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Basic science and pathology

In vivo vasodilatory action of Calcitonin Gene-Related Peptide (CGRP) in bone An experimental study in pigs

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Introduction: Calcitonin regulates the calcium homeostasis by inhibition of osteoclast activity. The gene that codes for synthesis of calcitonin codes for another peptide, calcitonin gene-related peptide (CGRP), with considerable biological activity. CGRP is a systemic circulating hormone, but acts as a neuropeptide in both the central and peripheral sensory nervous system. CGRP has a certain calcitonin-like effect on bone resorption, but demonstrates a considerable vasodilatory effect, both in vitro in isolated arteries and in a number of organ systems. Nervous tissue containing CGRP is located in bone with high osteogenic activity, which probably reflects neurogenic regulation of bone formation. Accordingly, CGRP-containing nerve fibres apppear postnatally during secondary ossification, but not prenatally. In vivo role of CGRP in the regulation of bone hemodynamics is unknown. The purpose of this investigation was to study the in vivo hemodynamic effects of CGRP in bone.

Material and methods: In 9 pigs (55–62 kg) the tibial nutrient artery was exposed, catheterized and perfused with blood from the left carotid artery via a pulsatile pump. After steady state CGRP was infused stepwise intraarterially in concentrations of 10-10 to 10-6 M. The tibial bone perfusion pressure, intraosseous pressure (IOP), mean arterial pressure (MAP), central venous pressure (CVP), and arterial gases were recorded. Minimum 10 minutes of steady state preceded every CGRP-infusion.

Results: The tibial bone perfusion pressure decreased significantly by increasing concentrations of CGRP (p <0.0001, ANOVA for repeated measurements). Changes were registered neither in IOP, CVP, MAP nor central vasodilatory gases.

Conclusion: CGRP has a vasodilatory effect on bone in vivo. The importance of CGRP on osteogenesis has to be investigated.

High pressure blood injection—a study of the microcirculatory consequences caused by a controversial technique in microvascular surgery

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Introduction: Injection of autogenous blood is often used in microvascular surgery, either to prevent or inhibit vasospasm in free flaps. Although the technique is reported to be effective, no quantitative studies have yet been performed to determine its effect on vasospasm and capillary perfusion in the flap.

Aim: To quantify the effect of high pressure blood injection on vasospasm and capillary perfusion after 4 hours of ischemia in the isolated rat cremaster model.

Materials and methods: 10 male Sprague-Dawley rats (100–150 g), were anesthetized with pentobarbital and tracheotomized. Systemic blood pressure was monitored via a cannula placed in the left carotid artery. The right cremaster muscle was surgically isolated and denervated on the right iliac artery and vein. The right femoral artery was cannulated to allow withdrawal and subsequent injection of blood. All cremaster muscles were made ischemic for 4 hours prior to blood injection, by clamping both the pedicle (pudic-epigastric artery and vein) and the iliac artery.

Injections of autogenous heparinized blood (10 IU/mL) at high pressure (n=5, 0.2±0.1 mL, 820±60 mmHg, during 3 seconds) and normal pressure, control (n=5, 0.2 mL, 96–110 mmHg, during 7±3 minutes), were performed manually with a syringe. The blood was injected into the cremaster microcirculation after clamping the iliac artery. Flow was re-established by removing the clamps. Observation and measurements of vasospasm and capillary perfusion were performed using

videomicroscopic techniques. The number of vasospasms (defined as a reduction in diameter of 25% or more, compared with adjacent vessel segments), were measured on A1, A2 and A3 vessels (25–150 microns), directly from the videoscreen. Capillary perfusion was measured by counting the number of functioning capillaries, in 9 sub-areas in 3 predetermined fields, each representing 0.73 mm^2 surface area on the cremaster muscle. The measurements were performed every 30 minutes for 4 hours. The results were evaluated using student's *t*-test and are presented as a mean ± SEM.

Results: High pressure blood injection significantly reduced the number of vasospasms after 4 hours of ischemia during the time period 30–90 minutes after re-flow (2±1), as compared with injection at systemic pressure (10±3), (p <0.05). The number of perfused capillaries prior to ischemia were 87±12 in the high pressure group and 75±16 in the systemic pressure group. High pressure blood injection significantly reduced the number of capillaries during the first hour after clamp-release, down to 10±18 as compared to 41±17 in the systemic group (p <0.05).

Discussion: This experiment shows that high pressure blood injection is able to prevent or inhibit vasospasm after ischemia. However, it appears not to benefit flap microcirculation as it decreases capillary perfusion.

Effect on dietary fishoil on thrombosis in ischemic skin flaps

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Introduction: Microcirculatory intravascular thrombosis is a significant component of the patophysiology of ischemia-reperfusion injured flaps (1). Thrombosis promotes the risk of mechanical obstruction of the capillaries as well as the release of vasoactive substances, which further compromises microcirculation (1). A fishoil-supplemented diet (containing n-3 PUFA) inhibits platelet activation by reducing TxA2 synthesis and thus its vasoconstrictor and platelet-aggregating effects (2).

Aim: This study aimed at elucidating whether n-3 PUFA: 1) inhibits intravascular thrombosis in ischemia-reperfusion injured skin flaps, 2) prolongs bleeding time and inhibits TxA2 synthesis.

Material and methods: 18 pigs (20 kg) were maintained on standard pig chow. 9 pigs were supplemented with fishoil 20 ml/day (=7 g n-3 PUFA/day) for 3 weeks. Platelet count, TxB2 (a TxA2 metabolite), and bleeding time were measured before randomization and after 3 weeks of dietary fishoil-supplement. Bilateral 10x10-cm latissimus dorsi myocutaneous and buttock skin island flaps were dissected. 6 hours of arterial ischemia was induced (contralateral flaps served as controls). Before reperfusion radioactively labelled platelets and fibrinogen were injected. After 4 hours of reperfusion flaps and unoperated control tissue were harvested and radioactivity was counted.

Results: Pigs fed a fishoil-supplemented diet had lower levels of TxB2 after 3 weeks (51.8 ng/mL + 7.6 ng/mL before diet compared with 33.1 ng/mL + 1.3 ng/mL after 3 weeks; p <0.05). No differences were observed in control pigs. There was no difference in bleeding time between the 2 groups. Accumulation of platelets and fibrinogen as represented by radioactivity in the flaps gave the following ratios between flap and unoperated control tissue:

	Control group (flap/tissue)		Diet group (flap/tissue)	
	platelets	fibrinogen	platelets	fibrinogen
Buttock skin sin	4.4±0.7(*)	5.4±0.5	3.0±0.4	4.6±0.1
Buttock skin dxt	8.5±1.9*	6.9±1.1	4.1±0.5	7.6±0.3
LatDorsi skin sin	4.0±0.4*	3.3±0.3	2.6±0.4	3.1±0.4
LatDorsi skin dxt	6.5±0.6	3.8±0.4	4.8±0.9	4.3±0.1
LatDorsi muscle sin	7.3±1.2(*)	10.7±1.2	4.4±0.8	11.0±1.9
LatDorsi muscle dxt	9.7±0.9	12.6±1.6	9.8±1.3	16.4±0.6

Significant difference between control group and diet group *p <0.05, (*) p <0.1.

Discussion and conclusion: This study confirms that feeding a fishoil-supplemented diet of 20 mL/day significantly lowers the level of TxA2 (measured as TxB2 level) and inhibits platelet accumulation marginally. There is no effect of fishoil on accumulation of fibrinogen.

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The relation between perfusion pressure and arteriovenous shunting —an experimental study in an isolated blood-perfused myocutaneous flap

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Background: A substantial fraction of the total blood flow in myocutaneous flaps bypasses the capillary circuit by arteriovenous (AV) shunting, and the fraction has been shown to decrease if arterial flow is reduced but to remain unchanged during venous congestion. AV shunting thus appears to be influenced primarily by the arterial perfusion pressure.

The aim of this study was to explore the relation between perfusion pressure, blood flow, and AV shunting in a myocutaneous flap model.

