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UPPER EXTREMITY

Treatment of distal radius fractures with external fixation in non-osteoporotic bone

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External fixation has proved to be effective in the surgical treatment of unstable distal radius fractures. The purpose of this study is to evaluate the outcome of fractures of the distal radius treated with external fixation in non-osteoporotic bone.

Material and methods: From April 1992 to August 1996, 36 patients with distal radius fractures were treated with external fixation. In this retrospective study 28 patients were examined for follow-up at mean 29 (10–62) months. 13 were women, mean age 46 (21–55) years and 15 men, mean age 45 (32–60) years. All fractures were classified by the AO-classification. 27 patients had C2 or C3 fractures, 1 patient had an A3 fracture. Clinical outcome and results were evaluated through questionnaires and the modified Mayo wrist score. Radiographs of the wrist were assessed.

Results: Four patients developed pin-track infection, one had the fixator removed. There was no damage of the superficial branch of the radial nerve. There were no fractures at pin-sites. The fixator was removed after 40 (21–62) days. All fractures went on to healing. At mean follow-up of 2.5 years, 15 patients were rated as excellent or good, 8 as fair and 5 as poor. 20 patients resumed work, 6 had to change their jobs. 2 retired, but not because of the trauma.

Conclusion: On the basis of the present study we conclude that external fixation is an acceptable method of treating intra-articular wrist fractures in non-osteoporotic patients. Compared to other studies the complication rate is low. The functional outcome is acceptable.

Ilizarov-technique used on malunited fractures of the forearm

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Ilizarov's technique for correction of malunited fractures of the distal radius is controversial. Only few works describe the use of this technique on the forearm.

Material and methods: In the period 1993–1997, ten patients were treated with lengthening and simultaneous correction of malunited fractures of the distal radius by the use of a modified Ilizarov technique. This retrospective study is combined with a clinical follow-up of 8 patients (4 men, 4 women), mean age 39 (15–71) years. Two patients did not show up.

Results: The indications were pain and restricted motion. The mean time between trauma and operation was 21 (6–60) months, the mean fixation time was 119 (55–79) days. The average lengthening achieved was 6 (0–15) mm, and the average correction of dorsal angulation was 17 (2–50) degrees. Two patients developed infection in the pin holes - one was admitted twice, both were treated successfully with antibiotics. One was admitted because of pain and had early removal of the fixation. Other complications seen were a re-fracture in the lengthening segment and lunata malacia. None developed pseudoarthrosis. At follow-up two patients were in consideration for early retirement because of pain; two worked full time, doing non-manual work; four were fully active. All showed improvement of their preoperative condition.

Conclusion: The modified Ilizarov technique with callotaxis is a practicable method for treating malunions after fractures of the distal forearm in cases where the aim is lengthening of the distal radius combined with correction of the dorsal angulation.

SHOULDER

Total shoulder replacement for the treatment of glenohumeral osteoarthritis

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Our purpose was to determine the outcome of 38 Total Shoulder Replacements (TRS) performed between 1983 and 1994 for the treatment of primary and secondary osteoarthritis (OA). All shoulders presented severe pain and disability preoperatively. However, only 28 shoulders, all with greater than 3-year follow up (mean 7.1 years) are reviewed.

Material and methods: The results are based on the Constant Score (CS) from 0–100 points.

Primary OA: 8 patients (10 shoulders) with a primary diagnosis of primary OA of the glenohumeral (GH) joint underwent TSR. Mean age at the time of evaluation was 80 (71–87) years. Pain and function improves significant in the majority of the patients with a mean CS of 57 (12–68). In follow up 2 wellfunctioning patients (initial CS score 88) developed late rotatorcuff defects and there were 2 reoperations due to mechanical loosening of the glenoid prosthesis.

Secondary OA: 17 patients (18 shoulders) with secondary OA were followed for avr. 6 (3–13) years. The mean age at the time of evaluation was 69 (47–90) years.

6 patients (6 shoulders) with a primary diagnosis of (non-operated) instability were treated with a TSR (5 shoulders) and a hemiarthroplasty (1 shoulder). 2 shoulders had glenoid bone grafting. CS was low (21–30) in 3 shoulders due to persistent instability. Mean CS was 52 (21–80). 4 patients (5 shoulders) with necrosis of the proximal humerus (AVN) underwent TSR (4 shoulders) and hemiarthroplasty (1 shoulder). Etiology was steroid in 4 shoulders and radiation therapy in one shoulder. One patient, suffering LED had a bilateral TSR with a poor outcome. Mean CS was 55 (17–84). 6 patients (6 shoulders) were treated for large rotatorcuff tears or cuffarthropaty with a TSR (2 shoulders) and a hemiarthroplasty (4 shoulders). Mean CS was 54 (29–82).

Discussion: TSR in primary OA is a well established and safe procedure. However, we found deteriorating results related to late rotatorcuff failure in 40% of the primary OA cases. Late rotatorcuff rupture might be related to a continuing age related soft tissue degenerative process unrelated to OA. Prosthetic replacement in shoulders with secondary OA due to instability is a technically demanding procedure. AVN of the proximal humerus treated with TSR gives predictably good results in patients with a non-systemic disease. Hemiarthroplasty with an oversize-head is preferable in cases with large rotatorcuff defects.

Clavicular non-union treated with compression plate fixation and bone grafting

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Non-unions of clavicular fractures are rare. Most published series are small, and collected through many years. Many authors have reported a high rate of success in achieving union, after surgical treatment of midshaft clavicular non-unions by using plate fixation and bone grafting. Only a few authors have evaluated the functional outcome. The purpose of this retrospective study was to evaluate both the fracture healing effect and the functional outcome.

Material and methods: 17 patients with midshaft clavicular non-unions were treated with compression plate fixation and autologous cancellous bone grafting in the period from 1989 till 1995. 3 patients were lost for follow-up. 13 patients presented for follow-up. 4 female and 9 male patients with an average age of 37 (17–62) years and an average duration of non-union of 26 (6–116) months. There were 5 hypertrophic non-unions and 8 atrophic non-unions. Radiographs were reviewed for healing, and the functional outcome scored according to Constant score.

Results: 12 of 13 patients achieved union, two of these had a second operation due to loosening of the screws shortly after the first operations. The last patient had 3 operations but did not unite, and finally the lateral part of his clavicle was resected. 11 patients had a good or excellent Constant score. 10 patients returned to their preinjury activity level.

Conclusion: The results after treatment of midshaft clavicular non-union with compression plate fixation and autologous cancellous bone grafting provides a high rate of healing and an acceptable functional outcome.

Chronic dislocation of the acromioclavicular joint treated by excision of distal clavicle and transfer of the coracoacromial ligament

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The aim of this study is to evaluate the long term postoperative outcome of chronic symptomatic dislocation of the acromioclavicular (AC) joint treated by excision of the distal clavicle and transfer of the coracoacromial ligament.

Material and methods: 19 patients with a type III injury to the AC joint and secondary chronic pain were operated on and followed prospectively. Average follow-up time from injury to operation was 31 (7–192) months. Postoperative follow-up was averagely 37 (10–56) months. The distal 2–3 cm's of the clavicle were excised and the lateral end reamed by drilling. The coracoacromial ligament was osteomized from acromion with a bone fragment, inserted in the lateral

clavicle and fixed by sutures through drill holes. Finally a screw reduced the clavicle to normal position by attachment to the coracoid. The screw was removed after 6 weeks. All patients were assessed postoperatively and 11 patients preoperatively by Constant functional scoring (100 points scale).

Results: The mean preoperative score for the affected shoulder was 71 (36–88) compared with a mean postoperative score of 86 (64–98), showing a significant functional improvement due to the operation ($p < 0.03$, t-test). Postoperative outcome was rated by difference in bilateral scoring (A) Constant score = non operated – operated). 14 patients presented excellent ($D < 10$ points), 4 good ($10 < D < 20$) and 1 patient poor results ($D > 20$). 14 patients (74%), regained full range of motion, while 10 (53%) patients gained equal bilateral power and positioning.

Conclusion: The operative technique described is a possible solution for patients with chronic pain secondary to complete acromioclavicular dislocation. A full, painless free range of motion is gained for the majority of patients, while the ability of strained motion is a less certain outcome.

Arthroscopic release of the stiff shoulder

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The aim of this study was to evaluate the functional outcome of arthroscopic release of adhesive capsulitis of the shoulder in four patients.

Material and methods: Four patients, 3 with idiopathic periarthritis humeroscapularis and one with stiffness following pyomyositis were treated with arthroscopic release of anterior structures. The symptoms were persistent pain, stiffness and limited function. There were three men and one woman, mean age 50.5 (48–54) years. Mean time from start of symptoms to surgery was 15 months. For pain control cervical epidural analgesia with sufenta/bupivacain was used postoperatively for 4 days. Twice a day the shoulders were manipulated by a physiotherapist. The patients remained admitted in hospital for 5–7 days. Out-patient physiotherapy was continued twice a week for seven weeks. The patients were scored 1, 2, 4 and 8 weeks after surgery.

Results: (Preoperative/8 weeks)

	Patient 1	Patient 2	Patient 3	Patient 4
Abduction	70/160	80/160	60/110	110/180
Flexion	95/150	100/145	130/160	140/180
Internal rot.	L4/Th8	S1/Th10	L3/L2	L1/Th9
External rot.	40/45	25/40	10/35	20/35
VAS	2.5/0	3.5/2.5	4.0/0	3/1
Constant Score	83	89	74	87

No complications were seen. Operation time was 70 (60–90) min.

