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Basic science and pathology

Intraosseous hemodynamics during knee joint tamponade—experimental studies in growing pigs and dogs

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Introduction: Increased intraosseous pressure (IOP) is a painful adjunct of inflammatory and degenerative diseases of joints. Intraosseous hypertension also may occur in the intraosseous engorgement-pain syndrome. The relation of this condition to early arthrosis is uncertain. The pathomechanism appears to be impaired venous outflow from bone due to either extraosseous venous compression by synovial effusion, capsular oedema, and subsynovial fibrosis, or intraosseous vascular pathology at the outlet from bone. Knee joint tamponade in young dogs causes increased intraosseous pressure in the distal femoral epiphysis. As part of an experimental series designed to elucidate the hemodynamic mechanisms in bone during knee joint tamponade, we measured regional bone blood flow (RBF), intraosseous vascular volume (VV), and mean transit time of blood (TT) in two species.

Material and methods: Identical procedures were performed in eight dogs and eight pigs. One knee joint was cannulated, and the intraarticular pressure was elevated to 75% of mean arterial pressure by intraarticular infusion of dextran. IOP was monitored bilaterally by bone cannulation. RBF was measured after 30 minutes of steady state with 15 µm 141Ce-microspheres. Plasma volume (PV) and red cell volume (RCV) were determined by the distribution volumes of 125I-fibrinogen and 51Cr-erythrocytes, respectively. VV was obtained by RCV+PV, and TT by VV/RBF.

Results and Discussion: IOP was elevated by 317 ± 21% in the distal femoral epiphysis of dogs, but not pigs, indicating differences in the relation between the knee joint capsule and epiphyseal drainage routes between the two species. Pig bone generally was more vascular with higher RBF and VV values. Pigs had unchanged RBF and TT during knee joint tamponade, but subtle changes in the PV and RCV distributions were detected, and VV of pigs decreased significantly in patella (16 ± 5%) and subchondral bone (12 ± 4%). Precapillary vasoconstriction in bone is unlikely because RBF was unchanged. Intraosseous veins have no muscularis and cannot contract. The only possible explanation seems to be that subchondral bone in pigs is sufficiently compliant of yield to mechanical compression during joint tamponade. Dogs exhibited decreased RBF and increased TT in the medial femoral condyle, but PV, RCV and VV remained unchanged. The increased intraosseous drainage time known from human studies of bone with increased intraosseous pressure thus may be reproduced experimentally in dog knees. The intraosseous vascular system, encaged in hard tissue, appears unable to expand during acute intraosseous venous stasis.

Vascular reactivity in bone—a new method for direct assessment of resistance vessels isolated from cancellous bone

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Introduction: Present knowledge of vascular physiology in bone tissue is limited to information obtained from in vivo perfused models. However, in these experiments it may be difficult to distinguish direct effects of vascular reactivity in bone from hemodynamic changes in bone secondary to effects in other organ systems. We have therefore established an in vitro method for direct investigations of vascular reactivity in resistance vessels from bone.

Material and methods: The distal femur was removed from anesthetized pigs (approximately 80 kg). The condyles were sliced sagittally and stored in a physiological saline solution. Proximal resistance arteries were dissected from cancellous bone (one to four vessels per pig) under stereomicroscope and mounted as ring preparations on a small vessel myograph (1, 2). The diameter (l100) the vessels would have had in vivo when relaxed and exposed to a pres-

sure of 100 mmHg (13.3 kPa) was determined. The vessels were stimulated isometrically with a solution containing 125 mM potassium and 10 µM noradrenaline (NAK), or with increasing concentrations of noradrenaline, vasopressin, or potassium. From the force development measured, active tension and active pressure were calculated. The active pressure represents the pressure against which the vessel would have been able to contract under in vivo circumstances (1).

Results: The success rate of dissection and mounting was about 95%. 39 viable vessels (1100 = 250 µm [range 159–401 µm]) were studied. The force development was maximal at 0.9 x 1100, and this setting was used in all subsequent experiments. When activated with NAK, the maximal tension was (mean ± SEM, n = 9) 2.92 ± 0.33 N/m and the active pressure 198 ± 19 mmHg (26.4 ± 2.5 kPa) (25 vessels, nine pigs). This is consistent with values obtained from vessels isolated from other vascular beds (2) and suggests that bone vessels are fully viable using this technique. When stimulated with noradrenaline, vasopressin, and potassium, dose-dependent responses were found. There was no difference in force development, agonist sensitivity, and reproducibility between vessels investigated on the first and the second day after dissection. Contractile responses remained constant for ten hours after mounting.

Conclusion: With the establishment of this technique, controlled in vitro investigations of small trabecular arteries have been made possible, allowing direct assessment of normal vascular physiology and pathophysiology in bone tissue.

References:

1) Mulvany and Halpern: Contractile properties of small arterial resistance vessels in spontaneously hypertensive and normotensive rats. Circ Res 1978, 41:19–26.
2) Mulvany and Aalkjær: Structure and function of small arteries. Physiol Rev 1990, 70:921–961.

Enhancement of new bone formation with Transforming Growth Factor-ß

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Purpose: The purpose of this study was to investigate the effect of the growth factor, Transforming Growth Factor-ß (TGF-ß) on local bone formation. Two experimental models were used:

A: Local application into tibial periostal defect.

B: Local application into osteotomy.

Material and methods: TGF-ß was produced from human platelets. Purity was tested by means of SDS-page electroforesis and HPLC reverse-face electroforesis. The biological activity of TGF-ß was tested in a fibroblast in-vitro assay.

