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Fractures

External fixation or percutaneous pinning for unstable Colles' fracture? A prospective randomised study

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The purpose of this study was to compare the results of treatment for complex distal radial fractures with either external fixation a.m. Hoffmann or percutaneous pinning and plaster cast.

Patients and methods: From November 1992 to December 1994, 42 consecutive patients >20 years of age, with comminuted Colles' fractures of type Older 3 with more than 5 mm shortening and type Older 4, were randomly allocated to two treatment groups: Group 1: Closed reduction under image intensifier control and application of Hoffmann's external fixation device. Group 2: Closed reduction under image intensifier control and fixation with percutaneously placed K-wires and a plaster cast. Regular follow-up according to a protocol till 6 months postoperatively with clinical and functional assessment according to a modified Gartland-Werley score and radiographic measurement of axial radial shortening and dorsal angulation (tilt). There was one drop-out of the series so that it consist of 41 patients, 36 women and 5 men, mean age 60 (32–89) years. 21 patients had external fixation and 20 pinning, 15 were type Older 3 and 26 type Older 4.

Results: The two groups were similar concerning age, gender, fracture type and dislocation. Preoperatively mean axial radial shortening was 5.4 mm and dorsal angulation 40° when compared to the opposite uninjured wrist. Shortening and dorsal angulation postoperatively and at 6 months were 0.8 mm, 2.3 mm, 8° and 12°, respectively in group 1 and 0.4 mm, 2.5 mm, 9° and 10° in group 2. Gartland-Werley score at 6 weeks and 6 months were 22.0 and 4.3 in group 1 and 18.5 and 4.1 in group 2. The results are not significantly different in the two groups. The functional results were excellent or good in 36 patients (88%), fair in 5. One patient had signs of sympathetic reflex dystrophy (group 1). There were no other major complications.

Conclusion: Both treatment groups achieved a clinically and radiologically good result and there was no significant difference between them. Mode of treatment can therefore be chosen according to other criterias. In our department we regularly prefer pinning due to simplicity and treatment costs.

Fractures of the scapular neck—a therapeutic problem?

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Fractures of the scapula are, in Norway, usually treated conservatively. Dislocated fractures of the scapular neck and unstable fractures of the clavicle (the combination of scapular neck and clavicle fractures) do, however, represent a therapeutic problem and must in the choice of treatment be differentiated from other fractures of the scapula. An analysis of 7 patients treated with this type of fracture tries to outline this therapeutic problem.

Patients: 7 patients, 5 men and 2 women, with a median age of 46 (24–79) years, were treated for a fracture of the scapular neck (5), in 2 cases combined with a fracture of the lateral clavicle. Observation time was 8 (4–22) months.

Method: Three patients with isolated dislocated fracture of the scapular neck were treated by ORIF. Two patients with an unstable shoulder girdle were treated with ORIF of the clavicle and immobilization in a mitella for three weeks. Two patients with an isolated nondislocated scapular neck fracture were immobilized in three weeks.

Operation methods: A posterior approach to the scapula by a L-shaped incision and dissection of the posterior scapular neck between the infraspinatus and the teres minor muscle regarding the prescence of the suprascapulare nerve and vessels was performed. The fracture was reduced and retention obtained by one or two 3.5 mm AO/ASIF reconstruction plates. In the two patients with an unstable shoulder girdle the clavicle osteosynthesis was done by direct approach using a 3.5 mm AO/ASIF reconstruction plate. The follow-up included functional examination of the shoulder girdle, discomfort registration and radiographic examination.

Results: All patients treated with ORIF because of a dislocated scapular neck fracture had an excellent functional result without any discomfort and were back in normal occupational activities at the last control. Two patients with an unstable shoulder girdle treated by ORIF of the clavicle had an excellent functional result but one of the patients had discomfort and needed analgetic medication. This patient was well known because of drug problems prior to the operation. Both patients with nondislocated scapular neck fractures had a functional impairment at the follow-up, but no pain. One of these patients, a carpenter, was 4 months after the accident, still not back to work. No secondary fracture dislocation was observed.