Conclusion: In this small series arthroscopic release of

the stiff shoulder provides good functional results, especially an excellent range of movement.

Should subcutaneous bursitis be resected arthroscopically?

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Subcutaneous bursectomies have been performed arthroscopically at our department since 1994. The technique is described. The aim of this study is to evaluate the arthroscopic technique for resection of subcutaneous bursitis over patella and olecranon and to defuse its indication.

Patients and methods: The case records of patients operated on in the period of 1/1/1994 to 30/6/1997 with the diagnosis of bursitis and the operations excisio bursae or incisio abscessus were reviewed. A bursitis was defined as infected in cases with a positive culture from a preoperative aspirate or material taken out peroperatively or when bacteria were present at microscopy of an aspirate.

Results: 70 (10 female, 60 male) patients were found to have the index diagnosis and operation. 29 were prepatellar and 41 olecranon bursitis. 19 had been operated by arthroscopic resection (AR), 19 by excision and primary suture (EPS), and 32 by incision (I). 14 (74%) of the AR group, 5 (26%) of the EPS group, and 26 (81%) of the I group were infected. Median operation times were 30 min. (AR), 30 min. (EPS), and 17.5 min. (I). Median hospitalisation times after operation were 2, 2, and 4.5 days respectively. None of the patients in the AR group were readmitted or reoperated. One patient in the EPS group was reoperated and one had the sutures removed when readmitted from the outpatients' clinic. Ten patients in the I group were left to heal secondarily, 2 of these were sterile. Sixteen patients had one reoperation (12 secondary closures), 3 had 2 reoperations, one had 3, one 4, and one had 7 reoperations. Three patients in the I group were readmitted from the out-patients' clinic and 3 patients were readmitted by their general practitioner because of a relapse after cessation of follow-up in the out-patients' clinic.

Conclusion: The investigation suffers from the weaknesses of the retrospective design. Though there seems to be no difference between the groups concerning infection, temperature at the admission, competitive diseases and age, there may be a difference in the severity of the bursitis: CRP is higher in the I group. Arthroscopic resection is safe and effective, and it gives short hospitalisation times. It has not been proven, though, to be the method of choice in all cases.

Treatment of MDI of the shoulder with an exercise programme

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Multidirectional instability (MDI) is a fairly new diagnosis which was introduced by Neer and Foster in 1980. It is generally accepted that the initial treatment of MDI should be an exercise programme even though there are few studies to support this assumption. The aim of this prospective study was to evaluate the effect of an exercise programme in the treatment of MDI.

Material and methods: 7 patients were included in the study from September 1996 through April 1997. The group consisted of 5 women and 2 men with an average age of 31 years. The mean duration of the symptoms were 71 months ranging from 24 to 216 months. The patients were evaluated with Constant score, Rowe instability score and a functional score prior to the rehabilitation programme. The inferior translation and glenohumeral movements were evaluated with radiography. After a 3 months follow-up period the patients were evaluated again.

Results: Prior to the rehabilitation programme the patients had a mean Constant score of 64. The Rowe instability score had a mean of 49 out of a possible total of 100 points. The functional score had a mean of 45 out of a possible total of 60 points. At follow-up the Constant score had increased to a mean value of 83. The Rowe instability score increased to 87 and the functional score to 56. The results were compared with Wilcoxon's rank sum test for paired data and in all three cases the difference between the scores was highly significant, $p=0.007$. The evaluation of the inferior translation and glenohumeral movements did not show any significant change. The duration of the symptoms had no influence on the results of the rehabilitation programme.

Conclusion: The patients had a significant increase in shoulder function and stability at follow-up, but we were not able to support these findings with radiographs. The short-term results show that an exercise programme is an excellent treatment of atraumatic MDI.

SPINE

A new method of geometry generation and finite element analysis of a lumbar disc-body unit.

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The main objective of this study has been to develop a new method for the construction of three-dimensional geometrical models and subsequently to do biomechanical simulations of displacements and stresses of a lumbar disc-body unit by the Finite Element Method (FEM).

Material and methods: FEM is a general computer-based engineering method to calculate the effects of forces on structures. The FE model is generated from CT images. The procedure of extraction consists of 3 steps; (1) stacking by use of IDL software for (2) generation of 2D contours by the Mvox. software, and (3) finally creation of a 3D mesh by connecting the 2D contours. This is captured by the FE software COSMOSM. The FE model consists of a central isotropic and linear volumic core of trabecular bone and incompressible nucleus pulposus surrounded by a shell of cortical bone and a multilaminar shell of annulus fibres, respectively. The ligaments and the facets are non-linear. The method of validation is a comparison between the computed results and experimental data from compression tests of the spine and FE results from literature, which is the load-displacement behaviour, intradiscal pressure, disc bulge and facet load transfer.

Results: The FE results are in general within 1 standard deviation of the experimental data. An exception is the posterior disc bulge, which is within 2 standard deviations of the experimental results.

Conclusion: A three-dimensional geometrical and non-linear finite element model has been developed for a lumbar disc-body unit. A new methodology has been implemented to form a 3D FE model based on CT-scans. The FE results for applied load cases have been verified, and confirm the reliability of the methodology.

Bone transplantation in spine surgery—an animal study

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The purpose of the study was to evaluate bone formation following posterior spine fusion using autologous cancellous bone graft. This study was planned as a pilot study to further

investigate and histologically compare the fusion rate and growth potential using different bone grafting techniques.

Material and methods: Ten mature female white rabbits (4000–4500 g) in general anaesthesia, had a lumbar spine fusion using standard surgical technique. Posterior fusion was performed at L5/6 using autogenous iliac crest cortico-cancellous bone. Decortication was done at L3/4 around the facet joint as control without grafting. The animals were labelled with four different IV fluorochromes after 1, 2, 3 and 4 weeks. The rabbits were killed after 5 weeks the lumbar spine taken out, x-rayed and the two operated levels were excised en bloc, and sagittally cut in halves. One half was embedded in methylmethacrylate and cut in a microtome for both usual van Gieson picrofuchsin/Stevenels blue histology and for unstained fluorescent-microscopic evaluation. The other half was decalcified, embedded in paraffin and sectioned for decalcified stained specimens.

Results: Ten lumbar spines were sectioned. One rabbit (the first) was only operated at one lumbar level with a facet-joint decortication and no bone grafting. Thus we have 9 sets of grafted and 10 sets of ungrafted specimens to compare. Light microscopic evaluation of the grafted group showed 8 out of 9 specimens with large amounts of bone remodelling. In 6 of 9 specimens, areas of endochondral ossification were seen. In the ungrafted group we found no endochondral ossification and only a small amount of new bone formation. Fluorescence microscopy showed increasing bone formation during the five weeks of observation. Radiographic examination revealed 5 of 9 lumbar spines with good solid bone mass at the grafted level. No conclusion could be drawn regarding fusion rates based on the x-ray.

Relation between spinal metabolism and the circulation of vertebrae—establishment of an experimental model

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An attempt was made to establish a model for monitoring spinal metabolism during changes in the vertebral circulation.

Material and methods: Seven pigs, 80 kg, were used. The lumbar spine and the aorta were exposed. Bone cannulae were inserted into two adjacent vertebral bodies. Blood for gas analysis was drawn intermittently from the vertebral bodies, and intraosseous pressure (IOP) was monitored. The aorta was closed above and below the cannulated vertebrae, thus creating a closed sac containing the origin of two pairs of segmental arteries. Blood was routed to the lower body through a shunt. The sac was perfused with blood through a branch of the shunt. The experiment had four periods: steady state, establishment of the shunt, noradrenaline bolus infusion, and closure of the shunt.

Results: Systemic parameters remained stable with

(mean) MAP 87 mmHg, pH 7.42, pACO₂ 5.5 kPa, and paO₂ 26.6 kPa. The vertebral circulation was stable in the steady state period with IOP 21 mmHg, pH 7.36, pCO₂ 5.8 kPa, and pO₂ 7.9 kPa. Establishment of the shunt caused IOP to decrease to 11 mmHg and pH to 7.33 kPa, while pCO₂ increased to 6.3 kPa. Parameters did not respond to noradrenaline infusion. Shunt closure led to intraosseous ischemia.

Conclusion: The model enables manipulation of blood flow to vertebrae while the animal remains in hemodynamic equilibrium. A problem of ischemia after shunt establishment needs to be solved. Absence of a vascular response to noradrenaline infusion may be due to relative intraosseous acidosis, but low sensitivity of the vertebral circulation to noradrenaline is another possibility. The model may be expanded to allow measurements of the relation between the vertebral end plate environment and that of the intervertebral disc.

Pain drawings are scored differently in a multidisciplinary team treating patients with low back pain

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Pain drawings are used as a tool in the psychological evaluation of patients with low back pain. Since the treatment of these patients has become a multidisciplinary task, we found it of relevance to examine the interobserver variation in the interpretation of pain drawings among different members of a multidisciplinary team treating these patients.

Material and methods: 100 preoperative consecutive pain drawings were included in the study. They were assessed by three observers: a psychologist, a medical orthopaedic and an orthopaedic surgeon. All observers were trained in the scoring principles before the study was conducted. The patients were allowed to use predefined symbols indicating their symptoms. Kappa statistics were used to assess the interobserver variation. The scores of the pain drawings were classified into two groups. Scores from 0 through 2 were designated normal and scores above this range were assigned abnormal.