Methods: 7 pigs were used. A myocutaneous flap supplied by the superior epigastric artery and vein was isolated, and both vessels were cannulated. Systolic blood pressure (SBP) was monitored in the femoral artery. The flap was perfused with freshly drawn heparinized blood from the pig via a pulsatile pump. The flow was adjusted to an initial perfused pressure (PP) equal to SBP. Total blood flow (BF) and AV shunting were then measured with microspheres during perfusion at a PP of 140%, 100% and 40% of SBP.

Results: Mean (SEM) baseline flap BF of 7.1 (1.9) mL/min/100 g was reproduced after periods with high and low PP. BF was increased to 11.1 (2.7) mL/min/100 g during perfusion at PP 140% of SBP ($p < 0.05$) and decreased to 3.0 (0.2) mL/min/100 g during perfusion at PP 40% of SBP ($p < 0.05$). AV shunting was 23.0 (3.8)% at PP 100% of SBP and unchanged 20.3 (4.7)% at PP 140% of SBP, but reduced to 6.5 (4.6)% at PP 40% of SBP ($p<0.05$).

Conclusion: Total flap blood flow is reproducible after periods of perfusion at pressures above and below the physiological level in this model. The relation between perfusion pressure and AV shunting indicates that some shunts are closed at low perfusion pressure.

Effect of ischemia and reperfusion time on survival and muscle ATP-levels of myocutaneous island flaps exposed to arterial or venous ischemia

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Introduction: Survival of island skin flaps following secondary global ischemia is thought to be depending on whether the ischemia is of arterial or venous etiology. The period of reperfusion seems to have opposite effects on flap survival after a secondary episode of arterial or venous ischemia.

Aim: The study aimed at elucidating the effect of secondary arterial and venous pedicle clamping and the effect of reperfusion on survival pattern and ATP levels of myocutaneous island flaps.

Material and methods: 24 pigs had bilateral myocutaneous flaps of the rectus abdominis muscle elevated and exposed to consecutive periods of primary ischemia (2 h) (n=48), reperfusion (1, 4, 8, 12 h) (4x n=12), and secondary ischemia (6, 8, 10, 12, 14, 16 h) of arterial (6x n=4) or venous origin (6x n=4). ATP content of muscle biopsies and flap viability were assessed.

Results: Survival of flaps exposed to arterial ischemia (viable flaps/total number of flaps) (20/24) was significantly better (p =0.003) than those of venous ischemia (9/24). Secondary arterial ischemia was better tolerated the longer reperfusion was allowed (p =0.025). No significant trends were observed for the effect of reperfusion in venous ischemia. Secondary venous ischemia (median (25/75 percentiles), 3.7 (1.7/7.1)) had higher ATP content than arterial ischemia (1.2 (0.8/1.8)), (p =0.001).

Conclusions: This study confirms that venous ischemia is more detrimental to flap viability than is an equivalent period of arterial ischemia, although ATP contents were higher in venous ischemia. Survival of flaps exposed to arterial ischemia was improved by prolongation of the reperfusion period.

An experimental model for perfusion of rat hindlimbs with HP-16

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The present pilot study was carried out to evaluate whether amputated extremities should be perfused prior to replantation.

Material: A model for perfusion of the rat hindlimb was established. We examined 26 hindlimbs after perfusion with 10 cc HP-16 and as controls the opposite 26 hindlimbs from the same animals were examined without perfusion. The soleus muscles were studied under ligthmicroscope. In 16 cases an additional electronmicroscopy was carried out.

Results: In tissues with ischaemic periods of 2 and 4 hours no microscopic changes were visualized. With 6 hours of ischemia vacuoles of the cytoplasm and perinuclear area, slight edema of the pericytes and the endothelium were demonstrated. The mast cells were degranulated only in non-perfused muscles. By an ischaemic time of 9 hours and up, the limit of no-reflow was exceeded.

Conclusion: We have demonstrated that perfusion and reperfusion of an amputated extremity are possible in a laboratory setting. The delayed degranulation of the mast cells in the perfused muscles points to a protective effect of the solution HP-16. Further studies are needed to examine the reperfusion damages after re-establishing blood flow.

Cytokine levels in plasma from trauma patients—relation to clinical findings

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In a consecutive series of 22 patients with multiple trauma and head injury and 22 patients with isolated head injury we measured plasma levels of Interleukin (IL) 1ß, IL-2, IL-6 and tumor necrosis factor (TNF) on admission and on days 1, 2, 3, and 7 after the incident. Levels of IL-1ß, IL-2 and Il-6 were significantly higher in the trauma patients compared with healthy

controls on all days. IL-1ß increased significantly from admission to day 1 and from day 1 to day 7. Levels of the cytokines did not differ on any day in patients with isolated head injury compared with patients with multiple trauma. Cytokine levels were not significantly correlated to Injury Severity Score or Glasgow Coma Score and they were not different in patients who survived (n=38) compared with patients who died (n=6). Levels of TNF on day 7 were significantly higher in patients who received transfusions (n=19) compared to levels in patients who did not (n=25) and TNF on day 7 were significantly correlated to the number of blood transfusions (r=0.47). In 4 patients with multiple trauma posttraumatic pulmonary dysfunction developed during the study. In these patients levels of TNF were significantly lower on day 1 and levels of IL-6 significantly higher on day 2 compared with patients without pulmonary dysfunction.

Conclusions: Plasma levels of IL-1ß, IL-2 and IL-6 are elevated in trauma patients. Relations between posttraumatic pulmonary dysfunction, blood transfusions and cytokines deserve further investigation.

An experimental biomechanical elbow joint model

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Introduction: The purpose of the present study is to provide a biomechanical osteoligamentous elbow joint model, where a significant and reproducible joint instability, through a bilateral ligament injury, can be induced.

Materials and methods: 10 cadaver elbow-specimens were included (median age 68 years). The specimens were mounted in the experimental stress apparatus, and the forearms were subjected to 0.75 Nm stress in valgus, varus and rotation. Lesion was induced in the anterior part of the ulnar collateral ligament and in ligamentum annulare, the injured joints were restressed. Statistically a paired *t*-test was applied to the results (significance at $p < 0.02$). Reproducibility was estimated through systematic double recordings.

Results: The induced lesion caused instability as follows: Valgus stress; significant valgus instability in the complete flexion arch, and a significant external rotational instability from 10–120 degrees of joint flexion for the corresponding spontaneous rotation. Varus stress; significant varus instability in the complete flexion arch, and a significant external rotational instability from 110–120 degrees of joint flexion for the corresponding spontaneous rotation. External rotation; significant external rotatory instability from 30-120 degrees of joint flexion. Internal rotation; significant internal rotatory instability in the complete flexion arch. Reproducibility measurements showed a maximum standard error of 0.54 degrees for intact joints, and a maximum standard error of 1.09 degrees for injured joints.

Conclusion: It is possible to design a biomechanical elbow joint model. A significant instability through bilateral ligament injury can be induced. The model and mobility measurements are through systematic double recordings found reproducible.

An experimental reconstructive procedure for chronic elbow joint instability

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Introduction: The aim of the present study is to provide a corrective operative procedure for stabilizing chronic elbow joint instability. One procedure which has found clinical application is here tested biomechanically.

Materials and methods: 10 cadaveric elbow joints were included (median age 68 years). The specimens were mounted in the experimental apparatus, stressed and lesioned as described in the method study. Drill holes were made in the medial and lateral epicondyles and through ulna immediate distal to olecranon. A nylon cord was inserted from the posterior side of the epicondyles and through the ulnar drill hole, fixed in the epicondylar channels with cortical screws. The reconstruction was restressed. Statistically a paired t-test was applied to the results (significance at $p < 0.02$).

Results: The reconstructive procedure showed significant reduction of instability at 90° of flexion in varus stress, varus- and valgus stressed spontaneous rotation and forced internal rotation. The max mean improvement in varus was 9.1° at 110° of flexion, in forced internal rotation 6.11° at 110° of flexion and in spontaneous rotation 8.05° at 100°. In valgus stress and forced external rotation, no significant improvement of stability was seen. By further extension, no effect of the reconstructive procedure was seen. With further flexion the stability of the joints was improved, but the flexion-range was reduced by the reconstructive procedure, and only 4 of the specimens could be inflected more than 110° after the reconstructive procedure was performed.