Conclusion: ORIF is recommended in dislocated fractures of the scapular neck. Instability in the shoulder girdle should be stabilized by ORIF of the clavicle. The position of the glenoid have to decide wether an ORIF of this component of the shoulder girdle should be included in the ORIF or not. Nondislocated fractures of the scapular neck should be treated functionally without immobilization.

Transiliac screw fixation of the sacrum in unstable pelvic ring fractures

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External fixation alone may be insufficient in the stabilization of the posterior instability in pelvic ring fractures. The experience with transiliac screw fixation is reported.

Patients: 7 patients, 5 men and 2 women, with fractures in the sacrum combined with anterior fractures in the pelvic ring or disruption of the symphysis, were operated on with transiliac screw fixation of the posterior fracture component. Median age was 37 (23–69) years and observation time 24 (5–49) months. Five patients had paramedian fractures through the foramina sacralia while two patients had iliosacral luxation fractures. All patients were polytraumatized and 5 patients had neurological symptoms prior to surgery. Median time from accident to surgery was 4 (0–12) days.

Method: Preoperative evaluation with conventional radiographic examination and CT was performed. Signs of instability and neurological status were recorded. Operation was performed with the patient in prone position and under general anesthesia. Two times a semicircular incision along the posterior iliac crest and five times a straight paramedian incision was used as a surgical approach. The glutei were detached and the inscira ischiadica identified. After reduction of the fracture, a K-wire as a guide was introduced through the iliosacral joint and the pedicle into the body of the first sacral vertebra under fluoroscopic control. Stabilization was obtained by one or two AO/ASIF 6.5 mm cancellous bone screw with washers to prevent cutting through the ilium. Two patients had a disrupted symphysis stabilized by a plate osteosynthesis. Postoperative control of the fracture reduction and screw position was performed by conventional radiography and CT. All patients were mobilized on the

second day after surgery or as soon as the other lesions permitted it.

Results: At the follow-up consolidation of the fracture without secondary dislocation could be confirmed in all patients. Two patients had remission of their neurological symptoms while three patients had remaining neurological symptoms like radicular pain and dysesthesia. No motor deficiency or new neurological symptoms caused by an iatrogenic operative lesion were recorded at the controls.

Conclusion: Iliosacral screw fixation of the sacrum in unstable pelvic ring fractures provides a good stability and early mobilization is possible. The method, however, requires good anatomical knowledge and the use of fluoroscopy in different projections is mandatory.

Shoulder

Arthroscopic stabilisation of posttraumatic anterior shoulder instability with bioabsorbable tacks

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During recent years a number of different techniques for arthroscopic stabilisation of posttraumatic anterior shoulder instability has been developed. Advantages against traditional open techniques are less pain, easy rehabilitation, little loss of mobility and good cosmetic result. Instability recurrence rate show great variability in published results. These publications are not always comparable regarding patient selection. Generally well documented traditional open techniques have a lower recurrence frequency. After 3-years experience we have studied our results of arthroscopic stabilisation with bioabsorbable tacks ("suretac") a.m. Warren.

Patients and method: We evaluated 41 shoulders in 39 patients, 3 patients were lost to follow up. Seven patients were interviewed by telephone. Mean age was 30 years and there were 11 women and 28 men. Mean observation time was 21 months. All patients had more than two episodes of dislocation or subluxation. All had a Bankart lesion. A standardized rehabilitation programme was followed for 12 weeks.

Results: There were no complications. Mean hospital stay was 2.2 days. Rowe score showed excellent result in 62%, good 32%, fair 6% and poor 0%. Recurrent dislocation occurred in 7.3%, recurrent subluxation in 14.6%. The functional result regarding mobility and strength was very satisfying according to clinical testing and cybex testing.