Results: The observed agreement ranged from 73 to 87%. The best observed agreement was found between the medical orthopaedic and the orthopaedic surgeon. The corresponding kappa values ranged from 0.49 to 0.71. A moderate strength of agreement was found between the psychologist and the two other observers. The strength of agreement between the medical orthopaedic and the orthopaedic surgeon was good.

Conclusion: Members of a multidisciplinary team treating patients with low back pain, assess pain drawings differently. It is possible, however, that additional training of the observers may improve the agreement.

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Michael B Nielsen, Lars Nimb, Jørgen H Hansen, Thomas Kiær

Department of Orthopaedics, Rigshospitalet, Copenhagen, Denmark

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In 6 of 9, areas of endochondral ossification was seen. In the ungrafted group we found no endochondral ossification and only a little amount of new bone formation.

Fluorescence microscopy showed increasing bone formation during the five weeks of observation. Radiographic examination revealed 5 of 9 lumbar spines with good solid bone mass at the grafted level.

Conclusion: In the grafted specimens there was a larger amount of new bone formation and a more mature type with areas of endochondral bone formation compared to the ungrafted group. This animal model proved to be useable in comparing different types of graft materials and techniques in lumbar spine surgery.

HIP

10 to 20 years' results after cemented revision of the femoral component in THA

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In recent years many new technologies in hip revision surgery have been introduced. The purpose of this study was to evaluate the long term survival after cemented revision of the femoral component in THA.

Material and methods: 60 consecutive revisions in 57 patients were performed from 1977 through 1987 with a Charnley standard or long stem using first generation cementing technique. 58 were first-time revisions. All primary hips were cemented Charnley THA except one Monk hemiarthroplasty. Loss of femoral bone was evaluated from x-rays immediately before revision (Endo-Klinik classification) except in cases, where the original x-rays had been lost. Clinical outcome was evaluated from a questionnaire (modified Harris Hip Score). At radiographic follow-up loosening was evaluated according to Harris criteria. End-points were re-revision (third THA or resection arthroplasty) and definite loosening. Risk of re-revision of the femoral component was estimated using Kaplan-Meier survivorship analysis.

Results: The survival rate for the femoral component in this series was found to be 86% after five years and 70% after ten years. 21 patients with surviving prostheses were available for follow-up and four of these showed definite radiological loosening. Half of the patients had impaired gait, 19 of the patients had slight or no pain.

Conclusion: The results after cemented revision of the femoral component using first generation cementing technique were slightly better than expected. Not all, but some authors have demonstrated a further and significant improvement using more modern cementing techniques and stem designs. The choice of revision THA in the individual case must be adapted according to clinical and radiological data, but simple re-revision of the femoral component in older people with minor bone loss may prove to be the best solution.

The rotational position of the femoral component in total hip arthroplasty—pre- and postoperative 3D-CT measurements of femoral neck anteversion

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Previous studies have shown malrotation of components to be a predisposing factor for dislocation in total hip replacement (THR), but the normal variation of the result of surgery concerning rotational position has never been considered. The purposes of this study were to assess the normal variation in rotational position of the femur stem and compare the achieved positions with the femoral neck anteversion in each patient prior to surgery.

Material and methods: Pre- and postoperative 3D-CT-measurements of the femoral neck anteversion were performed in 43 patients operated on with a primary THR.

Results: The mean postoperative femoral neck anteversion was 18° (SD: 9°, range: 5°–51°) and not significantly different from the mean femoral neck anteversion prior to surgery ($P < 0.04$, paired *t*-test). Comparing the achieved rotational positions with the femoral neck anteversion in each patient prior to surgery 60 % of the total variation in rotational position of the femur stems could be explained. Changes in rotation conducted during surgery did not depend on the original femoral neck anteversion in the patient.

Conclusion: The rotational position of the femur stem is strongly dependent on the femoral neck anteversion in the patient prior to surgery.

A retrospective study of 189 primary hip replacements with uncemented PCA prostheses

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The aim of this study is to determine the rate of revision, Harris Hip Score and possible radiological signs of aseptic loosening in uncemented primary PCA hip replacements at 4–10 years follow-up, mean 6.6 years.

Material and methods: From November 1986 to December 1993 170 patients received 189 THA with PCA uncemented prostheses. Mean age at operation was 54 year [15–70]. At follow up 14 patients with 17 prostheses had died, 8 patients with 8 prostheses had had a revision. Of the remaining population, 137 patients with 153 prostheses were re-examined clinically and radiologically, 11 patients were lost to follow-up.

Results: Revision was performed in 8 patients 1–96 months after primary hip replacement. Indications: 2 aseptic loosening, 2 luxations and 4 because of pain. Another two patients with 2 PCA prostheses and permanent thigh pain underwent femoral inforation with a good result. At follow-up mean Harris Hip Score was 86 (16–100). Radiological evaluation revealed 3 displaced acetabular components. Radiolucencies were found in one or several zones in 84 prostheses. 29 THA showed signs of excessive polyethylen wear. In 56 hips the patients complained of thigh pain. Overall 123 patients with 139 THA were satisfied or almost satisfied.

Conclusion: In general patient satisfaction was good. We are, however, concerned about the number of radiolucencies and signs of polyethylen wear. This confirms earlier reports.

We no longer use PCA prostheses in our department. The population will be followed.

Osteoscopy in intertrochanteric femoral fractures

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Intraoperative osteoscopy may prove valuable in the evaluation of the viability of the femoral head in femoral neck fractures. To obtain knowledge of the normal bleeding pattern osteoscopy was performed in a series of patients with intertrochanteric fractures.

Material and method: 15 patients with intertrochanteric femoral fractures operated on with the DHS-apparatus entered the study. Following reduction of the fracture the osseous tunnel was prepared by hand reaming. A standard 5.5 mm arthroscope was introduced into the osseous tunnel prior to the insertion of the hip screw. After lavage with saline, bleeding was observed and video-recorded during the withdrawal of the arthroscope. The osteoscopic procedure was done without technical difficulties.

Results: We were unable to demonstrate a uniform bleeding pattern, and in some patients bleeding in the femoral head was undemonstrable. In patients with demonstrable bleeding, three types of bleeding points could be identified: 1) small vessels, 2) greater vessels, and 3) pulsatile vessels.

The number of bleeding points in the femoral head showed variation from no bleeding to more than 20. Almost all of the observed bleeding points were small vessels.

Conclusion: Bleeding of various patterns were observed in all patients. Assessment of the bleeding in the femoral head in patients with femoral neck fractures must be interpreted against this background.

Chiari pelvic osteotomy in the treatment of hip dysplasia

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Chiari pelvic osteotomy is a salvage operation for a painful dysplastic hip which does not reduce congruently with hip abduction.

Materials and methods: 16 hips in 15 patients underwent Chiari pelvic osteotomy. The age ranged from 8 to 46 years (average 23) and there were three males and twelve females. The diagnosis was in most cases primary hip dysplasia.

Results: The results were evaluated from 26 to 98 months (average 49) after surgery. The pain had decreased in 15 pa-

tients, and the limp in all patients, was less or unchanged. None of the patients lost any range of motion. The CE angle improved from 10 to 45. A pure medial displacement was only accomplished in four osteotomies while the rest had lateral displacement of the proximal fragment. The primary mode of displacement did not affect the coverage of the femoral head. All four osteotomies with pure medial displacement showed however, a decrease in CE angle on the other hip. An overall good or excellent result was obtained in 82% of the cases (Betz scale); while 12% had a fair; 6% had a bad result.

Conclusion: Chiari pelvic osteotomy is a salvage operation and should not be done when it is possible to cover the femoral head with hyalin cartilage. In patients with incongruent femoral head or subluxation it can be a useful procedure.

Hip protectors, acceptance and compliance

Klaus Hindsø, Jes Bruun Lauritzen

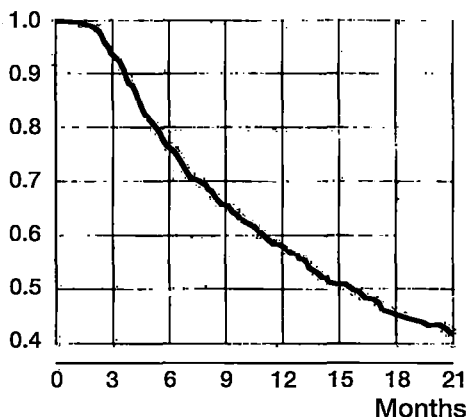
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In a prospective, controlled intervention study 1007 orthopaedic patients, aged 75 years or more were offered three pairs of impact-dispersing hip protectors (SAFEHIP®). The proportion of males was 18%, mean age was 84 years, and 30% had a hip fracture at inclusion.

Primary acceptance: The hip protectors were accepted by 572/1007 (57%). In a logistic regression model we found primary acceptance positively related to gender, self-reported tendency to fall, fear of falling, and admission caused by a hip fracture.

Compliance: Every third month users received a questionnaire regarding use of hip protectors. A total of 1050/1165 (90%) questionnaires were returned. All 572 patients were followed until they stopped using hip protectors—or for at least one year—giving 532 patient-years of hip protector use. Proportion of continuing users are presented on the

Proportion continuing use



Kaplan-Meier plot. In a multivariate Cox proportional hazard model compliance was negatively related to age, living in nursing home, and inability to walk outside without assistance.