Conclusion: The present posterior reconstructive procedure cannot be recommended, because the flexion range is impaired and the stabilizing effect on extended elbow joint does not occur. The biomechanical method has proven its efficiency for in vitro elbow joint studies.

Hand surgery

Arthrodesis of the wrist a m Mannerfeldt

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The aim of this study was to evaluate the long-term results of arthrodesis of the wrist using the technique described by Mannerfeldt (1) for degenerative arthrosis and/or collapse of the wrist joint.

Materials and methods: From 1979–1992 19 patients were treated with 20 operations. At the time of evaluation 4 patients (5 operations) had deceased, 2 refused to participate. The remaining 13 patients (13 operations) were evaluated clinically and radiographically with a median follow-up of 5 (1–13) years.

Results: 9 patients were painless, 2 patients had partial relief, 2 patients were unchanged compared to the preoperative status. Radiographs revealed bony fusion in 12 wrists and fibrous union in one. Clinically all wrists were ankylotic and pain free. Hand-finger function evaluated a m Van Gemert (2) gave an overall decrease in function of 22% (0–56).

Conclusion: Arthrodesis of the wrist as described by Mannerfeldt is easy to perform and leads to bony fusion and substantial pain relief, and the results are long lasting.

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Laesio fibrocartilago volaris and antiflogistic creme

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Purpose: To investigate whether Benzydaminchloride creme 5% (BC) and massage can be used as a supplement in the treatment of hyperextension injuries in the PIP finger joints.

Material and methods: 70 consecutive sportsmen (32 men and 38 women) who suffered a lesion of the volar plate in the PIP finger joint were randomized; median age: 20 (15-39) years.

Group I (34 patients): One week with immobilisation in removable dorsal Carstam-splint, combined with locally applied BC and massage of the PIP joint 3 times a day for 2 weeks.

Group II (36 patients): Solely carstam-splint one week.

Results: 74 lesions. 93% occurred during sports, most frequently handball- (49%) and footballplayers (21%). 61% was caused by a ball directly against the finger. At 4 weeks' follow-up 63% in group I were symptomless compared to 31% in group II (p <0.01). Correspondingly after 12 weeks: 86% in group I and 72% in group II (ns). The incidence of severe symptoms was significantly less in group I (17%) compared to group II (36%) after 4 weeks (p <0.01). Correspondingly after 12 weeks: 6% in group I and 8% in group II (ns).

Conclusion: The recovery-time and symptoms after a lesion of the volar plate in the PIP finger joint can be reduced with benzydaminchloride creme and massage as a supplement to immobilisation of the joint, compared to immobilisation alone.

Short- and long-term results of operative treatment of Dupuytren's disease

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Purpose: To evaluate the short- and long-term results of operative treatment of Dupuytren's disease.

Materials and methods: During the period from 1982 to 1991, 161 patients were operated on (201 hands). 114 were operated by the McCash procedure, 81 by closed fasciectomy. There were 6 primary amputations. Results are based on charts from 201 patients and clinical follow-up of 153 hands, on average 4 (1–10.5) years postoperatively.

Results: In the group who had the McCash procedure performed there were postoperative complications in 3 hands: 2 cases of necrosis and 2 cases of infection. In the closed fasciectomy group there were complications in 6 hands: 5 hematomas, 4 cases of infection and one of necrosis. On examination 3–6 weeks postoperatively 67% improved extension was recorded, 3.5% unchanged. In 27.5% of cases information about extension was not recorded.

48 out of 201 operations were performed because of recurrence of contracture, 1–3 previous operations having been performed. In the group of primary operations the following frequency of recurrence was found; in the McCash group: extension 11%, recurrence 20%, both 3% and none in 66%. In the closed group: extension 12%, recurrence 16% both 6% and none in 66%. In the group of reoperated hands, those having McCash operation performed no extension was found, recurrence was found in 30%, both in 10% and none in 60%. In the closed group: extension was found in 18%, recurrence in 35%, both in 6% and none in 41%.

Conclusion: Postoperative complications can be reduced by using the McCash procedure. The percentage of recurrence is similar to previously published studies.

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Hip

Prognostic factors for development of heterotopic ossification after hip arthroplasty

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Aim: (a) to evaluate whether heterotopic ossification (HO) increases beyond 3 months after hip arthroplasty, and (b) to identify factors prognostic for development of HO.

Material and methods: Radiographs of 443 hips from 3 previously accomplished thromboprophylaxis studies were reviewed and HO was classified according to DeLee. Patients did not recieve specific prophylaxis against HO. (a) Exact confidence intervals for the probability of increased HO after 3 months' observation were computed by the F-distribution, all hips with observations were included. (b) The association between HO 3-6 months after operation and 16 explanatory variables registered in the patient records peroperatively were analysed by graphical models in multivariate analysis, each patient was included only once.

Results: (a) Radiographs of 186 hips taken 3 and 12 months postoperatively were available. In 17% of these (confidence interval: 12-23%) HO increased one grade, the higher the grade of HO at 3 months the greater was the probability of worsening: 12% increased from grade 0 to grade 1, 21% from grade 2 to grade 3. (b): 350 patients had radiographs 3 or 6 months after operation. 3 of the explanatory variables correlated to HO: Sex (p =0.00001), deep vein thrombosis (DVT) documented by phlebography (p=0.048) and peroral anticoagulation (AC) (p =0.016). The association between HO and DVT can be explained by AC and vice versa, as AC was started only in case of DVT. There was no correlation between HO and thromboprophylaxis (low dose heparin, low molecular weight heparin, dextran or placebo) or use of non-steroid antiinflammatory drugs.

Short-term postoperative prophylaxis with indomethacin in prevention of heterotopic bone formation after total hip arthroplasty A randomized, double-blind and placebo-controlled clinical trial

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Aim: In a randomized, double-blinded and placebo-controlled design to examine the efficacy and safety of postoperative prophylaxis with indomethacin for 2 weeks in prevention of heterotopic bone formation after total hip arthroplasty.

Patients and methods: The study was designed to detect a reduction in the incidence of heterotopic bone formation (HBF) after total hip arthroplasty (THA) on at least 50%, at a level of significance of 0.05 and a test power not below 0.90. Using these data it was calculated that 28 patients had to enter each group. Totally 57 patients were included in the investigation. All had a cemented Exeter THA inserted at our clinic. No patients had undergone prior surgery to that hip. All patients were randomized to treatment with indomethacin 25 mg or placebo, both given as capsules 3 times daily for the first 2 postoperative weeks starting on the first postoperative morning. The hips were examined clinically and with radiographs preoperatively, immediate postoperatively and after 3 months. HBF was graded according to DeLee (1).

Results: 16 patients, 10 in the indomethacin-group and 6 in the placebo-group, were secondarily excluded. 5 patients, 4 from the indomethacin-group, were excluded due to dyspepsia. One patient treated with indomethacin had that stopped on the fifth day after surgery due to a milder upper gastrointestinal bleeding. Therefore, 41 patients fulfilled the study, 22 in the placebo-group and 19 in the indomethacin-group, being 14 males and 27 females. In the placebo-group 15 patients developed HBF, with 5 patients having a Grade-II lesion and 6 patients the severe Grade-III HBF. In the indomethacin-group 13 patients developed no HBF, one patient a Grade-II HBF and no patient developed a Grade-III lesion. Significantly fewer patients treated with indomethacin developed HBF (Fisher's test: p =0.002).

Conclusion: This study has shown that prophylaxis with indomethacin for the first 2 postoperative weeks effectively reduces the incidence and prevents the most severe HBF after primary THA. Compared to our previously published randomized, double-blinded and placebo-controlled studies on treatment with indomethacin for 4 (2) and 6 (3) weeks, the present two-week treatment is equally effective and therefore to prefer. Whether an even shorter treatment period will be sufficient cannot yet be answered.