Conclusion: Recurrent instability frequency is considered too high. In our opinion it is of crucial importance pre- and peroperatively to select the right patients for arthroscopic stabilisation. We changed our technique from September 1994 ("suretac II with slalom approach"), and later follow up will show if this gives better results regarding stability.

Arthroscopic surgery compared with supervised exercises in patients with rotator tendinosis

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The aim was to compare the effectiveness of arthroscopic surgery, supervised exercises or placebo for rotator tendinosis (impingement syndrome stage II) in a randomised clinical trial.

Patients and methods: 125 patients aged 18–66 years with complaints for more than three months resistant to treatment. Arthroscopic subacromial decompression performed by two experienced surgeons; exercise regimen over 3–6 months supervised by one experienced physiotherapist; or 12 sessions of detuned soft laser treatment over 6 weeks. The main outcome variable was the Neer Shoulder Score.

Results: 115 (92%) met at 2.5-year follow-up. Median Neer scores for those who adhered to the treatment randomised to were 93.0 for surgery, 82.5 for placebo and 94.0 for exercises. 50 and 22% of the patients randomised to placebo and exercises ($p=0.01$), respectively, had surgery during the follow up. Median Neer score after later surgery was 93.0 and 87.0. Results dropped from success (Neer score >80) at 6 months to failure at 2.5 year in 5 and 3 patients after surgery and exercises. Failure after surgery was associated with regular pain medication, sickness leave and overhead work activity at treatment start.

Conclusion: Arthroscopic subacromial decompression is an effective treatment for rotator tendinosis, but exercises will reduce the need of surgery. The time for surgery is not important for treatment success. Pain medication and work demands should be considered.

Hip

Cemented rearthroplasty of the hip joint

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The rate of revision arthroplasties of the hip joint is increasing in Norway and the choice of method is a debated issue. At Aust-Agder Central Hospital only cemented prostheses and standard components have been used for revision arthroplasties. Aim of the present study was to evaluate the results of cemented revision arthroplasties of the hip joint in our hospital.

Materials and methods: From January 1988 to June 1993, 61 cemented total hip revision arthroplasties were performed

at Aust-Agder Central Hospital. 17 patients died from unrelated causes. 43 patients were available for follow-up examination in 1995. 35 patients, 36 hips (82%) has been examined radiographically and accessed clinically. Three radiographic categories were defined according to Harris et al.: definite, probable or possible loosening. 8 patients who were alive were lost to follow-up. 3 were unable to attend because of disability due to other diseases, and 5 were unwilling.

Results: Mean age at the time of revision arthroplasty was 70 (59–84) years and at follow-up 75 (61–89) years. The median observation period was 48 (24–80) months. There were 10 men and 25 women. 9 revisions were left-sided and 27 right-sided. The reason for revision was aseptic loosening in 30 hips (83%), infection in 2, fracture of the femoral neck in 1, loosening and fracture of prosthesis in 1 and pain in 1. Müller was used as primary prosthesis in 22 hips and Freeman in 6. ITH-components were used in 30 revisions (83%), Müller in 4 and Charnley in 1. In 1 patient only the acetabular component was revised. One patient died of myocardial infarction postoperatively, 1 survived a pulmonary embolism and 1 developed DVT. There were no complications in 34 hips (94%). At the follow-up examination all the patients were ambulant, 19 without support. 25 hips (72%) were painfree. All patients lived at their homes. Harris hip score was 39 to 100 (median 83). The radiographic examination showed no loosening in 23 hips (64%), possible loosening in 3 (8%), probable loosening in 5 (14%) and definite loosening in 5 (14%). One patient in the group with definite loosening has been rerevised. Among the patients with radiographic signs of loosening, only 4 had symptoms.

Conclusion: Radiographic definite or probable loosening in 10 hips (28%) was alarming considering the short observation time. So far, however, no clear correlation between clinical symptoms and radiographic findings could be demonstrated. There has been few serious complications. The results are comparable to what has been published in other series.