Causes of non-compliance: In the follow-up period 264 patients stopped using hip protectors. One third stopped without any reason, one third had discomfort or practical problems, one sixth felt out of risk either because they were immobilised or they regained their walking ability, and for the last sixth the hip protectors disappeared, often when moving to nursing home.

The snapping iliopsoas tendon—presentation of a new diagnostic method and three clinical cases

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The snapping iliopsoas tendon is a diagnostic and therapeutic challenge. Groin pain and the sensation of a painful snapping in the groin region when extending the hip are the predominant symptoms.

Material and methods: We describe three cases treated either conservatively or surgically and present a dynamic ultrasonographic technique for examination of the psoas tendon in patients with snapping hips. With a small 5 MHz convex array transducer, a longitudinal scanning of the tendon was obtained.

Results: Before treatment, a sudden jerk movement of the tendon was detected in the diseased hip of each patient, concomitant to an audible and painful snap. After treatment, this movement was suppressed (surgical treatment), or less pronounced (conservative treatment). A short video sequence of the snapping tendon will be presented.

Conclusion: Ultrasonography is valuable to differentiate this affection from other causes of snapping hip, quickly and non-invasively.

KNEE

Arthroscopically assisted treatment of lateral tibial plateau fractures with bone transplantation

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Fractures involving articular surface are often associated with risk of developing poor joint function and arthritis.

Reconstruction of the articulate surface seems essential. Tibial plateau fractures are often associated with depression of the joint surface. Arthroscopically guided reconstruction could result in better joint surface and in better long-term results.

Methods: Surgery involved arthroscopically guided reconstruction of the articular surface, transplantation of bone to the defect below the articular surface, and osteosynthesis with screws.

Results: Six patients median age 47 (40–74) were treated. The fractures were divided according to Schatzker into four of the type II and two of the type III. Depression of the articular surface was 15 (10–20) mm. Mean surgical time 90 (80–120) min. The patients were hospitalized for 6 (3–11) days. No complications were observed. Follow-up period was 33 (12–48) months. All patients were very satisfied. Two patients experienced minor pain after long walks, while the rest did not experience pain. Radiologically the transplant was still in place. In only one patient a depression of the articular surface was observed (2 mm). Normal axes, flexion, extension, and stability of the knee were observed. No signs of arthrosis were observed. All patients had unlimited walking distance and walked without a stick.

Conclusion: Arthroscopy and bone transplantation can be useful tools in the treatment of tibial plateau fractures.

Correlation of function and proprioception in ACL deficient knees

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To estimate the functional level in patients with ACL ruptures before and after reconstruction is somehow a matter of controversy. Different tests are used but none has correlated the function in load tests and the proprioceptive sensitivity.

Material and methods: 58 individuals, 20 non-reconstructed, 18 reconstructed and 20 healthy controls. The functional capacity was evaluated in each patient. Each patient was asked to give a subjective evaluation of the damaged knee and of the degree of retropatellar discomfort at load. The knee joint was objectively assessed by a laxity test and by two load tests. The proprioceptive sensitivity was assessed by the ability to reproduce a prior angle of flexion and to detect passive motion.

Results: The non-reconstructed group was significantly distinguished from healthy controls by the triple jump test and lack of capacity to reproduce a prior angle from a flexed position in the knee joint. The one step leap test significantly distinguished the repaired or non-repaired, from healthy controls. Several correlations among the test parameters were found to be of statistical significance ($p < 0.05$). However none of the correlations disclosed strong linear correlation ($r > 0.8$).

Conclusion: The triple jump test, the one step leap test, and reproduction of a prior angle of flexion are of impor-

tance in evaluating the results after reconstruction of the ACL.

Proprioceptive sensitivity in knees with rupture of the anterior cruciate ligament

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In patients with rupture of the anterior cruciate ligament studies have shown a decreased perception of position and movements in the knee joint. The aim of this study is to test the ability in patients with ACL rupture to detect passive motion and to reproduce a prior angle.

Material and methods: 58 individuals, 20 having a ruptured, non-treated ACL, 18 who have had an ACL reconstruction, and 20 were healthy controls. The proprioceptive sensitivity of the knee joint was investigated in a test bench where the patients were blinded and other sensorial inputs were eliminated. The patients' abilities to detect passive motion and reproduce an angle of flexion were examined.

Results: When starting from a flexed position decreased ability to recognise and reproduce a prior angle in the ACL deficit knee was found in both groups of patients but not between the dominant and non dominant knee in the controls. No difference was found when starting from the extended position. Significant difference of ability to detect passive movement was found in the patients between the damaged and intact knee. No difference was found in the control group.

Conclusion: It is possible to demonstrate a decreased ability to reproduce a prior angle of flexion in patients with ACL deficit knee, when the movement starts from a position of 60° of flexion, but not from full extension.

ACL-reconstruction of the chronic unstable knee—bone-patella-tendon-bone versus ilio-tibial band autograft—a prospective randomised study with special focus on side effects

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It is well documented that knee stability can be improved by an ACL-reconstruction, however side effects of the various techniques remain a persistent problem. The purpose of the study was to compare two different techniques with special focus on the side effects.

Material and methods: 60 patients, 40 male and 20 female, median age 27 (16–44) with chronic anterior cruciate ligament deficiency were randomised to either reconstruction with a bone-patella-tendon-bone autograft (PT), $n=30$, or an ilio-tibial band autograft (IT), $n=30$. All patients were

evaluated by an independent observer after median 26 (12–51) months. No significant differences between the two groups were registered with regard to age, sex, follow-up time or incidence of associated injuries.

Results: There was no statistical significant difference in objective knee stability and function. Twenty-six PT-patients and 27 of the IT-patients scored A or B in the overall IKDC evaluation. One patient in the IT-group had a re-rupture after 6 months. Anterior knee pain was present in 17 (PT) and 3 (IT) respectively half a year postoperatively ($p=0.0003$), and 13 (PT) and 2 (IT) after 1 year ($p=0.002$). At follow-up 8 PT-patients had anterior knee pain, compared to 3 IT-patients ($p=0.18$). Three IT-patients had cosmetic complaints, and 7 had functional problems from the lateral femoral hernia. Complaints related to the fixation material was found in 7 PT- and 13 IT-patients ($p=0.17$).

Conclusion: Reconstruction of the anterior cruciate ligament using the PT and the IT band autograft is equal with respect to knee stability and function after median 26 months. Anterior knee pain is more frequent after reconstruction with the PT, however, it declines with time. One-fourth of the patients had cosmetic and/or functional problems from the lateral femoral hernia after reconstruction with the IT.

Posterior cruciate ligament instability of the knee—still an overlooked problem?—clinical findings superior to MRI and arthroscopy

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Missed diagnoses have resulted in unnecessary suffering in a number of patients. The purpose of this presentation is therefore to point out pitfalls in the diagnosis of posterior cruciate ligament injuries with regard to clinical, MRI and arthroscopic findings.

Material and methods: In a series of 12 patients reconstructed for a posterior cruciate ligament insufficiency the anamnestic, clinical, MRI and arthroscopic findings were compared. In 9 of 12 patients PCL injury could be suspected by the anamnesis (a direct posteriorly directed trauma to the tibia). Clinically all patients had more than 3 mm's total side difference in instrumented laxity testing and posterior subluxation of the tibia at 70–90° of knee flexion. MRI showed continuity and normal density of the PCL in 4 patients. At arthroscopy 7/12 with isolated PCL instability had a lack of tension in the ACL. In 4 of these this was interpreted as ACL insufficiency by the examiner, however without paying attention to the cause: posterior subluxation of the tibia. Because of this two patients actually had a reconstruction of the ACL!

Conclusion: The only diagnostic test that is specific for posterior ligament instability seems to be posterior subluxation of the tibia at 70–90° of knee flexion. Arthroscopy and MRI may be misleading.

Reproducibility and accuracy of the classic Lachman test and the KT2000 Knee Arthrometer

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In order to assure valid quantification of anterior knee instability, we performed an intra- and interobserver test of the classic Lachman test and the MEDmetric KT2000 knee arthrometer.

Material and methods: 20 knees, 10 clinically suspected for an ACL-rupture, were tested 3 separate times by 3 blinded examiners. All in all 180 examinations, each including the classic Lachman and KT2000 testing. The force-displacement curves were read at 15, 20 and 30 pounds.

Results: Test-retest of curve reading was reproducible ($r_s = 0.983$; $p < 0.00001$). The intra- and interobserver reproducibility of the classic Lachman test proved a Kappa value of 0.42–0.67; $p < 0.0005$. In the KT2000 test the intra- and interobserver reproducibility displayed a Kendall coefficient of concordance = 0.743–0.900 and a $p < 0.05$ in all three forces. Using the KT2000 data as reference, the classic Lachman test could only divide the knees into two statistically different groups, stable and unstable.

Conclusion: For quantifying anterior knee instability the use of the KT2000 arthrometer can be recommended, whereas the accuracy of the classic Lachman test only allows determination, as to whether the knee is stable or not.

Intraarticular glucocorticoid reduces pain, inflammatory response and convalescence after arthroscopic meniscectomy

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Convalescence after arthroscopic meniscectomy is dependent on pain and the inflammatory response. The aim of the study was therefore to investigate the effect of intraarticular bupivacaine + morphine + methylprednisolone versus bupivacaine + morphine or saline on post-meniscectomy pain, mobilization and convalescence.