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The effect of ketoprofen (Orudis®) on heterotopic bone formation after hip replacement. A double-blind randomized study

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The aim of this prospective double-blind randomized study was to examine the effect of ketoprofen on the incidence of heterotopic ossification after total hip replacement.

Patients and methods: In the period October 1987 to January 1990, 63 patients with coxarthrosis, operated with a cemented total Lubinus sp-2 prosthesis were double-blind randomized to either 200 mg ketoprofen depot-tablet or placebo once a day, from one day pre- to 30 days postoperatively. Radiographic and clinical examination were performed after 3 months and 2 years.

Results: The heterotopic ossification was divided between the placebo and ketoprofen groups as follows:

	3 months				n(pt)	2 years				n(pt)
Delee (°)	0	1	2	3		0	1	2	3	
Placebo	13	6	9	1	(29)	6	12	4	4	(26)
Ketoprofen	24	1	0	0	(25)	18	6	0	0	(24)
M-W test	p=0 00006					p=0 00008				

Clinical examination. according to Merle d'Aubigne, showed significantly less pain and better range of motion in the ketoprofen group. There was no difference in walking ability.

Conclusion; Treatment with *200* mg ketoprofen once a day, from one day pre- to 30 days postoperatively significantly reduces the heterotopic ossification after total hip replacement, and gives a better range of motion and less pain.

Registration of infections used to measure the effect of prophylactic antibiotics preoperative to osteosynthesis of hip fractures Quality assurance in an orthopedic department

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Introduction: Registration of wound infections in orthopaedic surgery is an attempt to measure the quality of treatment. This investigation demonstrates the use of the registration of infections in the process of quality assurance by showing the effect of prophylactic antibiotics in the osteosynthesis of patients with hip fractures.

Materials and methods: From January 1991 our routines concerning use of prophylactic antibiotics in osteosynthesis of hip fractures were changed, so 'hat all patients who underwent this operation should be given this treatment. Before this change, the surgeon decided if prophylactic antibiotics should be used or not. The effect of this change was read in the department's personal computer program for monitoring of wound infections and other complications for all operated patients. In the same program, the specific type and dose of prophylactic antibiotics is also registered. In the program 688 patients with hip fractures and their complications were monitored, 327 in 1990 and 361 in 1991.

Results: Prophylactic antibiotics were used in 56% of the osteosyntheses in 1990 and in 79% in I991. Cefuroxime was used in 98% of the prophylaxis. The rate of deep wound infections decreased from 2.9% in 1990 to I.I% in I991. The overall rate of deep wound infection was lower (p <0.0l) in the group treated with prophylactic antibiotic, 0.6% than in the group without this treatment, 4.6%.

Conclusion: It takes time to carry out a change in the procedure of treatement in a department. This investigation supports the indication for the use of prophylactic antibiotics in osteosynthesis of hip fractures. Computerised registration of wound infections and other complications is one suitable tool in the process of ensuring quality in an orthopaedic department.

Knee

Knee arthroscopy under local anesthesia Influence of equilibrium time on pain

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Introduction: Intra-articular anaesthesia has been widely used for knee arthroscopy. However, while different anaesthetic agents, volumes and concentrations have been introduced, no studies seem to have focused on the influence of the equilibration time (e g the time from the end of the intra-articular injection of local anesthesia to the start of the arthroscopy).

Patients and methods: 40 patients scheduled for diagnostic arthroscopy and possible arthroscopic surgery were included in the study. They were randomly allocated to an equilibration time of either 5 min or 30 min, with 20 patients in each group. Lidocaine 0.5% with Adrenaline (100 mg) was infiltrated in the skin at the portals and Bupivacaine 0.5% with Adrenaline (100 mg) was given intra-articularly. Pain was assessed by the patients using a 100 mm visual analogue scale before operation, after injection of local anesthetics, immediately after operation (worst pain) and 3 times postoperatively (4, 8 and 24 hours). The postoperative intake of analgesics (Paracetamol) was registered.

Results: Peroperative pain score was lower in patients with long equilibration time (median **16,** interquartil 14-23) than short (median 43, interquartil 18-60). There was no difference

between the groups in pain score pre- or postoperatively. However, postoperative Paracetamol intake was higher in patients with long equilibration time during the first 24 hours (median 2.5 g vs 0.0 g).

Conclusion: Although all arthroscopies were completed without problems, we ought to prefer a long equilibration time because of the lower preoperative pain score. The higher postoperative analgetic intake in this group could be explained by patients with low equilibration time having higher level of endorphines due to higher peroperative pain.

Cementless AGC-2000 revision of cemented demi-arthroplasty

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Introduction: This study was performed to evaluate the results of uncemented total knee revision arthroplasty of cemented demi-arthroplasty.

Materials and methods: 25 patients (26 knees) who had been revised were included in this study. There were 8 men and 17 women. The median age was 69 (44–83) years. Follow-up was median 3 (1–6) years. The cause of failure of the primary arthroplasty was aseptic loosening in 8 patients, progressive arthrosis of an unresurfaced compartment in 9, improper positioning of the primary components leading to decreased function and pain in 7, wear of a tibial component in one and pain of unknown origin in one. The New York Hospital for Special Surgery knee-score was used and radiographs were obtained fluoroscopically and evaluated according to the guidelines of The Knee Society.

Results: The median knee-score was 77 (52–92). There were 7 excellent results, 12 were good, 3 fair and 4 were poor. Radiographic assessment: in 4 knees radiolucencies more than one millimeter wide were found—in one or more zones—adjacent to the femoral component, and similar radiolucencies more than one millimeter wide were found adjacent to the tibial component in 9 knees.

Patient assessment was graded as follows: 12 were enthusiastic, 6 were satisfied, 5 were noncommittal and 3 were disappointed.

Conclusion: The results are satisfactory and comparable to the results obtained after cemented revision.

Primary cementless total knee arthroplasty in rheumatoid arthritis

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Introduction: The use of cementless TKA is under discussion, especially regarding patients with Rheumatoid Arthritis (RA). We present the clinical and radiographic results with the cementless technique used in Hillerød since 1985.

Patients and methods: In the period 1985-1990, a total of 51 primary cementless TKA's (AGC 2000) were performed in 40 patients with RA. Follow-up included patient assessment, NYHSS knee score, radiographic evaluation under fluoroscopic control and survivorship analysis. 31 patients (median age 63 years) with 40 knees were available for follow-up evaluation with a median observation period of 4 (2–6) years.

Results: One tibial component was revised due to aseptic loosening after 16 months. There was no pain in 32 knees and only mild pain ind the rest. Median ROM was 110° (50°–130°). Median knee score was 90 (71–97), and all knees were rated good or excellent. Median tibiofemoral angle was 3° valgus. Radiolucencies > 1 mm were found under 5 tibial components. There was no pain in these knees. No obvious migrations were seen. The cumulative success rate was 97% after 4–5 years.

Conclusion: The medium term results with cementless technique in patients with RA compares favourably to reported cemented series.

Intra-articular bupivacaine with or without adrenaline for arthroscopy of the knee Effect on pain and peroperative bleeding

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Introduction: In recent years local anesthetics administered intra-articularly (IA) for diagnostic or surgical arthroscopy has been an alternative to spinal, epidural or general anaesthesia. The addition of Adrenaline has been used in the belief that adrenaline prolongs the duration of local anaesthesia. However, no studies have focused on the effect on per- or postoperative pain relief or peroperative bleeding.

Patients and methods: The study was prospective, randomized and double-blind. 40 patients were allocated to group A (20) or group B (20) receiving IA Bupivacaine (75 mg) with or without Adrenaline, respectively. Pain was assessed by the patients using a 100-mm visual analogue scale before operation, after injection of local anesthetics, immediately after operation (worst pain) and 3 times postoperatively (4, 8 and 24 hours). The amounts of bleeding and the acceptability of the

method were evaluated by the surgeons. One patient in group B was excluded due to an incorrect procedure.

Results: The median peroperative pain score was 44 (0–87) and 34 (0–85) in group A and B, respectively (ns), and there was no difference between the groups in pain score postoperatively. Peroperative bleeding was reduced in group A (none) compared to group B (minimal). There was no difference between the groups regarding the operative conditions evaluated by the surgeons. One patient in each group would not accept the same type of anaesthesia in case of another arthroscopy.

