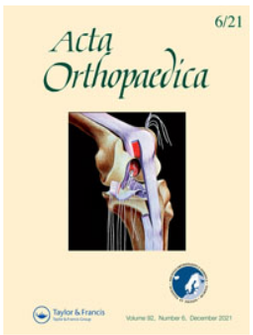

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PROCEEDINGS OF THE NORWEGIAN ORTHOPAEDIC ASSOCIATION

Oslo, October 29–30, 1982

EDITOR: BERNHARD PAUS

PROPHYLAXIS OF DEEP VENOUS THROMBOSIS (DVT) WITH LOW DOSE HEPARIN, ASPIRIN AND WARFARIN IN PATIENTS WITH FRACTURE OF THE HIP

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733 patients between 40 and 100 years of age were randomly assigned to receive either heparin (5000 IU t.i.d. s.c.), aspirin (500 mg. b.i.d.) or warfarin (thrombotest between 0.05–0.15). After exclusion for predisposing factors and contraindications, 487 women and 148 men with hip fractures were studied. The prophylactic treatment was carried out for a minimum of 14 days, with at least 3 months' follow-up.

Based on clinical signs, venography or chest X-ray and ventilation-perfusion scintigraphy were performed. Lethal pulmonary thromboembolism (PTE) was verified by autopsy.

DVT was found in 4.2% of the heparin group, 3.0% of the aspirin group, 2.5% of the warfarin group and 0.8% of the optimal warfarin (no TT over 0.15) group. PTE was found in 2.1%, 0.5%, 0.5%, 0.0% of these groups, respectively. Optimal warfarin was better than heparin in preventing DVT ($P < 0.02$).

All methods gave better results than no prophylaxis (historical series) at 25–50% of the cost.

FRACTURES OF THE FEMORAL SHAFT IN CHILDREN

A 4-year Material

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A total 68 children, 50 boys and 18 girls, aged 0–13 years, were treated for fracture of the femoral shaft during 1977–1980. Twenty one had sustained the injury in a traffic accident.

Children under 4 years of age were treated with vertical skin traction (Bryant) and older children with a proximal tibial skeletal traction. After 3 weeks the traction was discontinued and a modified hip spica or a long tuber bearing leg cast was applied. Median hospitalization time was 22 days.

The primary deformities found at X-ray after removal of the cast were antecurvature less than 20°, recurvature less than 15°, varus less than 15°, valgus less than 10° and shortening less than 20 mm except for one antecurvature deformity of 28° and one shortening of 23 mm. The Rippstein technique showed external malrotation exceeding 30° in five patients and no internal malrotation exceeding 10°.

We conclude that the conventional treatment in traction controls the rotational deformity poorly. A long-term follow-up of the series is in progress.

OPERATIVE TREATMENT OF TIBIAL SHAFT FRACTURES

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In 1980–81 28 fractures of the shaft of the tibia were treated operatively. Ski accidents were the most common cause of the injuries.

Twenty three fractures were stabilized by the AO dynamic compression plate. These patients achieved full weight bearing after an average of 16 weeks. Four transverse fractures were treated by intramedullary nailing. All of these healed without complication, and weight bearing was permitted after 4 weeks. One comminuted fracture treated by external fixation healed after 17 weeks.

Despite some early wound complications in the plate fixation group, only one patient developed deep infection requiring further surgical intervention.

These rewarding results suggest that operative treatment still must be considered as a valuable method in the treatment of tibial shaft fractures.

STRESS-PROTECTION OF THE INTACT RABBIT TIBIA AFTER METAL PLATE APPLICATION OR EXTERNAL FIXATION

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A thin six-hole metal plate or external mini-fixation was applied on the intact rabbit tibial diaphysis. The animals were sacrificed after 6, 12 or 18 weeks, and the tibial bending biomechanically tested in an Instron testing machine. A greater reduction in strength and stiffness was found in the plated bones in relation to the control bones at 12 weeks than at 6 weeks, but no further reduction was found after 18 weeks. Following external fixation a reduction in strength and stiffness occurred after 12 weeks, but not after 6 weeks. It is concluded that the stress-protecting effect caused by external fixation occurs later, and is less pronounced, than that caused by a metal plate.

