Acta Orthop. Scand. 57, 580–588, 1986

# Proceedings of the Finnish Orthopedic Society

**Helsinki, November 14, 1985**

**Editor: K. Österman**

Orthopedic Hospital of the Invalid Foundation, Tenholantie 10, SF-00280 Helsinki, Finland

## Hip

### Osteosynthesis of cervical and trochanteric fractures of the femur with the sliding compression screw

Esko Partio & Pekka Ylinen

Central Hospital of Middle Finland, Jyväskylä, Finland

Eighty-one patients treated with a sliding compression screw-plate system were followed from 6 months to 3 years. Forty-five patients had cervical fractures (Garden I + II:15 and Garden III + IV:30) and thirty-six had trochanteric fractures.

Two patients developed deep infection.

There was no nonunion in the trochanteric group. Union failed in 2/15 of the undisplaced and in 14/30 of the displaced cervical fractures. One patient developed necrosis of femoral head. Serious complications were thus encountered in 17/45 cervical fractures and 16 were reoperated on. The most significant factors associated with unsatisfactory results were poor reduction and poor position of the screw.

### Reoperations for hip fractures

Peter Lüthje & Esko Partio

Regional Hospital Jokilaakso, Jämsä, Central Hospital of Middle Finland, Jyväskylä, Finland

Between 1973 and 1982, 1,063 patients with a hip fracture were treated operatively in the area of the Central Hospital of Middle Finland. All reoperations were studied.

Reoperations after cervical hip fractures occurred in 25 per cent, and after trochanteric fractures in 7 per cent. Sixty per cent of the reoperations were performed during the first year. The average time spent in the hospital was 12 days. The main reasons for reoperation after cervical hip fractures were penetration of the nail (28%), nonunion (28%), technical failure (15%), and avascular necrosis of the femoral head (11%).

### Iso-oxazolyl penicillins and cefamandole in antibiotic prophylaxis of patients undergoing total hip or knee arthroplasty. A controlled trial

Eero Wilppula, Seppo Vainionpää, Martti Lalla, Olli-Veikko Renkonen & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital and Laboratory of Sero-bacteriology, Helsinki University, Helsinki, Finland

In a prospective clinical study, 58 patients undergoing total hip or knee arthroplasty were randomly allocated to two groups: one group received cloxacillin, 2 grams 8 hourly intravenously for 1 day, and dicloxacillin, 1 gram 8 hourly perorally for 2 days; the other group received cefamandole, 2 grams intravenously before operation, and then 1 gram 6 hourly parenterally for 3 days.

Concentrations of cefamandole or cloxacillin were measured in the serum of all the patients and in the synovial fluid of 28 patients. A C-reactive protein (CRP) sample was taken in 16 patients preoperatively and daily for 8 days.

One case of urticaria due to cloxacillin occurred. A superficial wound infection was observed in a patient receiving iso-oxazolyl penicillins. The concentrations of cefamandole and cloxacillin were high in the serum. In this study cefamandole entered the synovial fluid of the knee joint in 5–15 minutes; similar concentrations of cloxacillin were measured after 16–30 minutes.

One week after operation, CRP had decreased below 60 μg/ml in all 16 patients.

## Weight-bearing radiography in total hip arthroplasty

Kaj Turula, Ora Friberg, Juhani Haajanen, T. Sam Lindholm & Kaj Tallroth

District Hospital of Kuusankoski, Military Hospital 3, Jouvola, and Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

Weight-bearing anteroposterior (AP) plain radiography of the pelvis and hips is proposed for the follow-up of total hip arthroplasty (THA). The patient stands with a block between the heels for constant positioning. A mercury level or a plumb line provides a horizontal or a vertical reference on the radiograph. With this reference pelvic tilt, leg-length inequality, the lateral angle of the acetabular cup and distal migration of the femoral component can be estimated. Good reproducibility enables quantitative evaluation of radiolucency and bone resorption from serial weight-bearing films. This is of considerable value in the early diagnosis of radiographic loosening in THA. Weight-bearing radiography of the pelvis and hips is also helpful for preoperative planning of THA.