Study A: A dose-response study was performed on six mature rabbits in order to determine the effect of TGF-ß on bone formation in tibial periostal defects. Operatively a 1 x 2 cm piece of periosteum was removed.TGF-ß was applied to the area of periostal defect during six weeks via a catheter connected to a miniosmotic pump. Three concentrations (0.2, 10.0, and 100.0 µg TGF-ß/day) were studied.

Study B: Stimulation of fracture healing by local TGF-ß application in a rabbit tibial-osteotomy model. Unilateral tibial osteotomies were performed in 14 adult rabbits. TGF-ß was applied continuously to the osteotomy site via a subcutaneously placed miniosmotic pump with a dose of 10 µg TGF-ß/day for six weeks until termination. Fracture healing was evaluated by means of radiography, mechanical testing, histomorphometry and bone densitometry.

Results: Study A: Local TGF-ß application revealed macroscopically and radiographically enhanced bone formation in the periostal defect at concentrations of 10 and 100 µg TGF-ß/day.

Study B: In the osteotomy study, TGF-ß was found to increase callus formation by histomorphometry. The mechanical test showed equal strength of osteotomies with or without TGF-ß application.

Conclusion: The results indicate that local TGF-ß application is able to enhance new bone formation in adult rabbits both in periostal defects and in fracture healing. More research is required to describe the complex interactions between TGF-ß and other growth factors during stimulation of bone formation.

Prostaglandin E_2 stimulation of periosteum and muscle

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The effect of local infusion with prostaglandin E_2 (PGE_2) at tibial periosteum or in the anterior tibial muscle was investigated.

Materials: In 14 rabbits a mini-osmotic pump (Alzet®) was placed subcutaneously in both thighs. In seven of the rabbits the catheter tip was placed at an anterolaterally periostal defect of 8 x 20 mm at the middle of both tibial bones and in seven rabbits the catheter tip was placed in the middle of the anterior tibial muscle. In all rabbits PGE_2 was infused in the right leg and solvent solution in the left leg. The rabbits were killed after six weeks.

Results: The PGE_2 infusion caused significant periostal

formation of primitive woven bone compared with small amounts of periostal callus after solvent infusion. Similarly, the bone mineral content of the diaphyses and remodeling in the neighbouring cortical bone were increased after PGE2 infusion. In the muscle, PGE2 caused formation of connective tissue with small islets of bone in four of the seven legs, compared with negligible amounts of connective tissue at the catheter tip in controls.

Conclusion: PGE_2 stimulates bone formation in periostal tissue and formation of connective tissue in muscles.

Venous and arterial ischemia—impact on tissue oxygenation

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Cellular oxygenation depends on blood flow, arterial O2 content, and the diffusion distance from the vascular bed to the cells. Ishemia caused by venous obstruction is accompanied by accumulation of blood cells and fluid. The increased diffusion distance may compromise oxygenation more than arterial obstruction. Cellular oxygenation was studied in a bilateral myocutaneous island flap model with extracorporal flap circulation in five control pigs and in eight pigs subjected to stepwise reduction in flap blood flow to 50% of baseline for one hour, 25% for a second hour, and zero for the third hour by gradually obstructing the single artery supplying one flap and the vein draining the other flap at the same time. Tissue oxygen tension was monitored using four implantable polarographic electrodes. AV difference in O2 content and O2 consumption in the flap was calculated form blood samples and total flap blood flow. Relative edema formation was estimated as flap weight change and difference in water content.

Flaps with venous ischemia showed higher tissue oxygen tension in subcutaneous tissue and muscle ($p < 0.05$) but a lower O2 consumption (3.3 ± 0.6 µl/min) than flaps with arterial ischemia (6.3 ± 0.6 µl/min) ($p < 0.05$). The compromised oxygenation in venous ischemic flaps may be explained by edema formation (6% difference in water content and 27% higher flap weight [$p < 0.05$]) enhancing the diffusion distance from vessels to cells.

Platelet and fibrinogen alteration in skin flap ischemia-reperfusion injury

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Endothelial cell injury and microcirculatory intravascular clotting have been suggested to play a role in the pathophysiology of skin-flap failure.

Aim: Accumulation and distribution of platelets and fibrinogen and the morphological changes in the microcirculation in flaps injured by ischemia and reperfusion was studied in pigs in three ischemia models.

Material and methods: Bilateral buttock skin flaps (BS; 10 x 10 cm) and latissimus dorsi island flaps (LD; 10 x 10 cm) were elevated on 12 pigs. Two hours of primary ischemia was established by clamping the vascular pedicle.

Group I, n = 6: During the primary ischemia, the artery on one side was exposed, and a flap (5 x 1 mm) of adventitia was sutured into the arterial lumen (AIF—adventitial infolding). After two hours of reperfusion, seven or five hours of complete secondary arterial ischemia was initiated by clamp application, bilaterally (BS and LD, respectively). During the second ischemic period the AIF segment was removed and a patent arterial anastomosis was performed.

Group II, n = 6: After two hours of reperfusion, one side of the pig was subjected to venous ischemia for six hours and the other side served as non-ischemic control flaps.

Group I and II: Radioactively labelled autologous platelets (In-111) and human fibrinogen (I-125) were injected i v 1/2 hour before secondary reperfusion. Four hours later flap venous effluent and tissue biopsies were collected, and prepared for electron microscopy. The flaps and control tissue were counted for radioactivity.

Results: Platelets and fibrinogen accumulated significantly in all experimental flaps compared with control tissue ($p < 0.05$).

Group I: Ratio between ischemic flap and control tissue was 3:7. The accumulation was equal in the AIF flaps and the arterial clamping model.

Group II: The ratio between venous stasis flaps and control flaps was 3:4 ($p < 0.05$). Platelets and fibrinogen were distributed homogenously throughout the flaps. Electron microscopy showed extravasation of red blood cells, activated platelets, fibrin, and red blood cells in distended and partly disrupted vessels.