Antibiotic-prophylaxis in cemented total hip arthroplasty

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The effect of antibiotic in bone cement and of systemic antibiotic-prophylaxis on the revision due to infection and aseptic loosening of primary total hip arthroplasties (THA), have been studied in the Norwegian arthroplasty register.

Patients and methods: Data on 39,152 THA have been collected in our national arthroplasty register from September 1987 to January 1995. The present study was based on a selected group of 10,135 primary cemented THA followed for 0–7.3 years. These operations were performed because of coxarthrosis, with one of the four most common prostheses (Charnley, Exeter, Titan or Spectron/ITH) and with high-

viscosity cement (Palacos or Simplex). Adjustments for type of cement, type of prostheses, gender, age, operating theatre and operating time were done. The Kaplan-Meier method and the Cox proportional-hazards model were used for the statistical analysis.

Results: Totally 32 hips had been reoperated because of infection, 0.3% of all THA) and 91 because of aseptic loosening (0.9%).

	No. THA	Cox-adjusted		
		Revision	RR	P-value
<i>Infection</i>				
System+/Cement+	5195	0.1%	1.0	
System+/Cement-	4454	0.4%	4.65	0.002
System-/Cement+	232	1.3%	8.35	<0.001
System-/Cement-	254	1.2%	10.96	<0.001
<i>Aseptic loosening</i>				
System+/Cement+	5195	0.8%	1.0	
System+/Cement-	4454	0.9%	1.41	0.222
System-/Cement+	232	2.6%	2.38	0.044
System-/Cement-	254	2.0%	3.07	0.020

Conclusion: The revision rates because of infection and because of aseptic loosening after primary total hip arthroplasty were reduced when antibiotics was applied both systemically and in bone cement compared to when antibiotic-prophylaxis was not used.

Palacos angiography? Unusual radiographic findings after cemented hip prostheses

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Improved cementing techniques have been shown to decrease the rate of aseptic loosening of femoral components of cemented total hip replacements. Modern cementing technique including lavage, femoral canal plugging and cement injected with syringe system, has been used in our department for the last six years.

Patients and results: During the last year we have had 5 patients who on postoperative radiographs have exposed a strange phenomenon; i.e. a thin 12-15 cm long thread-like shadow emerging from the medial femoral cortex heading for the deep femoral vein. In the first patient where this phenomenon occurred, the finding was misinterpreted as being a radiodense thread in a surgical sponge. The patient was reoperated, but no surgical sponge was found. All 5 patients have excellent hip-function.

Conclusion: Impaction of bone cement for fixation of metallic implants in connection with hip replacement surgery may be associated with intraoperative cardiorespiratory depression. Even circulatory collapse and death has been reported (1-3). Many hypotheses have been forwarded to explain the pathogenesis of this syndrom, including different sorts of embolisms and methylmethacrylate monomer

(MMA) toxicity and MMA's activation of coagulation. Our 5 patients who demonstrate "jetbeam" of Palacos-cement into the deep femoral vein system (v. nutriciae) support the hypotheses that the cardiorespiratory depression is due to MMA's toxicity and/or ability to create a state of hypercoagulation.

We warn that a "jetbeam" of acrylic-cement in a vein can be misinterpreted as being a forgotten surgical sponge.

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Thromboprophylaxis with dalteparin reduces the prevalence and incidence of late of deep vein thrombosis and pulmonary embolism after hip replacement surgery

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Hip replacement surgery (HRS) is associated with a high frequency of thromboembolism (TE) although thromboprophylaxis is routinely continued for about one week after operation. The later frequency of TE is largely unknown.

Aim: To study the frequency of deep vein thrombosis (DVT) and pulmonary embolism (PE) until 35 days after HRS and to evaluate the possible effect of prolonged thromboprophylaxis with dalteparin.