Material and methods: In a double-blind, randomised study 60 patients undergoing arthroscopic meniscectomy were allocated to intraarticular saline, intraarticular bupivacaine 150 mg + morphine 4 mg or the same dose of bupivacaine + morphine + intraarticular methylprednisolone 40 mg. Pain during movement and walking, leg muscle force and joint effusion, use of crutches and duration of sick leave were assessed. The acute phase proteins CRP and orosomucoid were assessed.

Results: Combined bupivacaine and morphine reduced

pain, time of immobilisation and duration of convalescence. Addition of methylprednisolone further reduced pain, joint swelling and convalescence, improved muscle function and prevented the inflammatory response (acute phase protein).

Conclusion: A multimodal analgesic and anti-inflammatory treatment may enhance postarthroscopic convalescence, which depends on the trauma induced inflammatory response and pain.

Early prospective changes in muscle strength after total knee arthroplasty—a 6 month follow-up of 30 knees

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Several authors have examined muscle strength in patients with knee arthrosis (KA), but only few authors have evaluated prospective changes in muscle strength following total knee arthroplasty (TKA).

Material and methods: 30 patients with unilateral KA operated on with insertion of either a cemented TKA (n 26) or an uncemented TKA (n 4) were included in the study. Full weight bearing from the first postoperative day was allowed in all patients, and they received standard postoperative physiotherapy. 1 week prior to surgery, and after 3 and 6 months, measurements of isokinetic and isometric muscle strength using a Cybex 6000 dynamometer were performed.

Results: Isokinetic tests showed a bilateral, significant, and progressive increase in flexor muscle strength most pronounced in the operated legs (30–53%). Isokinetic extensor strength measurements showed significant increases in the operated legs (14–18%), while in the contralateral legs the increase in extensor strength was only marginally significant. Isometric flexor strength showed a significant decrease in the operated knees (17%), while in the healthy contralateral legs the strength remained unchanged. Isometric extensor strength showed a temporary decrease at 3 months, which had returned to the preoperative level 6 months postoperatively. No significant changes in strength were observed in the healthy legs. Knee pain level during the muscle strength measurements showed a significant decrease from the preoperative level.

Conclusion: Following TKA isokinetic flexor and extensor strength increased while isometric strength decreased. Knee pain might be an important factor when muscle strength measurements are performed in KA.

TRAUMATOLOGY

Spiral-scanning in the examination of the multi-injured patient

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In many hospitals spiral CT-scanning has become a standard examination method of multiple injured patients. We report a case where spiral-scanning of the spine showed no fractures. However, standard radiographic examination revealed a severe burst fracture of L3.

Case story: A 61-year old woman was a passenger in a road traffic accident. On admission to the local general hospital she complained of chest pain and pain in her left arm. A fracture of the left humerus, a fracture of the right clavicle and fractures of the left 5th, 6th and 7th rib were identified. Furthermore, lung lesion and haematoma at the left side of the thoracic wall. Spiral-scanning of the thorax and abdomen identified no further lesions. At day 19 after the accident we identified a fracture of the right processus styloideus radii. The patient had two consecutive operations under general anaesthesia; for the right clavicular fracture and for the left humeral fracture. Her neck was twisted to the side under these procedures. At day 35 radiographic examination diagnosed dislocation of C6/C7. At day 48 radiographic examination diagnosed a fracture of the L3.

Conclusion: The spiral-scanning examination must be used as a supplement to the clinical examination of the multiple injured patients in order to exclude lesions of the internal organs but it does not replace a systemic clinical examination and standard radiographic examination.

Treatment of femoral shaft fractures with Grosse-Kempf intramedullary nail

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Since 1989 the principal treatment of femoral shaft fractures in our department has been with Grosse-Kempf intramedullary nail (GK-nail). We present our results for a 6-year period.

Material and methods: 90 femoral fractures (87 patients) were treated with a reamed GK-nail in the period Jan. 1990 through Dec. 1995. At follow-up 57 patients (60 fractures) were examined. 20 patients had died and 10 patients were unable to attend. Median time of observation was 45 (24–84) months. 17 were women with a median age at follow-up of 38 (14–81) years, 40 men 33 (17–77) years. 50 fractures were closed and 10 were open. 11 patients were multitraumatized (ISS>18). 50 patients suffered from high energy trauma. Static interlocking was performed in 47 cases and dynamic locking in 13. 38 patients received antithrombotic treatment.

Results: 55 of the fractures healed within a median time of 5 (2-15) months. There were 5 nonunions. One healed without operation. Re-operation was required in 4 fractures. The functional results were excellent or good in 82%, fair in 16% and poor in 2% of the fractures when assessed on clinical examination and radiographic examination (1). At follow-up 21 patients had no, 26 seldom, 10 often and 1 constant pain. 68% had returned to prior occupation within a median time of 20 (4-84) weeks. In two fractures a rotatory malalignment was noted (20° and 30°). Two patients had a superficial infection. At follow-up a shortening exceeding 2 cm was noted in one patient and in two patients a peroneal palsy was found. No clinical thromboembolic complications were noted.

Conclusion: 6 years follow-up of treatment of femoral shaft fractures with GK-nail showed good functional results with few complications.

Reference: Klemm KW, Börner M. Interlocking nailing of complex fractures of the femur and tibia. *Clin Orthop* 1986; 212: 89-100.

New method for removal of bent intramedullary nails

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A new method of removing bent intramedullary nails using a high speed drill (Anspach) to make a controlled weakening of the nail before removal is described. The successful treatment of fractures of long bones with intramedullary nails has introduced a new problem: How to deal with the bent nail after re-injury? Traditionally this has required either in situ straightening through application of significant external force or opening of the fracture site with complete sectioning of the nail. The first method is impossible with the use of high strength nails (Gamma, Grosse-Kempf) and the latter method requires major surgery.

Material: Case story I: A 24-year old man was admitted to hospital after a motorcycle accident. 8 months earlier, the patient had had a Gamma nail inserted in the left femur because of a fracture. The fracture had not healed yet and the accident caused a 25° bending of the nail at the fracture site. The patient was operated according to the directions given below, and the Gamma nail was replaced with a Grosse-Kempf nail. At follow-up 4 months later the fracture had healed and the patient was well mobilised.

Case story II: A 17-year old man was brought to hospital after a car accident. 6 months earlier the patient had had an AO-nail inserted. The fracture had healed but the nail had not yet been removed. At the accident he had a refracture and a 25° bending of the nail at the fracture site. The patient was operated on according to the directions given below and the nail was replaced by another AO-nail.

Method: A small lateral incision was used to expose the fracture site and the lateral aspects of the nail. Using an Ans-

bach high speed drill the nail was sectioned half through its diameter. Metal debris was irrigated and suctioned from the fracture site. Once the nail had weakened it was easily straightened and then removed in one piece the usual way. Another reamed nail was then inserted without complications.

Conclusion: We have used this method successfully in removing bent nails using conventional technology in a new way to perform a safe, easy and low-cost procedure.

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- Montoli C et al. Il problema della rimozione dei chiodi di Kuntscher piegati. *Orthopedica e traumatologia* 1994; 45: 9-11.
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Treatment of tibial fractures with intramedullary locking nail

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Since 1992, in our department the first choice treatment of unstable tibial fractures has been osteosynthesis by use of a Grosse-Kempf intramedullary locking nail (GK-nail). This study presents our results after this treatment.

Materials and methods: From 1992 to 1995, 76 patients with a total of 78 fractures were treated with a GK-nail. 50 men and 26 women with a median age of 41 (18-88) years. In 66 fractures the GK-nailing was the primary procedure. In 12 cases the initial treatment was by a plaster of Paris, but because of later redislocation GK-nailing was performed. In 5 cases an unreamed nail was used. 59 fractures were closed and 19 were open (18 Gustilo grade I/II, 1 grade IIIa). At follow-up 55 patients were re-examined. 3 patients had died and 18 patients were unable to attend. Journals and radiographs for all patients were examined. The observation period was median 34 (17-56) months.

Results: At follow-up 74 fractures were healed within a median time of 24 (7-94) weeks. Two fractures remained unhealed (pseudoarthrosis). Two patients had died before healing could be expected. At the clinical examination 38 patients had no or rare pain, 19 patients often suffered from pain and one patient had constant pain. At follow-up the patients were classified according to Klemm and Börner: 21 patients had excellent results, 27 good, 3 fair and 3 poor. One patient could not be classified due to a hip fracture at the time of follow-up. Overall 16 patients had complications. Four patients had superficial infections. No deep infections. The locking-screw broke in 4 patients. In 2 patients the nail

broke. Three healed with abnormal rotation. Two patients had pseudoarthrosis. In 1 patient prolonged healing was observed, but healed after dynamisation. One patient had a transitory peroneal paralysis.

Conclusion: Based on this material it is concluded that GK-nailing seems to produce good results in unstable closed and open grade I and II tibial fractures.

Admission levels of Gc-globulin predict mortality after multiple trauma

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Experimental data suggest that the release of excessive amounts of actin into the circulation, may result in a condition resembling multiple organ dysfunction; a serious complication to multiple trauma. It has previously been demonstrated, that the serum level of the actin scavenger Gc-globulin is reduced during the first week after multiple trauma¹. The purpose of this study was to determine, if admission levels of Gc-globulin are correlated to survival after multiple trauma.

Material and methods: 23 consecutive patients were included in the study. 12 men and 11 women, with a median age of 31 (18–82) years and a median ISS of 22 (16–75). All patients had a blood sample taken median 49 (27–120) minutes after the injury. The Mann-Whitney test was used for comparison between groups.