Discussion and Conclusion: The ischemia reperfusion injury is associated with thrombosis in the microcirculation and this study gives physiological support for studying the effect of treatment modalities that aim at counteracting the different components in thrombus formation. The adventitial infolding model and the arterial clamping seems to cause equal amounts of microcirculatory thrombosis.

Hand surgery and upper extremity pathology

Forearm pseudarthrosis treated by external compression

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Introduction: The classical treatment of pseudarthrosis is resection, open reduction and internal fixation followed by immobilization in a cast or brace. This preliminary study reports the treatment of non-infected hypertrophic pseudarthrosis of the forearm, by external fixation with compression (Orthofix) without open reduction and bone grafting.

Methods: The rigidity of the external fixator is used for stabilization, and a compression screw brings the pseudarthrosis under axial compression. Compression is made by patients themselves, 0.25-0.5 mm a day, until obliteration of the pseudarthrosis is shown by radiography. The compression lasted for an average of 14 days.

Results: Six patients with hypertrophic non-united fractures of the ulna/radius have been treated since 1989. The time from fracture until operation was 21 (9-60) weeks. One patient had internal plate fixation, five patients underwent conservative fracture treatment, before external fixation. In average the Orthofix fixator was carried for seven weeks. After an average of five weeks obliteration of the pseudarthrosis was seen radiographically. Five patients had no problems and good mobility of their forearms, one patient had reduced supination/pronation.

Conclusion: The method of external compression of pseudarthrosis seems to be successful. It is less invasive than the technique mentioned before, and allows early joint mobility. The pseudarthrosis healed and five out of six patients had normal joint mobility after this treatment.

The anterior interosseous nerve syndrome

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The anterior interosseous nerve syndrome (AINS) is a relatively uncommon neuropathy, resulting in isolated paralysis of the flexor pollicis longus muscle, the flexor profundus to the index finger and the pronator quadratus.

21 cases in 20 patients were studied retrospectively and 14 patients were re-examined. Nerve compression was found in nine of the 15 patients where the anterior interosseous nerve was explored. 11 of these patients regained a satisfactory function and three were treated by tendon transfer. Five patients were not operated. Two regained a satisfactory function while three had continuous paralysis after over four years of observation. One patient was primarily treated by tendon transfer.

We recommend operative nerve decompression in patients with AINS. Conservative treatment can be reserved for patients with slight inconveniences or poor general health status. As recovery may take over one year, tendon transfer should be postponed until after this period in patients who do not achieve satisfactory function.

Recurrent anterior dislocation of the shoulder treated by arthroscopic suture of the Bankart lesion

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Introduction: As the shoulder joint is sensitive to immobilization, a less traumatic stabilization procedure as arthroscopical suture could offer an advantage with respect to ROM and cosmetics.

Method and material: In 11 consecutive athletes (mean age 28 years) with recurrent dislocation of the shoulder arthroscopic suture of the Bankart lesion was performed (Morgan and Bodenstaph) followed by six weeks of rehabilitation.

Results: No complications were seen after the procedure. Three months postoperatively all were clinically stable with normal ROM and back in sports at preinjury level. During the observation period (17 (4-20) months) one patient had redislocation after adequate trauma. The mean functional shoulder score (Rowe et al) one year postoperatively was 98.

Conclusion: Arthroscopic suture and intensive rehabilitation of patients with recurrent dislocation of the shoulder seems to be a safe and promising procedure.

Treatment of the clavicular fracture: figure-of-eight bandage versus simple sling

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Traditionally clavicular fractures are treated either with a figure-of eight (FE) or a simple sling (SS). These treatments were compared in a randomized clinical study for patients older than 13 years of age.

Material and methods: All patients had a clavicular fracture and no other injuries. 129 patients were allocated by means of birthday and date for treatment (72 to FE and 57 to SS). 21 patients were excluded, four changed treatment (1

FE/3 SS), three died and 14 patients refused follow-up examination (10 FE/4 SS). 108 patients (61 FE/47 SS) were examined after three months. Age, sex, type of fracture and displacement were comparable in the two groups. The following parameters were examined: 1) radiographic displacement of the fracture, 2) in the first three weeks pain was registered in a scale from 0–5 (from no to severe pain), 3) use of analgesics, 4) discomfort with the bandages, 5) pain at follow-up, 6) physiological statement at follow-up, 7) deformity of the skin, 8) cosmetic discomfort, 9) time for full recovery, and 10) evaluation of the end results.

Results: No differences were registered between the two treatment types regarding the parameters evaluated.

Hip

Risk of hip fracture and mortality in a nursing home

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Background: The risk of hip fracture and the mortality among nursing home residents is generally considered higher than in the background population.

Methods: During the year 1989 6% (women/men = 31/11) out of 741 (women/men = 511/230) nursing home residents aged more than 64 years suffered a hip fracture and 7% (women/men = 43/7) sustained a non-hip fracture. The incidences and mortality rates were compared to the background population.

Results: The relative risk of sustaining a hip fracture among nursing home residents was 3.5 in women (2.3–4.7, 95% confidence limits, CL) and 5.4 in men (2.3–8.4, 95% CL). Only 50% of the nursing home residents with hip fracture survived the first three months after hip fracture, and the standardized mortality rate (SMR) was 4.1 (2.9–5.2, 95% CL). The high mortality seemed to be related to concomitant diseases as reflected by a higher rate of cardiopulmonary medication (60%; 39–80, 95% CL) in those who died later following a hip fracture as compared to those who survived (24%, 9–51, 95% CL). The SMR among all nursing home residents was 2.7 (2.3–3.1, 95% CL) and 2.0 (1.5–4.9, 95% CL) for women and men, respectively.