Conclusion: The addition of Adrenaline to IA administrated Bupivacaine reduced peroperative bleeding, but had no effect on per- or postoperative pain.

Bone remodelling in the proximal tibia following uncemented total knee arthroplasty

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Bone remodelling in the proximal tibia assessed by dual photon absorptiometry was measured in 25 patients treated by uncemented total knee arthroplasty (TKA) because of primary osteoarthrosis of the knee. The patients were divided into subgroups based upon pre- and postoperative alignment of the knee. Local changes in bone mineral density (BMD) around the medial fixation peg (3 areas) and around the lateral fixation peg (3 areas) were measured postoperatively and at follow-up after 6 and 12 months. The patients (n=12) with varus malalignment preoperatively corrected to valgus or neutral alignment showed a progressive fall in BMD in all medial areas; significant after 6 months and reaching 21-36% after 12 months. Around the lateral peg a significant increase in BMD of 10-15% after 6 months was found, but after 12 months BMD was back to the initial value. When the results from all patients with a change in knee alignment (n=23) was calculated the same pattern of bone remodelling with a decrease in BMD in the tibial condyle less loaded postoperatively and a temporary increase in BMD in the condyle where load was increased was seen. Realignment of the knee joint during TKA causes significant bone remodelling in the proximal tibia closely related to the change in knee alignment.

Changes in bone mineral density in the proximal tibia following partial and total meniscectomy

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Introduction: Following a meniscectomy the area of loadbearing is reduced and the stress acting across the knee joint is increased.

Material and methods: 19 patients totally meniscectomized and 14 patients partially meniscectomized by open joint surgery respectively 11.8 (10–12.6) years and 11.7 (9.9–14) years earlier were included in the study. Bone mineral density (BMD) was measured by dual photon absorptiometry in the proximal tibia and measurements were done in the meniscectomized legs and in the healthy contralateral legs. 2 areas (1.2x4mm) of maximal density located medially and laterally in the compact bone of the subchrondral plates and 2 areas (8x8mm) centrally in the medial and lateral part of the subchrondral trabecular bone were selected for BMD-measurements.

Results: The table shows the percentage difference between BMD in the meniscectomized legs and the healthy legs (*p*-values).

	Meniscectomy	
BMD	Total	Partial
Trabecular bone, medial	1.0% (0.59)	7.7% (0.01)
Trabecular bone, lateral	–6.5% (0.002)	–2.7% (0.12)
Cortical bone, medial	7.3% (0.002)	6.7% (0.04)
Cortical bone, lateral	–2.3% (0.43)	–2.6% (0.20)

Conclusion: Following partial and total meniscectomy an increase in BMD medially and a decrease laterally (compared to the healthy legs) was found.

Arthroscopic meniscal suturing in Danish hospitals—regimen and after-treatment

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Purpose: To present various attitudes to the after-treatment of patients with arthroscopic suture of meniscal lesions.

Material and methods: A questionnaire was sent to all orthopedic departments and surgical departments with an orthopedic consultant in Denmark. 36 out of 42 answered.

Results: 9 departments perform meniscal suture routinely, 26 only for special purposes and one department never. The procedure is carried out arthroscopically as a routine in 16 departments and by arthrotomy in one.

The lesions that are sutured are: 1) In children: peripheral lesions close to the capsule (33 departments), peripheral one third (18 departments), middle thirds (4 departments). 2) In adults: peripheral lesions close to the capsule (33 departments), peripheral one third (13 departments) and middle one third (none). Outside-in suturing was used by 7 departments, inside-out by 17. After-treatment varies from department to department: plaster casts in varying degrees of flexion is used by 8 departments, 26 departments employ braces, allowing varying degrees of controlled flexion. 2 departments use no bandages or braces. Full weightbearing immediately after operation is only allowed by 5 departments. Sport is allowed from 5 weeks to half a year postoperatively. Control arthroscopy is not performed by any department routinely, however 20 department perform control arthroscopy in special cases, 14 departments never.

Conclusion: There is general agreement that arthroscopic meniscal suturing should be done on proper indications. Bandages and braces are used by all departments except 2, with varying regimen as far as movement is concerned. It is generally agreed that arthroscopic control is unethic to perform unless a new indication is present.

Arthroscopic meniscal resection in Danish hospitals—regimen and after-treatment

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Purpose: To examine attitudes in Danish hospitals to the treatment of patients after arthroscopic meniscal resection.

Materials and methods: A questionnaire was sent to all orthopedic departments and surgical departments with an orthopedic consultant in Denmark. 36 out of 42 departments answered.

Results: 13 departments perform meniscal resection by routine under admittance or as ambulatory surgery, 14 departments under admittance only and 9 as ambulatory surgery only. Antithrombotic profylaxis and peroperative antibiotics are not used routinely in any department, but for special purposes in 20 and 14 departments respectively.

NSAID is given routinely postoperatively in 8 departments. Postoperative physiotherapy is offered in 21 departments, 23 departments issue pamphlets on exercise and rehabilitation. In all departments weightbearing is allowed immediately postoperatively. Sport is allowed after surgery after a range from one to 8 weeks.

Conclusion: There is a general concensus about the attitude to the after-treatment of meniscal resections. All departments allow weightbearing immediately postoperatively. There is general agreement to letting patients resume sport as soon as swelling has subsided and control over muscular function has been regained.

Reconstruction of the anterior cruciate ligament with ABC-ligament 1–4-year follow-up

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Aim: To evaluate the early results after reconstruction of the anterior cruciate ligament with Surgicraft® ABC-ligament.

Material and methods: 31 consecutive patients were reconstructed in the period of 1988–1991 using Surgicraft® ABC-ligament consisting of polyester and carbon fibres. 32 reconstructions were done, one of these a re-reconstruction. 7 patients were lost to follow-up which leaves 25 patients at the time of follow-up. Preoperatively the patients were not consequently evaluated with Lysholm score or Tegner activity score. Indications for operation were restrictions in daily activities because of pain and objective signs of instability recorded by the Lachmann test graded in a four-point scale and pivot-shift graded as positive or negative. The study is based on the clinical examination pre- and postoperatively and the postoperative subjective knee function score according to Lysholm.

Results: The follow-up examination was performed on an average of 2 (1–4.5) years after reconstruction. 3 of the 28 reconstructions had ruptured, 2 within 6 months, leaving 25 patients. The knee function score according to Lysholm was excellent/good in 17; fair (65–83) in 5 and poor in 3. The Lachmann test was improved in 18 patients. The pivot-shift was positive in 15 patients preoperatively, improved in 11 at the time of follow-up. Complications: one case of deep vein thrombosis; one with non-traumatic sterile effusion. There were no late consequences.

Conclusion: Our short-term results using a polyester-carbon-fibre ligament are in agreement with results published earlier using other kinds of artificial implants but not on a level with latest published results using biological grafts.

Oxygen affinity of reinfused shed erythrocytes following knee arthroplasty

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Introduction: By using a simple autologous blood recovery system it is possible to minimize the net blood loss and also minimize or even avoid the use of homologous transfusions (HT). However, the quality of autotransfused red blood cells (RBCs) is poorly documented. This study investigates the oxygen carrying capabilities of RBCs from shed blood following knee arthroplasty.

Patients and methods: 13 patients with primary arthrosis of the knee had unilateral, non-cemented, total knee arthroplasty and were postoperatively connected to the Constavac™ autol-

ogous blood recovery system allowing postoperative collection, filtering and reinfusion of unwashed shed blood. Shed blood was collected for 6 hours postoperatively. Reinfusion was started 2 hours postoperatively if the collection reservoir contained 400 ml or more. Collection of subsequent drainage was terminated 6 hours postoperatively and reinfused within 2 hours. The following parameters were measured from shed blood ready for autotransfusion: 2,3-diphosphoglycerate (2,3 DPG) and acid/base-status. By using a computer program P50 and oxygen-dissociation curves were calculated for every 2,3-DPG-value measured.