## Revison arthroplasties of the hip

Eero Arajärvi & Seppo Santavirta

The Division of Orthopedic Surgery, Surgical Hospital, University Central Hospital, Helsinki, Finland

During the period 1974-1883, 768 total hip arthroplasties were performed. Brunswik prostheses were used until 1980, and after this the operations were performed with Lubinus prostheses. Additionally, during 1977–1981, Wagner & Freeman resurfacing prostheses were used in 107 cases. Of these patients, 44 (6%) needed revision arthroplasty. The average interval between the initial operation and revision arthroplasty was 4 years, and the follow-up after the second operation was 3 years. The patients who underwent revision arthroplasty were compared with a matched control group.

In the revision group, the radiographs revealed that the medial cement packing was complete in 28 per cent of the hips and in 78 per cent of the controls ($P < 0.001$). In lateral cement packing, there was no statistical difference between the two groups. The loosening rate of the resurfacing prostheses was 15 per cent and of the Brunswik prostheses 8 per cent. At follow-up the patients with a revised hip had less pain than before the primary operation ($P < 0.001$) and their mobility was improved.

We conclude that adequate cement medial and tip packing must be emphasized in the primary arthroplasty. Resurfacing prostheses have a relatively high loosening tendency. Revision arthroplasty after aseptic loosening of total hip replacement gives good results.

## Classification of the reoperations of THA

Timo Niinimäki

Oulu University Central Hospital, Department of Surgery, Oulu, Finland

This study examined the possibilities of using a proper classification to collect the THA reoperation data and to have a general quality control of the procedure.

The most useful classification was obtained when infection and aseptic loosening were grouped separately; also the primary operation and later ones were grouped separately.

The Finnish classification of operation will be changed to follow these principles from the beginning of 1986. The operation data from the whole country will be collected at the Medical Board for ADM processing.

# Knee

## Late results of hemijoint allograft replacement for bone tumors about the knee

Antti Alho, Erkki O. Karaharju, Olli Korkala & Erkki Laasonen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

We reexamined 9 consecutive patients who had undergone an osteoarticular allogeneic transplantation for low-grade malignant and aggressive tumor 8–15 years previously. Two patients were females and 7 were males; their mean age at operation was 32 (17–42) years. They had undergone 20 operations in all. At follow-up, 8 patients had functioning knees, whereas one transplantation had resulted in arthrodesis. All the knees had good extension, but only 3 patients could flex their knee 90 degrees. Seven patients were working. Radiographically, all the knees showed gradual deterioration. However, only three knees were painful on exercise and none at rest.

We conclude that hemijoint allograft is a useful alternative to fill a bone defect after tumor resection

about the knee, which at present compares reasonably well with arthrodesis and segmental prosthetic replacement. The ultimate result of reconstruction, however, depends on the preservation of the joint surfaces.

## Proximal tibial osteotomy in the treatment of gonarthrosis

Pekka Jokio, T. Sam Lindholm & Eila Vankka

Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

A prospective series comprising 52 knees in 48 patients suffering from medial or lateral unicompartmental gonarthrosis shows the importance of overcorrection of the mechanical axis into valgus in medial arthrosis. The clinical results were significantly correlated with overcorrection, the results 2 years postoperatively being better than those obtained at a follow-up 1 year after operation. Of the results, 82 per cent were within the limits of ±3° after 2 years, whereas 77 per cent were correspondingly good 1 year postoperatively. In lateral gonarthrosis, overcorrection was not good; but there was a mean overcorrection of +10°, and with respect to this overcorrection, the results were acceptable.

The results were directly correlated with the opening up of the joint space affected (80%) and diminution or disappearance of subluxation in medial gonarthrosis. In lateral gonarthrosis, subluxation was increased. The tilt angle had no correlation with the clinical results, but it mainly increased about 51 per cent, with the mean angle not exceeding 10°.

The extension deficit in varus knees significantly diminished after valgus osteotomy; the change in valgus knees was also evident, but not significant. However, 95 per cent of all patients showed good or fair results after a follow-up period of 2 years.