Conclusion: Nursing home residents are definitely a population with a high risk of hip fracture and prevention of falls and traumas are highly relevant in this population, even though their mortality rate is also increased.

Fractura colli femoris operated a.m. LIH

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The aim of this study was to determine whether our results were as good as the results published by Strömqvist, Hansson, Nilsson and Thorngren.

During a period of three years, 151 patients were admitted to our department with fractures of the femoral neck. 46 patients with 47 fractures and an average age of 82 years were primarily operated on with implantation of a Moore prosthesis.25 patients died in the period and ten patients did not want to participate in the survey.

70 patients with 72 femoral neck fractures and median age of 75 years were evaluated with interviews, clinical investigations and radiographs at a minimum of one year postoperatively.

Out of 26 non-displaced fractures 22 healed without complications and 31 out of 46 displaced fractures healed without complications. In the rest of the cases, complications (avascular necrosis, non-union or redislocation of the fractures) occurred. In one case the femoral head was excised. In nine cases reoperation with a Moore prosthesis was performed and in nine cases total hip replacement was performed.

Our findings were inferior to the results published by Hansson et al.

Internal fixation of femoral neck fractures: a randomized comparison of Dynamic Hip Screw and Gouffon Pins

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Introduction: A randomized comparison of the results after osteosynthesis of femoral neck fractures by either Dynamic Hip Screw (DHS) or by Gouffon Pins (GP) was done.

Material and methods: All patients with displaced, traumatic femoral neck fractures admitted to the hospital were included and randomized to DHS or GP. The operations were mainly performed by the registrars on duty. Postoperatively a radiographic control was obtained and full weightbearing was allowed. Follow-ups were done at 3, 6 12, and 36 months postoperatively. After entrance of 73 patients the trial was stopped, because of an obvious difference in the short time failure rate for GP. The material comprised 18 men, median age 81 (52–88) years, and 55 women, median age 76 (54–94) years. 38 patients were treated with GP and 35 with DHS.

Results: Six GP-patients and 14 DHS-patients had died before final follow-up. Three in each group had failed before their death. Non-union was seen in 18 GP-patients

and in nine DHS-patients. Seven GP-patients and three DHS-patients had necrosis of the femoral head. The cumulative rate of failure was 0.16 for the DHS-group and 0.34 for the GP-group. A chi-square test for the 73 patients one month after surgery elicited a difference in advantage to DHS ($p = 0.014$) and the same was true after 3 years ($p = 0.014$). The logrank test, which is more sensitive in studies with different follow-up rates for the patients, was also significant in favour of DHS after three years.

Conclusion: DHS turned out to be superior to GP in this study. GP suffered from a higher failure rate, both in short and long-term.

Hip arthroplasty in ankylosing spondylitis

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In order to evaluate the long-term results of hip arthroplasty in ankylosing spondylitis (Mb Bechterew), we have collected results from patients admitted to our hospital.

29 prostheses had been implanted in 19 patients. 28 Charnley prostheses and one Porous coated anatomic prosthesis. 14 men and five women (2.8:1). The average age at the time of operation was 40 (19–66) years. 12 patients were available for follow-up, six patients had died and one patient was in hospital for revision of both hips. The average follow-up was 8.5 (3–17) years. The evaluation was based on the clinical and radiographic results.

Results: Five patients were reoperated 1-5 years after the primary operation; among them three had a revision prosthesis, one had a Girdlestone procedure and one had refixation of the trochanter major. In addition, one patient was admitted to have a revision of both hips. Among the 12 patients three received disability pension and nine had a sedentary job. The average Harris hip score was 74 (47–91) fair, average pain score (d'Aubigne) was 4.3 (3–6) (6 = free from pain).

Ectopic bone formation grade II-III was found in three patients. There were no clinical or radiographic signs of loosening of the prostheses. The range of motion of the examined patients was generally reduced, especially the rotation of the hip. All patients were generally satisfied with their operation.

Conclusion: Hip arthroplasty in ankylosing spondylitis gives good results in regard to function and does not cause increased heterotopic ossification, but the frequency of revisions seems to be increased.

Five-year follow-up of non-cemented versus cemented acetabular component in total hip replacement

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We have previously published a one-year follow-up of 30 hips operated on with uncemented Ti-Bac acetabular component (TIB), and an age and sex matched group of 30 hips operated with Müller cemented component (CEM). This is a clinical and radiographic 5–6-year follow-up. 48 hips (27 TIB, 21 CEM) were available for the examination. Three hips had been reoperated because of problems with the acetabular cup (one TIB, two CEM), the patient with TIB because of luxation of the acetabular component on the third postoperative day, the two CEM because of loosening of the acetabular cup. Radiolucencies around the acetabular cup were seen in one of the TIB patients, and in 14 hips in the CEM-group ($p = 0.00005$).

Conclusion: Significant differences in frequency of radiolucencies around the acetabular component were found between the two groups. According to the reoperation frequency, no difference between the two types of acetabular components was found. An uncemented acetabular component is a good and probably better alternative than the cemented acetabular components in primary hip replacement.

Reference: Bødtker et al. Total hip replacement with an uncemented acetabular cup. Adv Orthop Surg 1988: 111-114.

Transfusion associated with infection after hip fracture surgery

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A one-year material of patients, admitted and operated on for hip or proximal femoral fractures, was reviewed. Excluded were patients who recently had had an infection or had had an arthroplasty/reoperation performed. In case of early discharge the files of the patient were obtained from the primary health service or the nursing home. The following parameters were registered: sex*, age, body mass, type of fracture*, hemoglobin (preop and on postop day one)*, operative delay, surgical procedure*, duration of surgery*, type of anaesthesia, amount of bleeding, transfusion requirements*, and duration of drainage*. No prophylactic antibiotics were administered routinely. Erythrocyte concentrate (SACMAN) was used for transfusion.