Materials and methods: During the period November 1991 to June 1994, 310 patients consecutively entered the study. All patients received triple thromboprophylaxis the first postoperative week (dalteparin 5000 IU/d, below knee T.E.D. stockings and dextran-70 during the perioperative period). Bilateral venography, perfusion ventilation scintigraphy and chest radiographs were obtained on days 7 and 35 after surgery. On day 7 the patients were randomized to further receive dalteparin 5000 IU/d or placebo until day 35. Patients with proximal DVT on day 7 were withdrawn from the randomized part of the trial for anticoagulant treatment. Altogether 227 patients finished the study and were evaluable on an intention-to-treat basis after 35 days.

Results: The prevalence of DVT on day 7 was 16%, 1/3

being proximal whereas PE (high, intermediate probability according to Biello) was encountered in 11%. On day 35 DVT was diagnosed in 32% in the placebo group and 19% in the dalteparin group (RR=0.61, 95%CI 0.38–0.97, p=0.034). PE (vide supra) was encountered in 10% in the placebo group and in 6% in the dalteparin group. In patients without DVT/PE on day 7, the incidence of DVT on day 35 was 26% in the placebo group and 12% in the dalteparin group (RR=0.46, 95%CI 0.24–0.88, p=0.017) whereas that of PE was 5% and 4% respectively. One patient in the placebo group died suddenly three weeks after surgery owing to massive PE (autopsy). No patients experienced serious complications related to the injections of dalteparin or placebo.

Conclusion: The prevalence of DVT after HRS is high even after one week with intense thromboprophylaxis. Without further prophylaxis the prevalence and incidence of DVT had increased substantially 5 weeks after the operation. This progression of DVT can be countered with the administration of dalteparin 5000 IU/d. Prolonged thromboprophylaxis after HRS is highly recommended.

Deep vein thrombosis following hip replacement surgery is a difficult diagnosis

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Objective: Hip replacement surgery (HRS) is associated with a high frequency of postoperative deep vein thrombosis (DVT). As a part of an ongoing multicenter study dealing with prolonged thromboprophylaxis, we performed a sub-study at our department to find out if routinely bedside questioning and examination by the visiting doctor possibly could disclose DVT formation in the legs of the operated patients.

Material and methods: 84 patients (64 women and 20 men) with mean age of 75 (47–87) years. Written informed consent was obtained. Thromboprophylaxis (dextrane, low molecular weight heparin and graded elastic stockings) according to the protocol was given. Bilateral venography was performed on all patients on day 7 (\pm two days) after the operation.

Results: No patients were suspected by the visiting doctor to have DVT. Venography visualized an overall DVT incidence of 15% (13 women). 7 of the patients had thrombosis in the calf, 4 patients had thrombosis both in the thigh and calf and 2 patients had thrombosis in the thigh. Bilateral DVT in the thighs were found in one patient. In the 10 patients DVT was visualized in the operated calf and 2 patients had DVT on the nonoperated calf.

Discussion: Although almost every sixth patient had DVT during their hospital stay, none were suspected to have DVT by the visiting doctor. This may be due to obligatory postoperative painful and swollen legs of the patients which effec-

tively mask signs and symptoms of DVT. This emphasises the importance of improved thromboprophylaxis to further minimize the risk of the thromboembolic complications since subclinical DVT may represent a source of fatal pulmonary embolism after hospital discharge.

Knee

Anterior cruciate ligament rupture repaired with intraarticular bone-patellar tendon-bone autograft (BPTB)—a follow up study on prevalence of early osteoarthritis development

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The main aim of this study was to evaluate the results of anterior cruciate (ACL) rupture repair, especially with respect to early osteoarthritis development.

Patients and methods: 40 of 44 patients operated for ACL rupture in the period from June 1990 until October 1993 were evaluated. The average age was 31 (18–49) years. There were 11 women and 29 men. Evaluation took place on average 38 (19–58) months after the operation. All patients were operated with the PTBT procedure, 18 arthroscopically. All patients were examined by one orthopedic resident who was not involved in any of the operations. The follow up examination included knee function score (Lysholm/Gillquist and Noyes), activity score (Tegner), pain score (VAS), clinical examination and the KT-1000 arthrometer, in addition to weight bearing radiographs and scintigraphic studies.