EXPERIMENTAL FRACTURE HEALING WITH ROTATIONAL INSTABILITY

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On 21 male Wister rats (mean body weight 383 g) the left femur was osteotomized, and intramedullary nailing performed. The medullary cavity was reamed to 0.1 mm greater diameter than the nails. This procedure resulted in nearly free rotation in the osteotomies. Ten rats had solid stainless steel nails, while 11 had Delrin® nails. Relative to intact femora, the stiffness ratio of steel nails was 0.8, while that of Delrin nails was 0.03.

At 16 weeks, two osteotomies had healed in each group, while the rest were classified as non-unions based on X-ray, mechanical (3-point bending test) and histological examinations. Values for strength and toughness were higher in the non-unions with flexible nails.

In conclusion, rotational instability gave a high rate of non-union in the present model. The same model stabilized for rotation gave safe healing (unpublished data). Flexible nailing improved strength and toughness of the non-union, but did not affect the incidence of healing.

EFFECTS OF SALMON CALCITONIN ON THE HEALING OF EXPERIMENTAL FRACTURES

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The influence of salmon calcitonin (SCT) (3 MRC-U/kg body weight/day) has been studied in young male rats with a mid-femoral unimmobilized fracture. SCT had a transient, inhibitory effect on the collagen synthesis, but after prolonged SCT administration (40 days) the total content and concentration of collagen increased and the concentration of calcium and phosphorus decreased in the fractures of treated animals compared to controls. Thus, SCT impaired the normal remodelling of callus by a transient reduction in the collagen synthesis and an inhibition of collagen mineralization and degradation.

EFFECT OF METHYLMETHACRYLATE ON THE BENDING STRENGTH OF HEALING FEMORAL OSTEOTOMIES IN RAT

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Both femoral canals of 35 male Wistar rats were widened to 1.6 mm. The left canal was filled with bone cement. After setting a standardized partial transverse osteotomy was done on both femurs. The rats were sacrificed after 0, 15, 30, 60 and 90 days. The femurs were removed and the bending strength tested. The median bending moment in cemented femur increased from 0.279 Nm just after the operation to 0.650 Nm after 90 days. The corresponding figures for uncemented femur were 0.289 Nm and 0.692 Nm. No statistical significant difference in bending moment between cemented and uncemented femur was seen after healing for 15, 30, 60 and 90 days.

CHOICE OF SUTURE MATERIALS IN ORTHOPAEDIC SURGERY IN NORWAY

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A questionnaire on suture techniques and choice of suture materials was sent to 82 surgical departments in Norway. Of 78 answers, 69 contained information about surgery of the extremities. For tendon sutures of the hand two-thirds of the materials used were non-resorbable, polypropylene (Prolene®) being most widely used. The rest were resorbable, synthetic sutures (Vicryl® and Dexon®). For suture of other tendons, including the Achilles tendon, the non-absorbable and absorbable materials were used equally often, and frequently simultaneously.

Ligament suture was performed in two thirds of cases with resorbable materials. In the one third of cases using non-resorbable materials, multifilament polyester (Ethibond®) was the most common. Suture of joint capsule was mostly performed with resorbable sutures.

In a few hospitals, silk was still used in surgery of the extremities, both for tendons and ligaments. Catgut was not in use in any hospital.

CLOSED BIOPSY OF THE SPINE

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Since 1981 closed biopsy of the spine has been carried out on 12 patients with the suspicion of neoplastic or inflammatory processes. The approach is rather troublesome by incisional biopsy.