We studied 181 patients, 41 of whom developed infections after surgery: 25 urinary, 12 pulmonary and four wound. 67 patients received transfusions. By monovariate analysis the parameters marked with * were found significantly associated with postoperative infection within 30 days after surgery. Preoperative hemoglobin and the amount of transfusion were found independently predictive with respect to postoperative infection (multiple regression analysis [BMDP]). These results support recent reports on an immunosuppressive effect of transfusion with blood components.

Knee

Insall-Burstein knee prosthesis—a 5–10-year follow-up

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Introduction: 121 cemented total arthroplasties (Insall-Burstein) in 95 patients were examined five to ten years after operation.

Materials and methods: In the period 1980 to 1985, 196 arthroplasties were inserted in 158 patients. 36 patients died before follow-up, and another 27 were not available for follow-up. 23 of the 121 controlled knees were from patients with RA. The average follow-up time was seven years. The ratio male:female was 1:3 and the median age at time of operation was 70 years. The level of function was evaluated by the Hospital for Special Surgery knee score. The examination included radiographic evaluation.

Results: The average preoperative score of 48 was improved to 82 at follow-up. 107 (90%) knees were rated as excellent or good. Before operation 77 (64%) suffered from moderate to severe pain at rest, as compared to six (5%) knees at follow-up; and three of these suffered from RA. Nearly equally good results were obtained with pain on walking. Before operation only eight (7%) had an unlimited walking distance, and 16 (13%) were able to manage 500 to 1000 m. Five to ten years after operation these numbers improved to 63 (52%) and 22 (18%), respectively. Radiographic evaluation demonstrated tibial radiolucencies in at least one zone in 57 (47%) knees. No correlation was found between numbers of radiolucent zones and function according to the scoring system used.

Conclusion: Our results are similar to those of other authors with similar follow-up time, and demonstrates total knee-arthroplasties of this type as an excellent treatment for knees suffering from arthrosis or RA.

Patellofemoral arthroplasty—a 10-year follow-up study

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In Denmark there is a very limited use of unicompartmental patellofemoral arthroplasty. During the last ten years such a prosthesis (Blazina type II = Patella II [P2]) has been used at Haderslev Hospital. The results are presented.

Material: From 1981 to 1990, 24 P2-arthroplasties were performed in 21 patients with the diagnosis unicompartmental patellofemoral arthrosis. The mean age at operation was 61 years. Four patients were lost to follow-up as one knee was revised to a total knee arthroplasty, one patient died and two patients did not attend the follow-up. 17 patients with 20 arthroplasties were interviewed and examined (HSS-rating and radiography). Mean observation time was 3 (0.5–10) years.

Results: Mean HSS-score was 82.5 and 17 knees were rated as excellent (12) or good (5). The mean range of movement was 119° (85°–135°). Mild or no pain at rest or during activity was reported by 14 of the patients. Five patients used analgesics daily because of moderate to severe pain. In four patients this was due to advancing tibiofemoral arthrosis and one patient had a malrotated patella component. In the whole material there was no loosening or infections.

Conclusion: The treatment of patellofemoral arthrosis with the Patella II prosthesis is acceptable with results slightly less favorable than total knee arthroplasty.

Miranax versus placebo after diagnostic and therapeutic arthroscopy of the knee joint

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The purpose of the study was to evaluate the effect of Na-naproxen (Miranax) after diagnostic arthroscopy or transarthroscopic surgery of the knee joint.

Patients and method: In a double-blind trial, 41 patients were randomized to Miranax 550 mg x 2 for ten days following surgery, and 46 patients received Placebo. If needed, patients received paracetamol during the study. 41 patients had a diagnostic arthroscopy performed, 46 patients underwent a transarthroscopic procedure in addition.

Results: In patients who underwent transarthroscopic surgery, there were no differences between Miranax and Placebo treatment regarding pain, but patients receiving Miranax had significantly less need of paracetamol and returned significantly faster to work than patients receiving Placebo (median 10 versus 30 days). In patients who had

only a diagnostic arthroscopy, there were no differences between the Miranax and the Placebo group regarding pain, amount of paracetamol or time for return to work.

Conclusion: Na-naproxen (Miranax) relieved pain (less use of paracetamol) and shortened the period before return to work in patients who underwent a transarthroscopic procedure. Patients with solely a diagnostic arthroscopy had no benefit of Miranax compared to Placebo.

Anterior cruciate ligament reconstruction with the ilio-tibial band in athletes

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Introduction: The treatment of athletes with ACL deficiency has in Denmark traditionally been very conservative. Since December 1989 we have changed our treatment strategy towards the ESKA consensus and we here present our preliminary results.

Methods and material: Isometric, distally based ilio-tibial band plasty and a five month rehabilitation programme was performed in 64 patients (Tegner level 7 or more) with an acute total rupture of the ACL and in patients with chronic functional instability in spite of a relevant training programme for three months.

Results: Six months postoperatively the median increase was: 4 in Tegner score (from 2 preoperatively), 22 in Lysholm score (from 73 to 95). 12 months postoperatively the median Tegner score was 7 and the Lysholm score 96.

The complications were: One superficial infection, five femoral haematomas. One patient had a rerupture and two patients 10° extension deficiency 12 months postoperatively.

Conclusion: Treatment of patients with ACL insufficiency according to the ESKA consensus is also possible in Denmark. Our preliminary results are comparable to those published by other international centers for knee surgery.

An experimental analysis of ligamentous and capsular restraints in the medial knee compartment in relation to anterolateral knee instability

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Objective: To analyze the influence of lesions to the medial capsule or the medial collateral ligament in the knee in relation to anterolateral knee instability (1).