Results: Median Lysholm score was 91. 7 patients (18%) had an unstable knee. Three patients had an extension deficit (7°–10°). 23 patients had a total of 29 damaged menisci. There were no operation or postoperation complications, but 4 patients were reoperated; 2 for meniscal injuries and 2 for decreased range of movements. Weight-bearing radiographs graded according to Ahlbeck showed 7 patients with arthrosis (18%). 32 of 34 patients (94%) examined had scintigraphic changes with uptake corresponding to one or both of the drill channels. There was no correlation to poor isometric placing of the channels. Subchondral uptake valued as possible arthrosis were found in 20 patients (59%). All patients with radiographic arthrosis had corresponding scintigraphic changes. 13 patients with scintigraphic changes had no radiographic changes.

Discussion and conclusion: Our results are fairly similar to earlier publications according to stability and function of the knee. Concerning arthrosis we found 18% by radiography which may reflect the long period from injury to surgery (mean 53 months) and a high frequency of meniscal injury

(57%). But if increased subchondral scintigraphic uptake by 59% of the patients really reflect early arthrosis development, it would be a dramatically high rate and could inflict changes in indications for ACLR repair in the future.

Congenital luxation and subluxation of the knee

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During 7 months we have seen 2 cases of congenital luxation of the knee. Both patients were boys, and in both cases the condition was bilateral. The incidence of this disease is estimated to be 0.017%, which is about 1% of that of congenital dislocation of the hip.

Patient 1: Normal delivery by healthy mother. Both knees were 90° hyperextended. Repositioning and plastering was relatively easy. The plaster was changed after 4 and then after 5 days, and he was kept in plaster of Paris for less than a month. Normal development of knees since then—controls have shown totally normal knees.

Patient 2: Born at normal termin by cesarean section due to prolapsing cord. He was born in breech presentation with extended knees. The mother was healthy except from being a heavy smoker. Both knees were subluxated to 90°. Repositioning and plastering was done. The plasters were changed at regular intervals for the first two months, but the condition did not improve. He was then treated with bony traction through lower femur and upper tibia, but this treatment failed due to pin tract infection and skin problems. The knees still remain subluxated, and open surgery is now planned.

Conclusions: Our results show that the outcome of this rare condition is unpredictable. Three types of subluxations/luxations are described in the literature, from slight subluxation to frank luxation with no contact between femur and tibia. Both our patients at first seemed to have seriously subluxated knees. Although the first boy was easy to treat, patient 2 was very difficult and the outcome for this patient is most uncertain. Both patients were treated according to what is recommended in the literature, with gentle repositioning and plastering with flexed knees. If this fails, traction is recommended, and then eventually open surgery if the joints remain subluxated. Open surgery may be quite challenging with extensive tenotomies and liberation of soft tissues, which often are very fibrotic.

Spine

Longterm results of instrumented spinal fusions

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The effect and outcome of instrumented lumbar fusion are the subject for continuous discussion. The aim of this study was to evaluate the outcome of instrumented spinal fusions performed on a group of patients with chronic degenerative spine diseases.

Patients and methods: During the years 1987–1994, 55 patients (31 women and 24 men), were operated on with instrumented fusion. In most of the patients the Hartshill rectangle was used, the VSP system in the remaining patients. In 35 patients 2 segments were fused, in the remaining 1, 3 or 4 segments. All patients were preoperatively evaluated clinically, neurologically and radiographically. We used a pain-drawing and a visual analogue scale registration (VAS), in addition to a brace-test. The “Boston overlap brace” was also part of our standard after-treatment. 52 patients were re-examined in our out-patient department, 31 women and 21 men (mean age 54). The duration of follow-up ranged from 17 to 90 (mean 58) months. In addition to the clinical examination, a new pain-drawing and VAS was registered and a radiographic examination of the lumbosacral fusion area was done.