The biopsies were carried out under local anaesthesia with a trephine 4 mm in diameter under X-ray image intensifier control. The thoracic and the lumbar vertebrae and discs were biopsied 4 and 8 times, respectively. Representative material was obtained from nine patients and non-representative from three patients. There were no complications.

The method has proved valuable for spinal biopsies without any particular problems for the patient. The examination is safe, provided there is adequate knowledge about and consideration paid to anatomically important structures.

HARRINGTON's FIXATION IN DISSEMINATED MALIGNANCY IN THE SPINE

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From 1979 to 1981 seven patients with spinal malignancy were treated with Harrington distraction rods to prevent vertebral collapse. The various forms of malignancy were: metastatic breast cancer ($n = 3$), metastatic hypernephroma (1), metastatic adenocarcinoma of unknown origin (1) and multiple myeloma (2).

A laminectomy was performed in five cases. Bone grafting for fusion was not used.

All patients had severe pain preoperatively. Four patients were able to walk while three were bedridden because of paraparesis, back pain or radicular pain.

Postoperatively all had pain relief and were able to walk. Neurological improvement was seen in five patients. Survival varied from 2.5 to 17 months in six patients. One patient with multiple myeloma is alive and well 30 months after the operation.

RELATION OF DISC HYDRATION AND ANNULUS COLLAGEN FIBRE ORIENTATION TO MOTION SEGMENT FLEXIBILITY

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The object of this study was to investigate a possible association between the flexibility of the different segments in adolescent spine, and the water content and predominant orientation of the annulus collagen fibres of each disc.

Eleven motion segments (C4-S1) were removed at autopsy from the spine of an 11-year-old male. The three-dimensional, quasistatic flexibility of the segments was examined, whereupon the specimens were resealed in plastic bags and refrozen for further experiments. The variation in hydration across the median slices of each disc was estimated by weighing small parts of the slices before and after drying in an oven.

In the 10 caudal discs, collagen fibre orientation in the anterior annulus fibrosus was estimated using a stereo microscope.

A rank correlation analysis was performed between the hydration- and fibre-angle variables and the measured directional flexibilities in shear, bending and torsion

At different vertebral levels, systematic variations were found in both mean disc hydration and annulus fibre angle.

FLEXION TORQUE AND PERFORMANCE AFTER RESECTION OF THE ILIOPSOAS TENDON

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Maximum torque and performance were measured in both hips during flexion from 0° to 90° in a patient who had been treated with unilateral resection of the iliopsoas tendon because of painful snapping of the tendon. A Cybex-II-isokinetic measuring device was used.

Five months postoperatively the maximum flexion torque and performance were 83 per cent and 76 per cent, respectively, related to the values for the non-operated hip.

Furthermore, right-left differences were studied in 10 healthy men.

The findings suggest that resection of the iliopsoas tendon might at most have reduced the maximum flexion torque by 30 per cent, whereas the flexion performance might have been slightly more reduced.

INHIBITORY EFFECTS OF ACETYLSALICYLIC ACID ON BONE METABOLISM IN A BONE TRANSPLANTATION MODEL IN RATS

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Bones from inbred rats, prelabelled with Strontium-85 and 14-C-proline, were transplanted to muscle pouches in other inbred rats. The recipient rats received acetylsalicylic acid for18 days in doses giving serum concentrations comparable with anti-inflammatory levels in humans. Calcium-47 and 3-H-proline were administered to assess bone formation.

Acetylsalicylic acid reduced the bone resorption measured as loss of incorporated Strontium-85 (minerals) and loss of 14-C-hydroxyproline (collagen) from the transplants. Acetylsalicylic acid also reduced the rate of Calcium-47 uptake (mineralization) and amount of 3-H-hydroxyproline (collagen synthesis) in the transplants, that is, it reduced the new bone formation.