Design: Abduction-adduction rotation, coupled tibial translatory movement and coupled tibial axial rotation were recorded continuously and simultaneously during flexion or extension while applying a well-defined valgus directed moment in an experimental setting using 24 normal osteoligamentous knee preparations. Data were collected after transection of the anterior cruciate ligament (ACL) and medial capsule or medial collateral ligament (MCL) and compared to those of the intact knee.

Results: During flexion or extension abduction and simultaneous external rotation without change in anteroposterior translation were recorded after isolated transection of MCL. During flexion movement after transection of both MCL and ACL abduction and initially external rotation suddenly changing to internal rotation with simultaneous anterior translation was recorded. During extension movement an analogous but reverse movement pattern was found. The magnitude of the instability recorded was almost twice that recorded after isolated transection of the ACL. In the ACL-deficient knee partial or total medial capsular lesion did not result in significant changes in the measured abduction, internal rotation and anterior translation.

Conclusion: The study demonstrates the influence of MCL lesions on the grading of anterolateral instability using the Jerk test and the Pivot shift test.

Reference: 1) Østgaard, Helmig, Nielsen and Hvid: Anterolateral instability in the anterior cruciate ligament deficient knee. Acta Orthop Scand 1991, 62(1): 4-8.

Leg and foot

Surgical versus conservative treatment of acute rupture of the calcaneal tendon evaluated by gait analysis

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The calcaneal tendon is of major importance in normal gait. We therefore have analysed the gait following surgical and conservative treatment of rupture of the calcaneal tendon.

Material and methods: 20 patients, all of whom had presented a unilateral acute rupture of the calcaneal tendon were included in a prospective randomised study. The patients were treated either by end-to-end suture of the tendon a m Kessler followed by six weeks of plaster casting or eight weeks of plaster casting. The gait analysis was performed 4 and 12 months after the injury using a computerised treadmill.

Results: Gait analysis at four months showed a shorter stance phase on the injured side in both groups. This differ-

ence however was reduced after 12 months ($p > 0.05$). The mean external work performed by the injured extremity was significantly less, than the uninjured, in both groups. At 12 months the external work was equalized in the surgically treated group, whereas the difference persisted in the conservatively treated patients ($p < 0.05$).

Conclusion: The results suggest that surgical treatment of ruptures of the calcaneal tendon tends to allow the patient to regain a normal gait, whereas after 12 months the gait in conservatively treated patients is not normalized.

The role of dynamic and static stabilizers in functional ankle stability

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Methods: The role of musculo-tendineous and articulo-ligamentous mechanoreceptors in ankle proprioception and functional stability was assessed by measuring active and passive ankle joint inversion position sense, the peroneal reflex reaction time to sudden ankle inversion, and postural stability during single limb stance in seven subjects with stable ankles before and under anaesthesia of the foot/ankle complex.

Results: We found that subjects only relied on afferent input from the ankle joint region for passive position assessment. Musculo-tendineous receptors seemed to provide the active position sense as well as the triggering of the peroneal reflex reaction to sudden ankle inversion. Postural stability during single limb stance was not dependent upon afferent information from the ankle joint area.

Conclusions: Our results suggest that the integrity of the lateral ankle ligaments and ankle capsule is of minor importance in the dynamic protection of the ankle against inversion injuries. The results stress the importance of the peroneal musculo-tendineous receptors for functional stability.

Treatment of large tibia defects by segmental callotasis with the Orthofix apparatus

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Introduction: Callotasis is a new method in the treatment of bone defects which implies slowly controlled distraction thereby utilizing the patient's capability for osteogenesis. Segmental callotasis is preferred with large bone defects. Different types of external fixators have been used for this purpose. By means of cone-formed pins and a single lateral bar, the Orthofix system gives sufficient stability to allow early weight-bearing.

Method: After applying the Orthofix external fixator a subperiosteal osteotomy (= corticotomy) is performed. Segmental callotasis is initiated after two weeks. The patient moves the segment 1 mm a day by turning a screw on the side of the bar. The apparatus can be removed when the conjointing segments have merged and the bone has remodelled in the defect.

Results: Two patients with large tibial defects (8 cm) that resulted from complicated lower leg fractures have been treated by this method. One of the patients was scheduled for a below-knee amputation when he accepted to undergo segmental callotasis. Healing and remodelling occurred after eight and nine months respectively. Both patients walk without crutches and joint mobility is unchanged as compared to preoperatively.

Conclusion: With this method healing and remodelling is obtained after a relatively short period depending on the size of the defect and the speed of distraction. Furthermore, joint mobility is preserved. When pin-hole care is carried out daily, the Orthofix apparatus can be worn for several months.

External fixation with the Orthofix system in dislocated fractures of the lower extremities in children

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Introduction: External fixation is a well-established technique. Conventional external fixation systems neither inhibit motion at the fracture sufficiently to permit optimal primary bone healing, nor do they allow sufficient motion to encourage adequate external callus formation and this combination results in a prolongation of healing time. In this study we used a dynamic axial fixator, the "Orthofix System". A single bar with articulating ends which clamp self-tapping conical screws can be locked at an angle appropriate for axial alignment. Telescopic facility allows easy conversion from rigid to dynamic fixation. We present the results from our first ten patients.

Material, methods and results: From October 1988 to May 1991, ten children—four girls and six boys—with a fracture of the lower extremity were treated with Orthofix. The material comprised seven femoral and four tibial fractures—all dislocated—one girl suffered both fracture types. We operated six patients primarily, whereas four patients were operated secondarily after insufficient conservative treatment. Closed reduction was possible in seven cases,

while four fractures had open reduction. Physiotherapy for the adjacent joints was begun on the first postoperative day. In eight of the ten patients partial weight-bearing on crutches started at this time also. Daily pin-tract-hygiene was performed.