Results:

		Median	Range	Ref range
2 h postop:	2,3-DPG(mmol/L)	4.3	(3.7–4.7)	(4.1–5.6)
	P50(kPa)	3.4	(3.2–3.4)	(3.2–3.8)
6 h postop:	2,3-DPG(mmol/L)	4.2	(3.7–4.7)	(4.1–5.6)
	P50(kPa)	3.3	(3.2–3.4)	(3.2–3.8)

Conclusions: RBC from shed blood has normal 2,3-DPG level indicating normal oxygen binding capacity. RBCs from homologous banked blood have low 2,3-DPG levels and consequently high oxygen affinity. It takes up to 24 hours before the 2,3-DPG-level and oxygen binding capacity are normalised following HT with banked blood. Reinfused RBC from shed blood are optimal oxygen carriers immediately after reinfusion. This may be of importance during the immediate postoperative period.

Survival of reinfused shed erythrocytes following knee arthroplasty

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Introduction: Evaluation of the clinical effect of autologous transfusions (AT) is often based only on the need for supplementary homologous transfusions (HT). The need, if any, for (HT) has, however, multifactorial dependence and gives no information about the quality of the autotransfused red blood cells (RBCs). To assess whether the life span of RBCs, collected from surgical drains following surgery of the knee, was affected by the procedure of AT, we determined the long-term survival of 51-chromium(51Cr)-labeled autologous RBCs.

Patients and methods: 10 patients with primary arthrosis of the knee had unilateral, non-cemented, total knee arthroplasty and were postoperatively connected to the ConstavacTM-autotransfusion unit, which is a closed, autologous blood recovery system that allows postoperative collection, filtering and reinfusion of unwashed shed blood. Shed blood was collected for 6 hours postoperatively and reinfused within the following 2 hours. Immediately before reinfusion, 18 ml of the shed blood was aspirated from the system and radiolabeled with ^{51}Cr. AT of the shed blood was performed and the ^{51}Cr-labeled RBCs were reinfused towards the end of the autotransfusion. Subsequent venous blood samples were drawn after 20 minutes (baseline) and repeated 3 times weekly until 50% activity of 51Cr was reached, followed by samples drawn weekly until less than 33% activity remained in the blood (minimum 40 days postoperatively). The time until 50% activity of ^{51}Cr in blood (corrected for physical decay, but not for elution) was determined by monoexponential fitting.

Results: The time from 100% activity to 50% activity ($T_{50}Cr$) was 22 days.

Conclusions: $T_{50}Cr$ for autotransfused erythrocytes from unwashed shed blood is equal to $T_{50}Cr$ for banked homologous blood (1), suggesting equal long-term survival, but both are slightly shorter than the normal values of 25–33 days reported for autologous RBC (2).

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Ankle and foot

Early mobilization of operatively treated achilles tendon ruptures 1–2-year follow-up

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From experimental studies it is known that an early restricted motion of sutured tendons accelerates the tensile strength of the repair; but the risk is an increased gap between the tendon ends, and a possible elongation of the tendon. The purpose of this investigation is to study if an earlier restricted motion of sutured Achilles tendons can shorten the period of convalescence and improve the results in the short and longer term, without increased risk for reruptures or tendon elongation.

Material and method: During a period of 2 years, 71 patients were randomized for postoperative bandaging in either a below-knee plaster with the ankle in equinus position for 6 weeks followed by a plaster cast for walking for 2 weeks, or a dorsal plaster cast for 2 weeks followed by 4 weeks in a modified DONJOY ROM-Walker. In this bandage, with a dorsal placed elastic, an active dorsiflexion between -30° and 0° was possible in the 3rd and 4th week of treatment, and free unloaded motion in week 5 and 6. During the operation metallic markers were placed in both tendon ends and the distance between these were followed by standardized radiographs. 31

ROM-Walker and 30 plaster cast treated, were seen at follow-up one to 2 years after the operation.

Results: Early results (3 months) indicated, as previously presented, better results after early mobilization. After 12 weeks, no significant differences between marker separation were found. At follow-up median 16 (12–28) months after the operation, the patients in the ROM-Walker group were significantly more satisfied with the result. No difference was found in complains of tenderness or stiffness. 7 patients in the plaster group and 3 in the ROM-Walker group had sought physiotherapist. Patients in the ROM-Walker group resumed sport earlier, and resumed to same level as before rupture faster than the plaster group. We found no significant differences in ROM, plantar flexion strength (isometric strain-gauge), work capacity of calf muscles tested with heel-raise test and calf circumference. The ROM-Walker group had significantly fewer and minor adhesions between tendon and skin.

Conclusion: The study shows that, with our concept, an early restricted motion of sutured Achilles tendons is possible without increased risk of re-rupture. It seems to shorten the period of convalescence and improve the results in the short and longer term.

Spine

Spondylitis in Denmark—how was it diagnosed?

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The aim was to describe how spondylitis was diagnosed in Danish hospitals during a 5-year period, and how often it was primarily mis-diagnosed. Every patient submitted from a Danish hospital with the diagnosis spondylitis during a 5-year period was identified. The records for every patient were studied. Of the 183 patients, 24% were excluded because they did not have spondylitis.

Results: 85% had acute back-pain with a median duration of 21 days before admission. 45% had fever before admission. After admission but before treatment 31% had no fever.

Findings: The median ESR was 103 mm/h and 93% had an ESR>20 mm/h. White blood cell counts were elevated in 51%. Spondylitic changes were seen radiographically in 96%, but a false normal spine radiograph was primarily present in 41% of the patients. A scintigram was obtained in 56% and was positive in 92% of these.

Microbiology: In 57% of the cases a specific bacterial diagnosis was made. *Staphylococcus aureus* was found in 51% of these and *E. coli* in 24%. Bone biopsy was performed in 56% of patients, 39% of which had a positive culture, 67% histologically proven osteomyelitis and 30% no pathological changes. Blood was cultured from 65% of patients and was positive in 45% of these. A primary focus was found in 45%. 52% of the cases were primarily mis-diagnosed. These patients spent 155 days in hospital (median), in contrast to 65 days for patients in whom the diagnosis was established primarily.

Conclusion: Radiography of the spine is often normal during early stages of spondylitis, and the scintigram is an important supplement. Only 40% of cultures from biopsies of the affected vertebral body were positive. *Staphylococcus aureus* and *Escherichia coli* were isolated most often. 52% of the cases were primarily mis-diagnosed.

Radical surgical treatment of acute spondylitis

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Introduction: Both pyogenous and tuberculous spondylitis have a low incidence accounting for 2–4% of all cases of osteomyelitis. Both types appear after hematogenous spread and the localization is usually the vertebral body. The conventional treatment has been conservative with prolonged administration of antibiotics and a minimum of 3 months' immobilization often in a plaster. Because of the development in both diagnostic and surgical techniques a more active treatment is now possible, and this has shortened the treatment considerably. We present our results after surgical treatment in a series of 9 patients with acute spondylitis.

Materials: In 1991–1993, 2 women and 7 men, median 60 (25–72) years were operatively treated for spondylitis at our department. Localization and etiologic agens were: T5/T6 (*Staph. aureus*), T7/T9 (*Staph. aureus* and pseudomonas ae), T8/T10 (salmonella t), T9/T11 (TB), L1/L2 (*Staph. aureus*), L2/L3 (2 patients *Staph. aureus*), and L3/L4 (*E. coli*), whereas a single patient suffered from a double affection T10/T12 and S1/S2 (TB, surgical and conservative treatment respectively). 4 patients were without neurological damage, 4 patients had incomplete paraplegia with varying degrees of motory and sensory affection, and one patient developed acute complete paraplegia. In all patients the infection was predominantly located to the vertebral body, more or less affecting the posterior structures and the paravertebral tissue.

