Kalms, Per S. Jørgensen and Carsten Tørholm

The Complication Study Group of the Danish Orthopedic Society, Departments of Orthopedics, Roskilde County Hospital Køge/Roskilde, University Hospital Gentofte and Viborg County Hospitals, Viborg West, Denmark

From January through May 1989, a continuous registration of complications in relation to orthopedic surgery was accomplished. The computer program MIKROORT, which was designed by the study group, was applied in 2,157 patients who underwent surgery during that period.

The average wound infection rate declined from 3.2 percent in the two first months to 1.9 percent during the latter 3 months. All the surgical procedures were unchanged during the period in all four wards.

The average hospitalization time was 12.7 days/patient. Patients with a superficial wound infection were hospitalized 19.2 days; and in cases with a deep wound infection, i.e., subfascial or intraarticular pus efflorescence, hospitalization was 31 days.

The patients sustained the following complications: urinary tract infection, superficial wound infection, pneumonia, death before discharge, deep wound infection, fractures and dislocations of arthroplasty.

The hospitalization time is the major cost expense in the nosocomial medical care. Apart from alleviating human suffering, the implementation of the registration procedure has a positive side effect on the daily medical care procedures.

At least 900,000 DKK were "saved" because of the descending wound infection rate in the latter 3-month period. The registration expenses were 1/60 man hour/patients.