Eight of the ten patients were discharged within the first three weeks. Average hospital stay was 14 days. All fractures except one, where re-reduction was easily performed with the screws left "in situ", revealed good alignment during the whole treatment period. At the first radiographic indication of periostal callus, dynamic loading began. Removal, offered as an outpatient procedure, was performed after an average time of eight weeks. We observed three superficial pin-hole infections—none persisted after a short antibiotic treatment and none was followed by pin-loosening. We observed no cases of non-union and no cases of mal-alignment. We achieved an overall success for all patients defined as healing with less than 10° of angular deviation/rotation, less than 0.5 cm of shortening/lengthening, with the patient restored to full weight-bearing without the need for external support, and a full range of associated joint movements.

Conclusion: We find the Orthofix system a safe and easy operative method for fractures of the lower limbs in childhood. The system offers the obvious advantages of maximal stability during primary healing and allowance of partial weight-bearing in this period and easy conversion to a dynamic modus once there is radiographic evidence of callus formation.

Infection

The development of planocellular carcinomas from chronic fistulous osteomyelitis

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The development of cancer from chronic fistulous osteomyelitis is a rare but severe complication. According to previous surveys the estimated incidence approximates 0.4%. The condition manifests itself by a sudden increase in pain and swelling, increased, often sanguinolent discharge and possibly a fracture. Two cases are reported below.

Case 1: In a 73-year-old man, who had been suffering from osteomyelitis for 61 years there was a sudden increase of sanguinolent discharge from a fistula, an onset of pain and swelling and a fracture at the site of the osteomyelitic changes. Biopsies revealed chronic inflammatory changes, but cancer was not suspected. During the following two years numerous surgical corrections and skin/muscle transplants were performed. However, new fistulae developed continuously. Renewed biopsies revealed the presence of a planocellular carcinoma. Amputation of the femur was performed. Metastases have been noted in regional lymph glands.

Case 2: In a 77-year-old man, who had been suffering from osteomyelitis in the tibia for 52 years, pain suddenly intensified and discharge of sanguinolent secretion from a fistula increased. A biopsy specimen from the fistula revealed a planocellular carcinoma. Amputation of the femur was performed. No metastases have been demonstrated.

Discussion: An almost intermittent discharge of pus attendant on chronic fistulous osteomyelitis makes it an unhygienic and therefore troublesome disease. Furthermore, if the condition is not treated, carcinoma may develop at the site of the chronic changes. If only for that reason antibiotic treatment and surgical correction are indispensable in cases of chronic osteomyelitis.

Surgical treatment includes removal of all infected bone, a guttering of the medullary cavity, fistulectomy and local antibiotic therapy. Systemic antibiotic treatment should be administered until complete healing has occurred.

Intraarticular antibiotics for experimental septic arthritis

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In a known infection model Cloxacillin was given intraarticularly for evaluation of inflammatory changes in knee joints and its effect on infection.

20 rabbits with unilateral staphylococcus knee infection was treated with Cloxacillin 50 mg/kg x 2 and Probenecid 250 mg x 1 p o for three weeks. 12 of these received in addition 50 mg of Cloxacillin intraarticularly daily for five days preceded by aspiration of pus. In another eight rabbits intraarticular treatment for five days was given as the only treatment for infection, just as it was instilled in all uninfected knees (n = 28). The animals were killed two, three, five and seven weeks after inoculation and the joints were examined according to Salter's histological-histochemical scoring system.

Minor inflammatory changes were observed in four uninfected knees after two weeks but not later in the course. All infected joints were sterile after two days of treatment. The groups which had parenteral therapy or intraarticular antibiotics alone presented progressive destruction. However, the 12 animals which got the combined therapy had significantly lower scores but with great dispersion throughout the course.

The conclusion is that although intraarticular antibiotics cause no harm to the joint, the results following the combined treatment is unpredictable and cannot be recommended in case of septic arthritis.

Amputations

The social and economic outcome after upper extremity amputation

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66 upper limb amputees in the County of Funen, Denmark, were visited in their homes by the author. The purpose of this study was to evaluate the social and economic outcome for a population of upper limb amputees compared with the normal population for the same period of time.

The mean age at amputation was 25 (0–72) years, and at review 45 (4–83) years. The mean time lapse from amputation to review was 21 (0–63) years. The amputees were characterized as active, partially active and passive prosthetic users and non-users. The amputees were classified in social groups according to the terms of the Danish Institute for Social Research, and compared with the social groups of the background population. The number of amputees investigated corresponds to the annual number of persons becoming upper limb amputated in Denmark.

The amputees had become better placed in the social system after amputation independent of prosthetic use. Their social migration quotient was higher than that of the background population and reflected the amputees' better income and housing conditions. The reasons for these positive results must be the high grade social system in a sophisticated industrial country. None of the amputees had to pay for rehabilitation or prosthetic supply. Only 14% lived alone. The divorce rate for the amputees was 11%. Those who had sexual debut after amputation were three years later in sexual appearance than the rest of the amputees.

Rehabilitation after amputation following lower limb fracture

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The aim of this study was to evaluate the functional result after amputation following lower limb fracture.

Patients and methods: From 1973 to 1988, a total of 38 patients underwent lower limb amputation proximal to the foot joint following fracture. 22 were available for follow-up. Median age at time of injury was 44 (14–77) years; follow-up time 9 (2–23) years; time from injury to amputation 1.5 (0–17) years. Level of amputation: 4 AK, 4 TK, 14 BK.