Results: In all patients a part of the surgical procedure was an anterior transthoracic or retroperitoneal osseous and paravertebral debridement. In 5 patients a decompression of the medulla and nerve roots was performed, and 3 patients were additionally stabilized posteriorly using CDI. All patients were postoperatively mobilized using a plaster, 8 within days to a few weeks; the one patient with the double-affection had to be immobilized through a longer period for conservative treatment of the sacral affection. In all cases the operation was withouth complications leaving the infectious focus clean as judged clinically and from infectious parameters. In all patients a postoperative improvement was achieved concern-

ing the neurologic function. The hospital stay varied from 3 weeks to more than 4 months.

Conclusion: Surgical treatment for both pyogenic and tuberculous spondylitis is a safe procedure. The infectious focus is well-cleaned, the spine is stabilized, and good decompression of the neurological structures can be obtained.

Morbus Scheuermann in conscripts 10 years follow-up

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Purpose: To investigate and compare the incidence of back complaints in conscripts with Scheuermann's disease, at the time they were rejected, and 10 years after.

Material and methods: 28 conscripts called up for national service August 1979 to January 1980, were rejected on account of radiologically verified Scheuermann's disease. We presented the "back rejects" (BR) with a questionnaire identical with one already answered at the time of rejection, including some new questions.

Results: 19 answered the questionnaire at a median age of 29 years. At follow-up 17 of the BR had experienced back symptoms during the last year compared to 12 at rejection. Radiation of pain to lower extremity occurred in 5 and 2 BR respectively. 7 felt improvement, 2 worsening and the remaining 10 had no change in symptoms since the time of rejection. 12 BR had consulted a general practitioner, physiotherapist, hospital etc, compared to 5 at rejection. 9 had been reported sick because of back complaints compared to 5 at rejection (p =0.0217). Only one BR had quit sport compared to 3 at rejection. 12 BR did some kind of sports, an increase in 10%.

Conclusion: There is a tendency toward worsening of the symptoms at the follow-up, although no significant changes were found in the majority of the parameters.

Congenital kyphoscoliosis complicated with paraplegia

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Introduction: Congenital kyphoscoliosis is often caused by hemivertebrae. Correct treatment demands an early typing of the deformity and an early intervention.

Material: Case I: A 17-year-old girl complained of pain high in the back. Radiography: hemivertebra at Th V with dextroconvex thoracal scoliosis (80°). Treatment: physiotherapy. A year later she complained of walking disability and pain in her right knee. Examination revealed positive Babinski and clonus in both feet. CT and myelography: thoracal kyphoscoliosis (90°) with spinal stenosis and compression of medulla.

Case 2: An 11-year-old boy with congenital thoracal kyphoscoliosis has been seen every sixth month since his fourth year. For a short time he was treated with an orthosis. The kyphosis became more dominant about his tenth year and during 2 months he developed walking disability. Examination revealed spasticity of both legs and paraparesis. Radiography: hemivertebra at Th VII with kyphoscoliosis (90°). CT and myelography: Stenosis from Th VI to Th IX and osseus compression of medulla. In both cases we performed an acute transthoracic anterior decompression with anterior fusion resulting in neurological restitution. A few weeks later we performed a posterior fusion and fixation a m Cotrel-Dubousset.

Conclusion: 1) Treatment of congenital kyphoscoliosis with paraplegia includes anterior decompression and 360° fusion. 2) Neurological deficits are reversible with correct treatment.

Vertebral bone blood flow

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Osteoarthrosis increases the bone pressure and sometimes subchondral ischemia occurs. In exercise studies ischemia in cancellous bone has been demonstrated at exercise. It is possible that this ischemia participates in the pathogenesis of osteoarthrosis. The same theory could support the pathogenesis of disc degeneration and spondylosis. The knowledge of hemodynamic environment in the vertebral column is limited. There are no topographic studies available.

Material and methods: 10 Gottingen-pigs, 18 months old, 38-43 kg, were trained on a treadmill for 6 months. Chronic catheterization of left cardiac ventricle and the descending aorta was established. RBF measurement was performed with differently labelled 15 microns microspheres at rest, after 15 minutes' treadmill exercise at 3 km/h, and 30 min post-exercise. 6 animals succeeded. The vertebral bodies were isolated and separated into endplates, cortex, and cancellous bone. Regional blood flow (RBF, mL/min/100 g tissue) was calculated and analyzed using ANOVA.

Results: Table 1 shows average values for all vertebral bodies (mean, SEM). There was no significant change during exercise. There was post-exercise hyperaemia in cortex and cancellous bone, but no significant hyperemia in endplates.

Table 1. RBF values, mL/min/100 g tissue

	Rest	Exercise	Post-exer.	Anova
Cortex	25.0 (2.6)	22.6 (2.7)	29.0 (3.7)	p <0.05
Endplates	19.0 (3.4)	15.4 (2.6)	20.0 (2.7)	NS
Cancellous	32.0 (3.6)	28.8 (3.3)	40.0 (3.3)	p <0.01

mean extraosseous venous pressure was 8 (2–18) mmHg. No difference between pain-free and painful extremities was observed.

Effect of compression of Hoffa's fat pad on intraosseous pulsatile excursions. The apical veins are the most important drainage complex from the patellar bone marrow. Figure 67 shows a typical intraosseous pressure reaction at the three points of measurement before, during and after compression of Hoffa's fat pad (patella), and Table 14 the mean pressure rise above rest level in the patella, femur and tibia.

The increase in size of pulse pressure waves was statistically significant in the pain-free patella ($p < 0.001$; Table 15), and in the tibia ($p < 0.01$). There is a tendency to even greater excursions in painful knees, but the difference between controls and painful knees was statistically significant only in the patella ($p < 0.05$, Mann–Whitney).

Manual compression of the patella against the femur in the extended knee. The effects on intraosseous pressure of compression of Hoffa's fat pad and of the patella against the femur (pressure test) were compared in 10 controls. The rise in pressure was greater at all points of measurement during compression of the patella than during blockage of drainage through the apical veins (Table 14; Figure 68).

As observed earlier the size of the pulse waves increased during fat pad compression. Patellar compression, however, was always accompanied by total or almost total disappearance of pulse synchronic excursions in the patella (Figure 68; Table 15). In the femur and tibia, where the rise of intraosseous pressure during patellar compression was modest, the tracings remained pulsatile.

Patellar pressure in extended, relaxed PP knees, with and without chondromalacia. Table 16 shows pressures from painful patellae with or without arthroscopic signs of chondromalacia (graded acording to Ficat and Hungerford 1977). Taken as a group, the pressure in chondromalacia patellae was not higher than in painful patellae with macroscopically normal cartilage.

Intraosseous pressures during sustained knee flexion. Forced maximum flexion of the knee joint caused a sudden rise of intraosseous pressure, in control as well

Table 13. Pressures in the patella, and the femoral and tibial condyles in the relaxed, extended knee in controls and in knees with patello-femoral pain. Mean (range) mmHg above the extraosseous venous pressure

Groups	n	Patella	Femur	Tibia
Controls	41	19 (0–68)	18 (0–46)	13 (2–38)
With pain	81	24 (3–62)	18 (0–54)	15 (2–38)

Difference in patellar pressure 5.3 mmHg ($p < 0.01$)

Table 14. Pressures in the patella, and the femoral and tibial condyles, during compression of Hoffa's fat pad and patella against the femur in 10 control knees. Mean (range) mmHg above the pressure in the saphenous vein

Compression	Patella	Femur	Tibia
Hoffa	44 (22–53)	25 (8–44)	27 (13–47)
Patella	73 (44–98)	44 (24–76)	36 (10–57)

Table 15. Mean pulse amplitudes (mmHg) in the patella in 10 control knees in extension, before, during, and after compression of Hoffa's pad and patella against the femur

Compression	Before	During	After
Hoffa	8	13	8
Patella	8	0	8

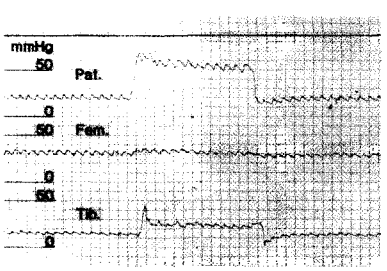

Figure 67. Pressure tracings from the patella and the femoral and tibial condyles, before, during and after compression of Hoffa's fat pad. Pain-free knee in relaxed extension.