Results: All patients had significantly reduced levels of Gc-globulin compared to normal controls. 15 patients survived, and the admission levels of Gc-globulin were significantly higher in the group of survivors compared to non-survivors. Median 215 mg/L vs. 135 mg/L ($p < 0.01$).

Conclusion: These data suggest that the admission level of Gc-globulin may be predictive of survival after multiple trauma. They also support the theory, that Gc-globulin plays a role in the immediate pathophysiologic response after severe injury.

Reference: 1. Dahl et al. Serum Gc-globulin in the early course of multi-trauma. *Crit Care Med* 1997 (in press).

FOOT/ANKLE

Complications following Achilles tendon repair

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The treatment of rupture of the Achilles tendon is a controversial issue. In 1982 Cetti suggested that the operative treatment, performed under local anaesthesia was safe, economical, acceptable to patients and complication-free. The objective of the present study was therefore to examine whether the operative treatment of Achilles tendon ruptures was complication-free in a large series.

Methods: During a period of 18 years all patients with a rupture of the Achilles tendon treated at Frederiksberg University Hospital were recorded. In the period from January 1978 through December 1982, patients were operated on under general or spinal anaesthesia. From January 1983 to December 1995, patients were operated on under local infiltration anesthesia with 10 to 20 mL 1–2% lidocaine and without tourniquet. After the operation the treatment consisted of 3 weeks in a below-knee plaster cast with the ankle in moderate plantar flexion followed by 4 weeks in a new below-knee plaster cast with a heel and with the ankle in a neutral position.

Results: A total of 209 patients sustained 213 Achilles tendon ruptures (55 in women and 158 in men). Four patients (3 men and 1 woman) had bilateral ruptures. The median age was 41 (18–86) years. A total of 22 patients were lost to follow-up. The material therefore comprises 191 patients. There was no perioperative mortality. The re-rupture rate was 7%. The deep infection rate was 1% and the superficial infection rate was 6%. Two patients had a wound necrosis and one a deep thrombophlebitis.

Conclusion: The infection rate was 15% in the group of patients operated on under general or spinal anesthesia and with tourniquet compared with 4% for patients operated under local infiltration anesthesia without tourniquet ($p < 0.05$); however re-rupture rates were equal.

Reference: Cetti R. Complication-free Achilles tendon repair. *Brit J Sport Med* 1982; 16: 230-235.

CAM-walker versus cast in conservative treatment of Achilles tendon ruptures

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The conservative treatment of Achilles tendon ruptures is traditional immobilisation in cast for 8 weeks. The purpose of this study was to compare the CAM-walker to a traditional cast. We expected the CAM-walker to be comparable to the cast regarding complications, and with less inconvenience for the patient.

Material and methods: 50 patients with first time Achilles tendon rupture were randomised to either cast or CAM-walker. Both groups were immobilised for 8 weeks. The first 4 weeks in plantar flexion, followed by 4 weeks with the foot in neutral position. All patients were examined 4 months after the injury. We registered complications, resumption of work, patient satisfaction, muscle strength, range of motion and overall patient assessment.

Results: In 29 patient treated with casts we found 5 re-ruptures, all within the first month. There were no re-ruptures in 21 patients treated with CAM-walker. There were no difference in age, sex, patient satisfaction, resumption of work, dominant/non dominant leg, muscle strength, range of motion and overall patient assessment.

Conclusion: The CAM-walker is a useful alternative to a cast with few complications and lower costs.

Treatment of Achilles tendon rupture with adhesive

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Good results are reported of fibrin adhesive (Sealant), used instead of traditional suture technique for repair of Achilles tendon rupture (ATR). The documented advantages of using fibrin adhesive are less formation of scar tissue, less thickening of the tendon, and avoidance of a foreign body (suture) inside the tendon.

Material and methods: We used fibrin adhesive for the operation in 13 cases of ATR. 2 women and 11 men. Mean age was 42 (30–67) years. 12 cases were sports accidents. Operations were performed in local anesthesia. Postoperatively a below-knee cast was used for 6 weeks.

Results: 9 of the 13 patients (2 women and 7 men) were available for follow-up 28 (8–45) months postoperatively. All patients had resumed the same activity level in work and sports as before ATR. 6 patients were satisfied or very satisfied with the results. Yet, 7 patients had complaints of ankle swelling, slight pain or elongation of the operated Achilles tendon. We found calf muscle atrophy of 1.2 (-0.5 to 2.0) cm, ankle swelling 0.5 (0–1.5) cm and reduced plantar flexion of 8° (0°–15°) in the operated legs. CT-scanning of both Achilles tendons showed swelling of the operated tendon in all patients.

Conclusion: Our results include a small number of patients, and a prospective comparison to traditional suture technique has not been carried out. Bearing these reservations in mind, we conclude that the use of fibrin adhesive is a possible solution for the operation of ATR. However, the method does not seem to present any benefit compared to the results of traditional suture technique presented in the literature.

Successful immediate weight bearing of internally fixated ankle fractures in a general population

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Ortopædkirurgisk Afdeling, T, KAS Gentofte

Several studies on operated ankle fractures have shown that immediate weight bearing is recommendable. Consequently we changed our postoperative standard regime, from 3 weeks of non-weight bearing followed by 3 weeks of weight bearing, to full immediate weight bearing in all 6 weeks. The below knee walking cast was applied immediately after surgery. Furthermore we sent out a questionnaire to all surgical departments in Denmark with orthopaedic function, asking about postoperative treatment of ankle fractures.

Material and methods: Between December 1995 and September 1996, we studied 73 patients (median age 55 (21–92) M/F: 27/46), with ankle fractures who attended our emergency department and subsequently were admitted for open reduction and internal fixation. We excluded those with distal tibia fractures and patients under eighteen years of age.

Results: This elderly population did not present complication rates higher than in similar studies on younger patients. In two patients we observed a radiographic widening of the ankle joint ~ 4 mm six weeks postoperatively. These two patients had sustained a SU4 fracture, including rupture of the deltoid ligament, but no medial fracture. No patients required re-operation. 80% of the questionnaires were returned. 78% still follow a regime without weight bearing for the first 3 weeks postoperatively, followed by 3 weeks of weight bearing (3+3). 7% were allowed immediate weight-bearing.

Conclusion: Our study indicates that full immediate weight bearing after open reduction and internal fixation is recommendable, even in an elderly population. Precaution, however, might be taken with the SU4 fracture, including rupture of the deltoid ligament. The overall postoperative standard regimen in Denmark, is still the "3+3".

Successful immediate weight bearing of conservatively treated ankle fractures in a general population

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In recent years several studies have established the fact, that immediate weight-bearing of conservatively treated ankle fractures is recommendable, providing that the ankle fracture is stable. Consequently the standard treatment of stable ankle fractures, at our department, was changed from generally 3 weeks without weight bearing, followed by 3 weeks with weight bearing to immediate full weight bearing in a plaster bandage.

Material and methods: We studied 48 patients with stable ankle fractures, who had been conservatively treated in the period between Dec. 1995 and Sept. 1996. All were allowed

immediate full weight bearing. Median patient age was 60 years. 75% were women. Furthermore a questionnaire was sent out to all departments in Denmark with orthopaedic function, asking about their standard treatment of stable ankle fractures.

Results: Our study supports the results from earlier works regarding early weight bearing. All the ankle fractures examined, remained in acceptable position when the plaster was removed after 6 weeks. Even though the patients comprised mainly elderly people, most of whom were women, the complication rate resembled that of younger populations. The results of the questionnaire revealed, that the most common treatment of stable ankle fractures, in this country, is 3 weeks of non-weight bearing, followed by 3 weeks of weight bearing (70%). Only 20% of Danish orthopaedic departments allow immediate weight bearing. (Presently 80 % of the questionnaires have been returned).

Conclusion: It is now established, that full immediate weight-bearing of stable ankle fractures is recommendable, even in a generally old, mainly female population. Nevertheless the overall treatment in this country is still "old-fashioned".

Richard TPR ankle joint replacement—a long-term follow-up

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Our department started to perform ankle joint replacements in 1980. Because of the high mechanical loosening rate reported in the literature the number of replacements were reduced after 1986.

Material: All replacements were done with the Richards TPR type of total ankle joints. From 1980 to 1993 a total of 33 ankle joint replacements were performed in 26 RA patients, mean age 57 (30–74) years.

Results: 15 patients with 17 prostheses had died. 5 prostheses in 4 patients have been revised (replacement or arthrodesis) because of mechanical loosening. The cumulative 5-

year prosthesis survival was 93% (95% confidence interval 77–100%) and the cumulative 10-year survival was 88% (95%CI 69–100%).

Conclusion: In 1987 we re-examined 21 of these patients. Five prostheses had obvious signs of loosening and 5 prostheses had minor radiolucency zones. Four of the prostheses with obvious sign of loosening and one with minor radiolucency zones were later removed. In 1987 we concluded that the results were not satisfying. Based on our knowledge from this follow-up, it would be appropriate to reconsider our previous conclusion as the long term results are significantly better than previously expected.