Results: All patients had a prosthesis and used it daily. 20 patients could walk outdoors, one used a wheelchair, and one used a three-wheeled motorbike for outdoor transportation. 15 patients were at work before the accident. Five of these have been unemployed ever since. The patients who returned to work were significantly younger than the patients who became unemployed. 11 patients felt no limitation in everyday performance including their jobs. Six patients could manage their own household, and five patients needed help to household or for personal care. Increasing age reduces the patients' ability to manage everyday performance.

Conclusion: All patients used a prosthesis, and the vast majority could walk outdoors. With increasing age the chance to return to work decreased, and the need for help to household and for personal care increased.

The amputation rate influenced by a close cooperation between orthopaedic surgeons and vascular surgeons

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The rate of major amputations has until now not been influenced to a great extent by vascular surgery. In 1988, the county of Viborg established a unit of vascular surgery, placed in Skive. Retrospectively we have estimated the amputation rate in a two-year period before the vascular unit was established (1986–1987), and compared this period with a two-year period after (1989–1990).

In the first two years 189 major amputations were performed, in the last two years the number was 142 - a reduction of 25%. In the same period the rate of patients examined by vascular surgeons before the amputation was performed, rose from 19 to 49%. Other data concerning age, sex distribution and diabetes were identical in the two periods.

We emphasize the importance of a close cooperation between orthopaedic and vascular surgeons when patients with severe ischemia of the lower extremity are evaluated - especially in view of new operative methods, mainly the in situ bypass technique.

Miscellaneous

Reduction and stabilization of displaced fractures of the pelvic ring with Mears sacro-iliac plate

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Major disruptions of the pelvic ring have traditionally been considered as a difficult surgical problem. Commonly accepted principles of treatment include traction, manipulation and pelvic sling, external fixation and open surgery combined with internal fixation. Non-operative treatment requires rest in bed for a longer period. Since 1988 we have treated unstable displaced fractures and luxations of the pelvic ring with internal fixation.

Materials and methods: Disruption of the pelvic ring with sacro-iliac joint luxation or fracture of the ilium or disruption of the symphysis pubis or fracture through both ischiopubic rami were present in all cases. Preoperative examinations included conventional radiographs of pelvis (including oblique projections) as well as computed tomography (CT) scan. The strategy of the operative procedure included reduction of the pelvic ring disruption - anterior fixation with a Letournel plate, posterior fixation of fracture/luxation of the sacrum with a Mears plate, and finally reduction/fixation of simultaneously occurring fractures of the acetabulum, if any.

Our material included six females and one male with an average age of 26 years. Two of these patients were initially treated with external fixation. Anatomical reduction was obtained in every case. The postoperative care included early mobilization, walking being allowed after four weeks.

Results: Primary union in anatomical position was obtained in all patients. The patients were painfree six months after surgery. Complications were seen in two cases, in both cases as necrosis of the skin covering the sacral plate. The defects healed after secondary closure.

Conclusion: Exact reduction and internal fixation is possible with optimal conditions for fracture healing. Restoration of the pelvic ring is also an important contribution to the surgical treatment of fractures of the acetabulum. The treatment allows early mobilization without considerable inconveniences for the patient compared to external fixation and non-operative treatment.

Motocross injuries

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This paper reviews motocross injuries by describing the lesions, the severity of the lesions, sequele and working days lost. The cause of the accidents was investigated and the use of approved equipment explored.

Materials and methods: 61 motocross drivers were treated at the casualty ward during the years 1988 through 1991. By telephone it was possible to contact 49 drivers, two of whom females, who also filled out a questionnaire. The mean age was 21 (7–53) years, among these 36 were under 20 years of age.

Results: 83 injuries required treatment. 40 injuries were located to the legs, 22 to the arms and 12 to the head and face. 23 lesions were fractures, 15 joint lesions, 21 contusions and 20 skin lesions. Eight patients were hospitalized. The total number of working days lost were 546, mean 11 (2–90). Sequelae were found in eight persons. 30 persons had less than one year of motocross experience, 14 accidents happened outside approved courses and 23 persons had no or poor equipment.

Conclusion: Many injuries could have been avoided if unexperienced motocross drivers would use the approved equipment available.

Hard copy prints from postoperative fluoroscopy images

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Introduction: We have examined the applicability of immediate postoperative image documentation, in order to promote early mobilization after osteosynthesis and save the standard radiographic examination.

Material and methods: Hard copy prints, sized 105 x 113 mm, were recorded from the postoperative fluoroscopy image by Fuji Film Thermal Imaging System FTI 200. These prints were compared with standard radiographs to assess the quality of the osteosynthesis and possible restriction in mobilization. The investigation included 123 patients with proximal femoral fracture.

Results: The specificity of finding an unacceptable osteosynthesis was 0.40 and the sensitivity of finding an acceptable osteosynthesis was 0.96. Four unstable fractures were overlooked on the prints. The specificity of finding patients needing restricted mobilization was 0.44 and the sensitivity of finding patients with free mobilization was 0.93. Eight patients needing restricted mobilization were overlooked on the prints. Hard copy images seems to be of limited value in estimating long axis.

Conclusion: Hard copy images do not safely expose unstable osteosynthesis, however, they are useful as a documentation when the osteosynthesis is found stable peroperatively.

Written information to patients before surgery for lumbar disc herniation

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The doctor's obligation to inform patients before treatment has recently been enjoined by a circular letter from the Danish National Health Board.

In order to draw up a patient information form, we have sent a questionnaire to the 22 Danish surgical departments, which in total perform approximately 4150 operations per year for lumbar disc herniation.

At two of the departments a written information about the operation and the possible complications were available. Six of the departments had an information form in preparation. None of the departments had so far received complaints of insufficient patient information. Several previous studies have shown the importance of combining written and verbal information in presurgical patient preparation.

We conclude, that written information forms about the operation and the possible risks are still not used in most of the departments asked.