## Why does high tibial osteotomy fail?

Bernhard Bardy, Erkki Tukiainen & Seppo Santavirta

Division of Orthopedics and Traumatology, Surgical Hospital, University Central Hospital, Helsinki, Finland

In the present series of 153 wedge osteotomies performed during the period 1974–1983, 9 patients were reoperated on because of unsuccessful high tibial osteotomy. The reoperations were performed in 6 patients 2–14 months to 4 years later. Bone grafting was performed three times and 1 patient later had an arthrodesis of the knee. One reosteotomy was performed to treat undercorrection. Total joint replacement was the definite operation in 5 cases. Misjudgements such as rheumatoid erosion of the tibial bone, high-grade arthrosis, and ligamentous laxity of the knee were estimated to be factors responsible for failure of adequate osteotomy. Technical mistakes were a too high osteotomy level and undercorrection of the axis. Tibial plateau fractures were seen in 2 patients, the reason in both cases being obesity and osteotomy at too high a level (less than 12 mm below the joint cartilage). Both patients underwent cancellous bone grafting and later on arthroplasty. Ligamentous laxity was present in 2 patients who both had had a previous meniscectomy. They developed a recurvatum deformity after the osteotomy and were both later treated with arthroplasty.

In high tibial osteotomies, we aim to achieve a 7–10 degree valgus, but in the failed cases, the primary correction never exceeded 0 degrees.

## Treatment scheme using external fixation equipment for tibial fractures

Allan J. Aho & Seppo Nieminen

University Central Hospital of Turku, Finland

Results of treatment using external fixation by Hoffman-Vidal-Audrey technics in 92 patients treated between the years 1971 and 1980 are presented. Risk of delayed union or nonunion and secondary posttraumatic osteoporosis are mostly due to the severity of the fractures – most of them are of grade II-III comminuted open fractures – but also to the prolonged use of the external fixation equipment (passive immobilization) and the long nonweight-bearing time. A small distraction in the fracture gap is often present after an otherwise successful reduction. The ossification disturbance because of this distraction and concomitant early union of the fibular fracture may prevent the compression effect between the tibial fragments in weight bearing and result in delayed union.

To prevent these harmful effects, we have used a short fixation time (≤10 weeks), a prophylactic segmental resection of the fibula, and early gradual weight bearing in the cast. The results have been good in 72 per cent of the patients.

## Ankle arthrodesis

Vappu Uuspää & Pauli Raunio

Rheumatism Foundation Hospital, Heinola, Helsinki, Finland

The material consists of 148 ankle fusions on 130 ankle joints of 118 patients performed by 13 surgeons from 1955 to 1981 and reexamined from 8 months to 27 years after operation. The average follow-up time was 8 years. There were 33 nonunions (22%). Compression arthrodesis modo Laine, with anterolateral incision and no internal fixation, had the lowest nonunion rate (14%).

Transfibular arthrodesis modo Vainio, with lateral oblique incision, had a nonunion rate of 20 per cent; and transfibular arthrodesis, with lateral longitudinal incision, 31 per cent.

## The Evans procedure for chronic lateral instability of the ankle joint

Jan-Magnus Björkenheim, Jerker Sandelin & Seppo Santavirta

Helsinki University Central Hospital, Helsinki, Finland

The anterior talofibular ligament is the primary stabilizer of the ankle joint. A positive anterior drawer sign and severe varus tilting follow the disruption of the anterior talofibular and the calcaneofibular ligaments. From 1979 to 1983, we used the Evans procedure in 46 ankles with chronic instability. The mean age was 32 years. Most of our patients had their primary accident in connection with physical activities. The best diagnostic tools were the clinical examination and the stress radiographic examination using the Cheuba device.

Our results were good in 86 percent, fair in 7 percent, and poor in 7 percent of the patients. The follow-up time was 40 months on an average. All the patients were able to return to their previous occupation and to participate in sports activities. In conclusion, we found the Evans procedure to be easy to perform; it has few complications; and it restores well the lateral stability of the ankle.

## AO-osteosynthesis versus biodegradable fixation in displaced bimalleolar fractures. Early results of a prospective study

Ole Böstman, Seppo Vainionpää, Kimmo Vihtonen, Antero Mäkelä, Jarmo Vuorinen, Pertti Törmälä & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, and Laboratory of Polymer and Fiber Technology, Tampere University of Technology, Tampere, Finland

In a prospective clinical study, 27 consecutive patients with a bimalleolar fracture showing an initial displacement of 2 mm or more, but without a total rupture of the distal tibiofibular syndesmosis, were randomly allocated to two groups. One group was treated with conventional AO-osteosynthesis (Group A) and the other with biodegradable rods and sutures of polylactide-glycolide copolymer (polyglactin 910) (Group B). The ankle was immobilized for 6 weeks in a below-the-knee plaster cast in both groups.

As for the demographic data of the patients and the severity of the initial displacement of the fracture, the two groups were similar. The mean age of the patients was 40 years.