BASIC SCIENCE AND PATHOLOGY

Increased IL-6 in osteo- and rheumatoid arthritic bone

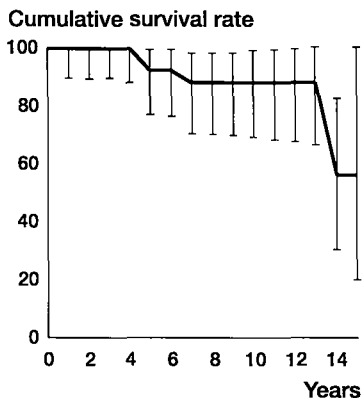
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In an attempt to clarify the cellular basis of bone loss seen in rheumatoid arthritis (RA), it has been demonstrated that osteoclastogenesis is increased in bone marrow cell cultures from RA patients (pts) suggesting that the potential of increased bone resorption is constitutive at the cellular level¹. The aim of this study was to investigate the constitutive expression of osteoclast-stimulating factors such as interleukin-1 (IL-1), tumour necrosis factor (TNF) and interleukin-6 (IL-6) in human osteoblast cells (HOB) derived from pathological bone.

Methods: Bone obtained from 7 RA, 15 osteoarthritic (OA) and 6 normal (NO) pts was cultured as described². Every third day conditioned media were removed for protein quantification by ELISA and HOB were harvested for RNA purification³. Northern hybridizations were performed using probes to IL-1 (a and b), TNF (a and b) and IL-6. Additional hybridizations with histone 4 (H4), collagen I (a1) (COL I), osteopontin (OP), Bone sialoprotein (BSP) and osteocalcin (OC) were performed to correlate cytokine expression to HOB developmental stages. Signals were quantitated by a Fuji Phosphorimager.

Results: IL-6 mRNA levels were significantly higher in OA and RA HOB compared to NO. Maximum was reached (13-fold increase in RA and 5-fold increase in OA, $p < 0.04$) at day 21 which corresponded to end of matrix maturation since COL I, OP and BSP were decreasing and OC increasing. IL-1 and TNF were undetectable. IL-6 protein secretion was significantly higher in OA and RA than in NO HOB at day 21 and 30 ($p < 0.05$). High levels of IL-6 protein had no significant effect on HOB proliferation and differentiation since H4 and phenotype genes were similarly expressed in all 3 groups.



Conclusion: These results indicate that newly differentiated OA and RA HOB constitutively express and secrete high levels of IL-6 suggesting that they, independently of local inflammatory parameters, are able to stimulate osteoclasts and thereby bone resorption.

References

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Low crystalline hydroxyapatite coating accelerates mechanical fixation of unstable weight-bearing implants

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No consensus has been reached on the most optimal hydroxyapatite (HA) coating quality. The aim of the study was to evaluate the early and late effects of HA coating crystallinity (75% versus 50%) on implant fixation.

Materials and methods: 16 dogs were included in the study. They were allocated into two groups with implantation periods of 16 and 32 weeks. Implants with either 50% (HA-50%) or 75% (HA-75%) coating crystallinity were randomly allocated to the medial femoral condyles. The implants were subjected to micromotion of 250 µm during each gait cycle using an unstable implant device. Mechanical fixation was evaluated by a push-out test.

Results: 16 weeks: Fixation of HA-50% was 2-3 fold stronger than HA-75% ($P < 0.05$). **32 weeks:** No difference between HA-50% and HA-75% was shown. In HA-75% implants, fixation increased from 16 to 32 weeks, whereas HA-50% did not become more strongly fixed.

Conclusion: This study suggests that HA-50% accelerates the early fixation (16 weeks) of HA-coated implants compared with HA-75%, however, in the longer term (32 weeks) no difference was demonstrated.

Effects of hydroxyapatite coating and/or bone graft on the interfacial strength of primary and revision implants

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The decreased longevity of revision joint replacement implants reduces patient function, and increases health care costs. Our long-term goal is to determine methods to im-

prove the results of revision implants.

Materials and methods: A micromotion implant in the canine medial femoral condyle modeled primary and revised implants. The revision setting was created by an 8-week implantation of an unstable PMMA implant, with polyethylene particulate (50% < 1 micron, range 0.5 - 50 microns) mixed with hyaluronic acid (0.5×10^8 particles/implant). After 8 weeks, the PMMA implant was removed, the cavity curetted, lavaged, and revised with a stable implant. At the same operative setting, an identical stable primary implant was installed in the opposite knee. The dogs were terminated 4 weeks later and results were evaluated by push-out test. Eight treatment groups (8 implants/group) evaluated stable porous Ti implants with or without HA, with or without allogenic bone graft, in primary and revision settings, in 32 mature mongrel dogs (64 knees).

Results and discussion: Fixation of revision implants was inferior to primary implants. In the primary and revision settings *without* bone graft, HA improved fixation strength over Ti. In the primary setting *with* bone graft, HA did not further improve fixation strength, whereas in the revision setting with bone graft, HA *did* further improve fixation strength. With HA and bone graft, the fixation strength of revision implants was as high as for the best primary implants (i.e., either grafted Ti or HA). These results support further clinical evaluation of grafted HA implants in revision surgery.

Synergy between implant motion and polyethylene debris in the formation of an aggressive periprosthetic membrane

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Factors influencing periprosthetic bone and tissue response are not well established. The purpose of this study was to investigate the role of implant motion, with and without particulate polyethylene (PE) debris, in engendering the typical characteristics of a membrane surrounding aseptically loosened human implants.

Materials and methods: A previously described experimental loaded implant device modelled stable or unstable conditions. The test implant consisted of a 6 mm smooth PMMA cylinder. The implant device was inserted into the medial femoral condyle of a dog for 8 weeks. PE mixed in hyaluronic acid was injected in the gap at surgery (0.5×10^8 particles /implant). 32 implants (16 dogs) were included: 8 implants in each of the four treatment groups (stable and unstable implants, with and without PE). A pathologist evaluated tissue response on decalcified H&E slides and ground sections were used for a qualitative description of the fibrous membrane and bone in the initial gap. Polarized light was used to identify PE particles.

Results: All stable implants, both with and without PE,

showed predominant bone growth in the gap. Unstable implants with PE showed an aggressive membrane analogous to that seen during revision of failed implants (macrophages, dense fibrous tissue, and a synovial-like lining), and unstable *without* PE showed a loose fibrous membrane.

Conclusion: We found an aggressive tissue response *only when both PE and motion* were present. This suggests a role of motion in potentiating the detrimental effects of particles.

Effect of nasal salmon calcitonin on post-traumatic osteopenia following ankle fracture

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The histomorphologic changes in a fractured bone consists of an increased number of both osteoclasts and osteoblasts, and thus has the histomorphology of a high turn-over disease of bone. Inhibition of bone resorption by a direct effect on the osteoclasts is a well known action of calcitonin.

Material and methods: 24 patients with an ankle fracture treated by open reduction and internal fixation were randomised to postoperative treatment with either 200 IU nasal salmon calcitonin (sCT) given daily for 3 months or placebo in a prospective, double-blind design. During follow-up 3 patients were excluded from the study. Thus, 11 patients in the placebo group and 10 in the sCT group were left for the study. Bilateral measurements of bone mineral content (BMC) in the coronal plane of the proximal tibia were performed by dual photon absorptiometry postoperatively within 7 days after the fracture and after 1, 3, and 6 months.

Results: 3 months after the fracture BMC in the injured legs decreased by 12.5% ($p=0.01$) in the placebo group, and only 5.3% ($p=0.14$) in the sCT group. In the healthy legs a tendency towards a decrease in BMC of 1.5% ($p=0.14$) was seen in the placebo group 3 months after the fracture, while BMC in the sCT group increased by 5.3% ($p=0.20$). When evaluating the effect of sCT on changes in BMC following ankle fractures, no statistically significant ($p=0.25$) effect was observed in the injured legs, but in the healthy legs a significant ($p=0.02$) difference between the sCT and placebo group regarding the changes in BMC from baseline to 3 months postoperatively was seen.

Discussion: In the present study 200 IU of nasal sCT given daily could not significantly inhibit the development of posttraumatic osteopenia in the injured legs following ankle fractures, but a significant effect was observed in the healthy contralateral legs.

Windsurfing injuries in Denmark

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It is estimated, that there are 25,000 recreational windsurfers and 2,500 organized windsurfers in Denmark. Windsurfing is believed to be a relatively safe sport, with a rate of 3.5-4.0 injuries per 1,000 surfing days, but is it difficult to determine the incidence accurately. The purpose of this study has been to estimate the incidence and study the severity of windsurfing injuries in Denmark.

Method: A retrospective study of 279 windsurfing injuries from 1990 through 1996 with data from The Register of Accidents at The Danish Health Ministry and from The Accident Analysis Group in Odense. The data cover records from six A&E Departments, corresponding to one fifth of the total Danish population. The EHLASS-emergency codes were used. Annual reports from the Danish Fleet were recorded.

Results: 220 men and 59 women were registered. Mean age was 26 (7-64) years. The mechanisms of injury were contact with the surfboard: 100 (35%), fall into the water from the surfboard: 55 (19%), acute overuse injuries: 51 (18%), fall during a jump with the surfboard: 32 (11%), jams or cuts: 31 (11%), 1 chemical injury and 1 foreign body in the eye. 8 were not specified. The body regions of injury were lower extremity: 154 (55%), upper extremity: 64 (23%), skull and face: 42 (15%), thorax, abdomen, upper and lower back: 19 (7%). Types of lesions were: 43 fractures, 8 articular luxations, 16 disruptions of cruciate or collateral ligaments of the knee, 75 distortions, 72 contusions and 51 wounds needing sutures. 14 patients were admitted to hospital with an average admission of 2,5 days. All others were treated as outpatients. 319 emergency calls with windsurfers involved resulted in 163 rescues by the Royal Danish Navy and Airforce, Life Boat Stations or locals. No drownings were reported.