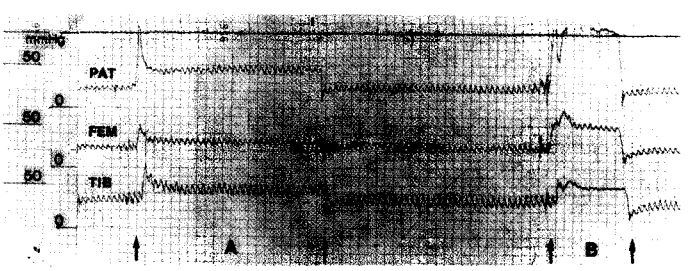

Figure 68. Pressure tracings from the three points of measurements in control knee: A. During compression of Hoffa's fat pad. B. During compression of the patella against the femoral trochlea.

Miscellaneous

Increased fracture risk in children

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The aim of this prospective epidemiologic study was to evaluate the fracture and luxation risk in children; describe the mechanism of trauma and investigate the fracture pattern.

Material and method: All children aged 0 to 16 years who had a fracture or a luxation were included in the investigation. In addition to the demographic data the mechanism of trauma, the fracture type, the treatment and the course were registered.

Results: From April 1991 through March 1992, 1087 children were treated for a fracture, 14 had luxation and 7 had a combination. Most injuries occurred at home (29%), while 21% occurred in sports and 14% in playground accidents. Fracture in traffic accidents constituted 10%. Mechanism of trauma in home accidents was fall from same height or higher. In playground accidents the cause was fall in 88%. In sports injuries the mechanism of trauma was being hit by another person or ball in 44% and fall in 49%.

Fracture of the forearm was the most frequent lesion (36%), while hand and finger fractures constituted 25%. 260 had fractures involving the growth plate, 42% Salter-Harris type 1 and 41% type 2. 41% were the age 11 to 14 years; 68% boys.

Discussion: The fracture incidence was 227 per 10,000 children. Compared to Landin's retrospective registration of childrens' fractures the risk has increased since 1979. The reason for increased risk was increased incidence in girls. No increase in sports- or traffic accidents were found. The amount of forearm fractures rose from 23% in 1979 to 36%, mainly caused by more home accidents.

The sensitivity of a computerised surveillance systemfor postoperative wound infection

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Introduction: Since postoperative wound infection is one of our most serious complications, health authorities and politicians have shown increasing interest in surgical wound infection and control. We have therefore found it of interest to evaluate the sensitivity of a continuous computerised surveillance system.

Material and methods: All operations performed from July 1987 to August 1990 were recorded. Infections were expected to be continuously registered. In August 1990, 5177 operations were registered in our database. 445 patients were randomly chosen to receive a questionnaire concerning any signs of infection in their surgical wound. 388 (87%) answered. The answers given were compared with data registered in the computer.

Results: 75 patients stated positive signs of infections in their surgical wound. 50 patients had infections diagnosed by physician or surgeon and 25 patients had found signs of infections without consulting any doctor. These 25 patients were excluded from the study. Of the remaining 50 infections, 17 reported reoperation because of infection. The case records of these 17 patients were scrutinized and deep infection was verified in 7 patients. 4 infections were registered in our database. The sensitivity for deep infections therefore was 57%. Of 33 infections treated without operation 3 were registered. The sensitivity for superficial infections was 9%.

Conclusion: The used surveillance system is found unsuited for the intended purpose. A more valid recording could be obtained by selection of a few "indicator" operations, which all should be controlled ambulantly after a suitable time and infection then positively disproofed.

Evaluation of lipomas by Magnetic Resonance Imaging

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Introduction: Soft tissue tumors greater than 5 centimeters in diameter or with a subfascial location, are potentially malignant. The purpose of the present study was to evaluate the diagnostic value of MRI (Magnetic Resonance Imaging) in the examination of lipomas.

Materials and methods: 43 consecutive patients with lipomatous tumors greater than 4 centimeters were examined with MR over a period of 2 years. The tumors were categorized as: lipoma, lipoma with components of other tissues, or expected malignancy. The localization of tumor in relation to fascia, nerves and vessels was described. In addition, the signals on T1 and T2-weighted sequences, together with demarcation and homogeneity of the tumor, were noted. All tumors were surgically removed with or without a preoperative incision biopsy. There were 17 men and 26 women, of mean age 54 (12–86) years. Tumor mean size was 10.2 (4–16) cm, and mean tumor age 3 (1–30) years. 13 tumors were subcutaneous and 30 were subfascial. 17 were located in the upper extremity, 21 in the lower extremity and 5 in the trunk. Histologic evaluation was performed.

Results: Based on MRI, 26 lipomas, 8 atypical lipomas and 9 malignant tumors were identified. Histologic evaluation confirmed the MRI findings with regard to the 26 lipomas. The atypical lipomas contained areas of myxoid, or connective tissue, and one was an angiolipoma. The 9 malignant tumours were liposarcomas.

Discussion: The results of the present study suggest that MRI in many cases can distinguish the benign lipoma from the sarcoma. Subfascial lipoma is difficult to distinguish from other tumors, and in order not to waste time, only subcutaneous lipomas greater than 5 centimeters should be remitted to

MR. In case of clinically malignant tumor, uncertain MR findings or subfascial tumor, the patients should be sent to a tumor center for further investigation before surgery or biopsy.

Ambulatory surgery—a patient's evaluation

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Purpose: To present an evaluation by the patients of ambulatory surgery.

Materials and methods: During the 6 month period from August 1991 to January 1992, a total of 184 ambulatory surgical operations were performed on 182 patients, 83 men and 99 women, age 36 (2–85) years. 181 patients recieved a questionnaire. 168 patients (92%) answered.

Results: 14 patients (7.7%) had to stay in hospital for 1-3 nights. 2 patients had contacted the hospital before the appointed time, 3 their general practitioner. No patients had called on the emergency medical service. 147 (87.5%) found it acceptable to be discharged the same day, and 145 (86.3%) would prefer ambulatory to stationary treatment in case of new surgery. 159 patients were satisfied with the information given preoperatively, while 139 found that the information given on discharge was adequate. 108 patients found the operation to be succesful while 38 answered no. Among the 38 patients who answered no, 25 had a diagnostic arthroscopy done. The operative procedure had not been curative, yet a diagnosis had been made. 113 patients were satisfied with the aneasthesia, 28 found it fair and 24 were not satisfied.

Conclusion: The majority of the patients found ambulatory surgery satisfactory and would prefer it again in case of need. It is of great importance that patients are carefully informed both on their first visit to the out-patient clinic, on the day of operation and on the first postoperative contact with the surgeon.

Consequences for an open casualty department changing the guard duty of general practitioners

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Introduction: As a result of collective bargaining the guard duty of the general practitioners was changed at the turn of the year 91-92. In the County of Vejle this meant an overall reduction in general practitioners on duty during evening and night hours as well as on Saturdays and Sundays.

Aim: To investigate the consequences for an open casualty department reducing the number of general practitioners on duty in the County of Vejle.

Material and methods: During 3 periods (period 1: Nov-Dec 1991; period 2: Jan-Feb 1992; period 3: Nov-Dec 1992) all attendances in the open casualty department of Horsens Hospital were registered. The following data were obtained: date, day of the week, time of arrival, time of departure, age, sex and diagnosis.

Results: In total we registered 7003 attendances (period 1: 2081; period 2: 2187; period 3: 2735). According to age, sex and diagnosis the 3 periods were comparable. Corrected for the number of days the increase of attendances was 6% in the second period and 31% in the third period respectively. For the hours of duty (weekdays from 4 pm to 8 am; Saturdays and Sundays) the increase was even more marked. On weekdays from 4 pm to 8 am the increase in period 2 and period 3 was 15% and 31% respectively. On Saturdays and Sundays the increase in period 2 and period 3 was 16% and 29% respectively.

Conclusion: Reducing the number of general practitioners on duty increased the number of attendances in an open casualty department. This increase was marked in evening and night hours as well as in weekends.