ANTIGEN-EXTRACTED DEMINERALIZED ALLOGENEIC BONE USED AS BONE INDUCING MATERIAL

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The purpose of this study was to assess the osteogenic potential of different bone inducing materials (BIM). As BIM were used: I) Antigen extracted, demineralized allogeneic bone. II) As type I combined with bone marrow from inbred rats. III) Bone chips from the iliac crest of inbred rats. The BIM was packed in tubes of porous titanium and placed in the back muscles of inbred rats. Evaluated by means of 47-Ca (mineral) and 3-Proline (collagen) type II has an osteogenic potential equivalent to isogeneic full bone. The results indicate that BIM type II can be applied to aid bone ingrowth in porous implants.

ACUTE TEARS OF THE ANTERIOR CRUCIATE LIGAMENT: RESULTS OF EARLY OPERATIVE TREATMENT

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Sixty-three of a total series of 71 patients were followed up with a median observation period of 48 months (range 15–75 months). Only six patients had isolated tears of the anterior cruciate ligament (ACL). In 54 patients the injury was combined with a medial tear. The ACL rupture was located near or at the femoral insertion in 53 cases.

At follow-up, 11 patients complained of instability, and in eight of these an anterolateral rotatory instability (ALRI) was demonstrated by the Slocum test. Another five patients not complaining of instability also had a positive Slocum test ($P < 0.001$). ALRI did not correlate with the location of rupture.

Thirty six of 50 patients with a sufficient ACL had excellent function compared to four of 13 patients with ALRI ($P = 0.007$).

We conclude that acute repair of ACL is worthwhile and improves the functional outcome.

KNEE LIGAMENT INJURIES. A 2-YEAR MATERIAL FROM A PERIPHERAL HOSPITAL

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From 1980 to 1982 we have performed 32 surgical explorations and treatment of knee ligament injuries at Ringerike Hospital. Ruptures of proximal or distal insertion of medial collateral ligament were reattached with a 35 mm cancellous screw with a plastic hooked washer.

The injury, treatment, hospital stay and postoperative treatment were evaluted.

Through personal examination we evaluated the postoperative results, performance at work and physical activity. The mean age was 27 years, mean hospital stay 6 days. Postoperatively the patients wore a knee cast for 5–6 weeks, with full weightbearing. After 16 weeks all but one patient was back at work.

LIGAMENT RECONSTRUCTIONS IN OLD KNEE INJURIES

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During the period 1976–80 50 ligament reconstructions were done on 41 men and nine women aged 17–59 years with instability of the knee joint.

Totally 31 pes anserinus transposition a.m. Slocum and 29 iliotibial tract transpositions a.m. Ellison were performed on 46 patients with anteromedial rotatory instability (AMRI) and/or anterolateral rotatory instability (ALRI).

At follow-up an average of 2½ years after the operation all 50 patients answered a questionnaire. Only 44 per cent were without pain and 22 per cent had subjective stable knees. Nevertheless 80 per cent were satisfied with the result of the operation.

OSTEOCHONDRITIS DISSECANS

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During 1971–80, 33 patients with a total of 39 affected joints were treated for osteochondritis dissecans in our hospital. The results were evaluated ½ to 10 years (mean 4.4 years) after start of treatment.

In 59 per cent of the cases the result was rated excellent or good, and in 41 per cent as fair or poor. The results were not correlated to observation time.

Conservative treatment gave good results in nine of 14 patients treated before epiphyseal arrest, but in none of four treated conservatively after epiphyseal arrest.

The operative method giving the best results was drilling combined with fixation with bone pegs. In this group 64 per cent were rated excellent or good.

ANTEVERSION OF THE HIP

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The anteversion angle of the femoral neck normally decreases from about 30° at the age of 4–6 years to about 10° in adults. As compared to this normal development, increased anteversion is not spontaneously corrected during growth.

No correlation seems to exist between the anteversion of the femur and that of the acetabulum. Consequently, a poor adaptation may be found between the femoral head and the acetabulum in cases of increased femoral anteversion. Such malfunction of the joint should be regarded as hip instability, which in time may lead to osteoarthritis.