Conclusion: The results indicate that approx. 200 windsurfers are injured and 23 need sea rescue annually in Denmark. Compared to other sports, it seems to be a relatively safe sport in the way it is practised in Denmark.

Sports injuries in high school students—an epidemiological study

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The purpose of this prospective study was to describe the total amount of sports activities among high school students, and to determine the incidence, severity and the regional distribution of the injuries.

Material and methods: In the autumn of 1994 a total of 1222 students in four high schools were asked to fill in questionnaires, reporting all sports activities and sports injuries

during a period of 12 weeks. A sports injury was defined as any physical damage caused by a sports-related incident. All students received uniform information from two of the authors about the definition of a sports injury, and were instructed how to report. Physical educators ensured that all questionnaires were filled in, and a response rate of 100% was obtained.

Results: A high sports activity was found. 73.0% were active outside high school. The average sports exposure per week was 3.9 hours. 595 injuries were registered during the 12-week period. These involved 392 (32%) of the students. The incidence was 10.0 injuries per 1000 hours of sports. The most common regions of injuries were the knees, feet, ankles, hands and the back. High rates were found especially in contact sports (soccer, handball, volleyball, basketball, and martial arts). The injury rate was not related to high school grade or sex. Competition and elite levels of sport were related to a significant higher injury rate. 46% of all students injured were seen by a physician, or 22% of all students.

Conclusion: High school students are sports active. The injury rate in this study was high. Possibly the physical education classes could be used to teach the students about how to train and how to avoid injuries.

Injuries associated with the use of roller skates —do injured roller-skaters use protective equipment?

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Sales of roller skates in Denmark have increased continuously during the last years. The aim was to describe the pattern of injuries associated with the use of roller skates, and to evaluate the use of protective equipment.

Material and methods: From May 1996 through April 1997, a total of 304 patients visited the emergency unit with injuries related to roller skating. Diagnoses, treatment, hospitalisation, out patient control when required, and use of protective equipment for roller-skaters was registered.

Results: A total of 364 injuries were registered in 304 patients. Twenty percent of all injuries were distortions, 21% contusions, 21% wounds and 38% were fractures. Forty-five percent of the patients had fractures. Eighty-three percent of all fractures were localised to the upper extremity. Wrist fracture was the most common fracture observed. Seven percent of all injuries were localised to the head. 4.6% were hospitalised. Only few fractures were seen in patients wearing protective equipment.

Conclusion: The majority of fractures are localised to the upper extremity, and wrist fractures are the most common fracture seen in patients visiting the emergency unit. Only a minority of the injured patients had been wearing recommended basic protective equipment.

Trauma of the wrist and forearm region in roller skating accidents

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Clinical research has shown that the majority of severe injuries among roller skaters is located to the upper extremities. The aim of this study is to focus on the fractures of the wrist and forearm region, and to evaluate the effect of the public appeal to use protective equipment when roller skating.

Material and methods: 213 patients with injuries to the upper extremities were clinically examined and treated in the Emergency Care Units in Aarhus, in the recording period from the 1st of May 1996 to the 30th of April 1997. In order to compare the incidence of fractures in this study with the material from Odense by Ovesen and Hejnstén (1989), the percentage of the wrist- and forearm fractures out of the total number of roller skating fractures in the one year period in the Emergency Care Units in Aarhus is presented.

Results: 114 out of the 213 patients with upper extremity injuries had fractures. 83 of these had fractures located to the wrist and forearm region. We found: 15 fractures of the elbow, 1 was internally fixated after reduction; 34 greenstick fractures and epiphysiolysis of the distal radius, 1 was reduced; 29 Colles, distal and mid antebrachium fractures, 10 were reduced, 2 with open reduction; 8 fractures of the scaphoideum; 2 fractures of other carpal bones.

Fractures of the wrist and forearm in percentage of all fractures recorded in roller skating accidents

Location of fracture	Odense 1980–1988	Aarhus 1996–1997
Elbow	9.4%	10.9%
Wrist and forearm	68.1%	46.0%
Scaphoid bone	0.2%	5.9%

Conclusion: Despite the obvious restrictions in comparing the two studies there seems to be a decrease in the incidence of wrist and forearm fractures. This might be explained by the enhanced offer and use of protective equipment.

Reference: Ovesen and Hejnstén, Ugeskrift for Læger 1989; 15/31: 1972-5.

Roller skating accidents

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The number of individuals using roller-skates in DK has increased markedly in recent years and so has the number of accidents. We drew up a questionnaire aimed at 109 patients who had visited the casualty department after roller skating accidents.

Material and methods: We studied 109 patients, who were treated in the casualty department for an injury caused by roller skating, in the period between June to October 1996 (4 months). A questionnaire was sent out to all these patients, asking about injury mechanism, level of experience, roller skating type, use of protective equipment, and duration of convalescence.

Results: 120 injuries were registered in 109 patients (median age 20), 34 of these were fractures (85% in upper ext., 12% in lower ext.), one suffered severe head trauma with skull fracture. 83 patients returned the questionnaire (76%). 73% were injured in public areas (streets, side walks, parking lots, etc.), only 4% were injured in a roller skating ramp. 75% of the injuries were caused by imbalance or stumbling over an uneven surface. None other than the roller-skater himself ever needed medical care. Median level of experience prior to the accident was 4 months. 41% had not used any protective equipment. 54% used in-liners and 46% used side by side roller-skates. 42% still suffered from the injury more than 5 weeks after the accident.

Conclusion: Injuries caused by roller skating is an increasing health problem. The patients are mainly young adults. A high incidence of severe injuries, such as fractures, have been observed.

The true number of bicyclist-accidents and behavioural characteristics among bicyclists—a random survey in the municipality of Viborg

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It is a well-established fact, that hospital records and police-reports concerning bicyclist-accidents underestimate the morbidity of bicycling because of either under-registration or difficulties in determination of the incidence of minor injuries, which do not require hospital- or police attention.

Materials and methods: Every 3rd month during the year of 1996 a randomly selected fraction of 1/40 of the approximately 40,000 inhabitants of Viborg municipality was sent a questionnaire concerning: a) habits related to bicycling, e.g. frequency of bicycling, use of helmets etc.; b) bicyclist-accidents during the past 3 months, counter-parts, use of helmets, personal injuries, treatment of injuries, place of treatment (e.g. at home, general practitioner, hospital) etc. Non-responders were contacted once more after one month. 72 percents of recipients answered the 4108 questionnaires.

Results: 35.4% never rode on a bicycle, whereas 35.9% used the bicycle daily. Among the 64.6% so-called "Bicyclists" only 18.9% always used a helmet when riding on the bicycle, 75.3% never used a helmet. However, this was clearly related to age: 97.2% among 0–9 years of age, 60.6% among 10–19 years of age but only 10.4% 20 years or older had a helmet. 112 bicyclist-accidents were reported during the whole year giving an estimated incidence of bicyclist-accidents in the population of 152 accidents/1000 inhabit-

ants/year. However, the incidence among children and teenagers was 5 times higher than in adults. In 78% of the accidents no counter-part was involved. The most common counter-part was another bicycle. The accident was reported to the police in only 3 cases (2.7%). In 62.5% of the accidents the bicyclist was injured. In 85.7% of these cases no doctors or hospitals were sought for treatment of these generally minor injuries. In only 3 cases the bicyclist was suffering from brain concussion due to the accident and in none of these cases, the bicyclist was wearing helmet. Only 2 bicyclists were admitted to hospital after a bicyclist-accident, giving an estimated incidence of hospitalisation after bicyclist-accidents of 2.72 /1000 inhabitants/year in the population.

Conclusion: In a municipal population 64.6% ride a bicycle. 75.3% never use helmets, but this was especially the case among adults. The incidence of bicyclist-accidents in the population was estimated to 152 accidents/1000 inhabitants/year. In 62.5% of these cases the bicyclist was injured, but more than 85% of these did not need any treatment from doctors or hospitals. The incidence of hospitalisation after bicyclist-accidents in the population was estimated to 2.72 / 1000 inhabitants/year. Only 2.7% of the accidents were reported to the police.

MISCELLANEOUS

Communication with cancer patients

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The aim of the study was to examine and to compare the level of information and satisfaction among cancer and shoulder-elbow patients in an orthopaedic ward, and the development over time.

Material and methods: From November 1996 through April 1997, 38 consecutive patients (18 females, 20 males) under suspicion of cancer and 38 consecutive patients (23 females, 15 males) with a benign shoulder-elbow disease were included. They were matched according to age. The patients in both groups were admitted to the same ward and surrounded by the same staff. Three questionnaires were constructed using closed and open-ended questions about purpose and results of the tests, diagnosis, and satisfaction with the information given. Patients were interviewed twice in the ward and one month after the discharge.

Results: At admittance to the ward the patients had a low level of information regarding examinations and diagnosis and low level of satisfaction. After the first information patients' level of information and satisfaction in both groups improved and remained high one month after the discharge.

There was no significant differences observed between the two groups with regard to level of information and satisfaction. Nevertheless, 9/38 patients under suspicion of cancer, and 12/38 shoulder-elbow patients had a wish for more information on prognosis and rehabilitation.

Conclusion: The level of information and satisfaction was high, and not influenced by the diagnosis of cancer. Despite these findings the results indicate, that patients want for more information.