Results: The radiographic examination revealed a satisfying consolidation of the bone-allografts in the majority of the patients; the continuity of the transplant seemed to be perfect on one side in all patients, but in 7 patients it was difficult to judge on the other side. The clinical results were rated as excellent, good, fair or poor related to the patients subjective evaluation, daily function, disability and the need of analgesics. There were 28 patients with excellent or good results (54%) and a total of 36 patients were improved after surgery (71%). At follow up 18 patients were capable of working full day, compared to 11 patients before surgery.

Conclusion: The study was performed on a limited number of patients, it was retrospective and without a control-group. Therefore one has to be very careful when drawing conclusions. Even with a relatively high mean age the consolidation of the bone-allografts seemed to be satisfactory. The results indicate that this kind of surgery is justified in the treatment of this patient-category, it is however a selection problem. The need of prospective controlled studies is mandatory to draw more secure conclusions.

Lumbar intervertebral disc herniation in adolescent patients

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Lumbar intervertebral disc herniation in children and adoles-

cents is uncommon, the incidence varies between 0.4–3.6% of all cases of lumbar disc herniation. We wished to investigate the incidence, history, clinical findings and results of treatment in disc herniation in adolescents.

Patients and methods: In the period January 1992–March 1995 we operated on 593 lumbar disc herniations at our hospital. In the same period we operated on 20 adolescents aged 15–19 years (3.4% of all cases of lumbar disc herniation). The hospital records of these 20 adolescents were investigated. The length of postoperative follow up was 0.5–2.5 years.

Results: 10 women and 10 men were operated on. Median time from start of symptoms to operation was 1 year (1 month–5 years). A correct diagnosis was made by the referring physician in most cases (17/20). Eight of the patients had a history of inducing trauma. 11/20 were active in sport. Back pain with radiation pain was the dominant symptom in 17/20. Straight leg raising test was positive in 19/20. Seven of the patients had scoliosis. The levels of herniation were the same as in adults, 9 in the 5th lumbar disc and 10 in the 4th lumbar disc. One patient had herniation at two levels. Open surgical treatment was used in all cases; in 6 patients a microsurgical technique was used. The operative findings correlated well with the preoperative CT scanning in all but one patient, where no disc herniation was found during the operation. There were no surgical complications and the results were good or excellent in all patients, except in the patient where no disc herniation was found.

Conclusion: Lumbar disc herniation in adolescents should be considered where there is back pain and radiating pain to one or both legs. Investigation and treatment should follow the same guidelines as in adults. Short term results in surgical treatment are good.

Varia

Treatment of early postoperative orthopedic deep infections with surgical revision and active irrigation-suction drainage

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Early post operative infection after hip arthroplasty or internal fixation of a fracture jeopardizes the final result. Our experience with aggressive surgical revision and active irrigation-suction drainage in patients with deep infections are reported.

Materials and methods: 13 patients, 7 women and 6 men, with a median age of 67 years were treated. All patients had clinical signs of deep infection. In 10 patients positive bacteriology was obtained. Positive cultures for *Staphylococcus epidermidis* (6 patients and one with meticillin resistant *S. epidermidis*) and *S. aureus* (2 patients) were obtained. One patient had a mixed flora. 8 patients had total hip replacement

and 5 patients were treated for fractures with open reduction and internal fixation. The primary revision was done 12 (3–45) days after the first operation. 5 patients had one or more unsuccessful revisions with implantation of gentamycin beads before the irrigation-suction drainage was performed. The irrigation-suction drainage was standardised: Two irrigation drains were placed deeply, next to the implant. Three suction drains were used, one next to the implant, one subfacial and one subcutaneously. All suction drains were put on active suction. One gram of Fucidin added to 3 L of 0.9% saline was used for irrigation. The patients were treated for one week with 3 L irrigation solution per 24 hours. Parental antibiotics were given according to resistogram (when available) in all patients. At the follow up the patients were evaluated clinically, radiologically and by determining the sedimentation rate and C-reactive protein.

Results: Median observation time is 13 months. One patient with a fracture, who was revised three times, died unrelated to the infection. This patient had a fistulating chronic osteomyelitis. In 12 patients there are no clinical signs of infection. Five patients are still on antibiotics. In no patients the implant had to be removed. All fractures were clinically and radiologically healed at the last follow up. The preoperative CRP was 71 (56–89) and the CRP at the control was 6 (3–11).

Conclusion: In 12 of 13 patients with early deep postoperative infection after internal fixation of fractures or infection after arthroplasty were healed by aggressive surgical revision and irrigation suction-drainage combined with antibiotics. The infections did not delay the fracture healing. None of the implants had to be removed. The results are encouraging. This is the choice of method at our hospital, when treating early postoperative orthopedic deep infections.

Vitamin-D deficiency reduced the strength of the femoral neck, but not the shaft in oophorectomized rats

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Vitamin-D (vit-D) is essential for normal bone calcification and has been found low in osteoporotic patients. Vit-D and calcium supplementation in a population of elderly women reduced the incidence of hip fractures (1). We have studied the effect of vit-D deprivation on femoral bone mineral density (BMD) and fracture strength of the femoral shaft and neck in oophorectomized and normal rats.

Material and methods: 40 mature female Wistar rats were randomized into four groups: two were oophorectomized (Ovx) and two were sham-operated (Sham). One Ovx and one Sham group were fed a vit-D deficient diet (Ovx-D and Sham-D), and the control groups got normal rat chow (Ovx-

C and Sham-C). After 12 weeks the rats were killed, and three days prior to sacrifice ^{85}Sr was injected to evaluate bone-mineralization. Both femora were dissected, weighed, measured and frozen and later thawed for measurements of ^{85}Sr activity, DEXA-measurements of BMD, and biomechanical testing of shaft and neck.

Results: There were no differences in femoral weight or length, but ^{85}Sr activity was higher in Ovx-D than in the other three groups ($p < 0.005$). BMD was higher in Sham-C than in Sham-D and both Ovx groups ($p = 0.0005$). There were no significant differences in the mechanical parameters of the femoral shaft, but the femoral neck was significantly weaker in Ovx-D than in the other groups (Table).

Conclusion: Both oophorectomy and vit-D deficiency led to a decrease in bone mineral density in rat femora, but only the combination increased the bone turnover and reduced the femoral neck strength significantly. The femoral shaft had unchanged mechanical strength even then. The combined loss of estrogen and vit-D seemed especially disadvantageous for the femoral neck strength in rats, and this might also be the case in humans where supplementation of vit-D and calcium decreased the incidence of hip fractures.

Reference: 1. Chapuy M C, Arlot M E, Duboeuf F, Brun J, Cruzet B, Arnaud S, Delmas P D, Meunier P J. Vitamin-D3 and calcium to prevent hip fractures in elderly women. *N Engl J Med* 1992; 327: 1637-1642.

Table. Mean values (SD)

Group	Ultimate bending moment (Nm $\times 10^{-2}$)	Energy absorption (J)	Stiffness (Nm $^{\circ}$ $\times 10^{-3}$)	Deflection ($^{\circ}$)
Sham-C	68 (8.9) ^a	0.23 (0.03) ^a	28 (6.4) ^b	30 (3.8) ^c
Sham-D	60 (6.5) ^a	0.19 (0.05) ^a	25 (5.1)	26 (8.3)
Ovx-C	75 (27) ^a	0.23 (0.13) ^a	30 (6.3) ^b	25 (7.5)
Ovx-D	44 (9.3)	0.09 (0.02) ^a	21 (3.7)	22 (3.6)

^a $p < 0.001$, ^b $p < 0.01$, and ^c $p = 0.05$ compared to Ovx-D