The mean duration of the operation was 41 minutes in group A and 53 minutes in group B. An exact reduction was achieved in 24 patients. In two patients of group A, a step-off of 1–2 mm was seen in the medial malleolus, and in 1 patient of group B the reduction of both malleoli was unsatisfactory. The position of fixation was maintained until union in 26 patients. In 1 patient of group B, secondary displacement of the lateral malleolus occurred at 3 weeks. One superficial wound infection was seen in group A.

As for the early results, no significant differences emerged between the treatment groups. Consequently, the advantage of avoiding the removal procedure associated with metallic implants renders such an equality in favor of the biodegradable fixation method.

## Experimental orthopedics

### Fixation of experimental osteotomies of the diaphysis of tibia with biodegradable material in rabbits

Seppo Vainionpää, Kimmo Vihtonen, Matti Mero, Hannu Pätiälä, Pentti Rokkanen, Jyrki Kilpikari & Pertti Törmälä

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki and Laboratory of Polymer and Fiber Technology, Tampere University of Technology, Tampere, Finland

Osteotomies of the tibial diaphysis were operatively fixed with biodegradable implants in 47 rabbits. Polyglycolic acid (PGA)/ polylactic acid (PLA) copolymer implants reinforced with carbon fiber (7%) and overlaid with gold were used in 24 rabbits.

Poly-beta-hydroxy butyric acid (PHBA) with carbon-fiber reinforcement and gold surfacing were used in 20 rabbits. Three tibial osteotomies were fixed with nonreinforced biodegradable PGA/PLA copolymer composite implants. No external support was used postoperatively.

Good or satisfactory results were achieved in 15 of 20 rabbits whose osteotomies were fixed with carbon fiber-reinforced PHBA implants. One out of three osteotomies fixed with completely biodegradable PGA/PLA copolymer devices united without malalignment.

### Experimental vertebral fusion using demineralized bone matrix and bone marrow

Paolo Ragni, T. Sam Lindholm & Tom Lindholm

Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland, and Orthopedic and Traumatologic Institute, University of Pavia, Italy

Allogenic demineralized bone matrix (DBM) has been shown to induce healing of large bone defects owing to its osteoinductive properties. In our experiment we used composite grafts of allogenic DBM combined with autogenous fresh bone marrow to induce spinal fusion. Thirteen rabbits representing 27 spondylodeses involving two spinal levels were operated on. At the thoracic level the spondylodeses were all stable 2 months after the operation, whereas in the lumbar spine some spinal segments were already stable after 1 month. Radiographically, signs of union or presence of calcified tissue were present after 2 months at the thoracic level, at the thoracolumbar level after 2.5 months, and at the lumbar level after 1 month, increasing in correlation with the time sequence.

The results show that allogenic DBM could be a substantial alternative to the autotransplant for spinal fusion.

### Effect of immobilization on the bone structure of the lumbar spine

Jarmo Vuorinen and & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

The spines of 128 rats were fixed using an external fixation method. Fixation caused neutral, distractive, or compressive immobilization between vertebrae L2 and L5. The periods of immobilization were 2, 4, 8, 16, 24, and 32 weeks. The reversibility of changes was also examined. After the immobilization of 8 and 24 weeks, the fixation was removed. The rats were killed after another 12 weeks. The area of the lamellar bone of the vertebrae was examined histomorphometrically using hard-bone sections.

We found that immobilization caused loss of lamellar bone. After 2 weeks of immobilization, there were no changes. Four weeks of immobilization caused 20–30 per cent bone loss and 8 and 16 weeks, 40–50 per cent. After 24 weeks, there were no more changes; the amount of bone decreased 45–60 per cent. After the immobilization of 8 and 24 weeks, there was no reversibility in the amount of bone loss.

### Callus and bone grafts in deep articular defects

Harry Göransson, Pentti Rokkanen & Matti Linden

Helsinki University Central Hospital, Helsinki, and Jorvi Hospital, Espoo, Finland

The healing of articular defects was studied in 72 young rats. The rats were divided into three groups: a) The callus group: A 2-mm x 4-mm hole was made to the left tibia. Twelve days later, the callus was transplanted to an articular subchondral defect in the intercondylar notch of the left femur. b) The cortical bone group: A 1.5-mm x 4-mm cortical bone graft was taken from the left tibia and transplanted to an articular defect. c) The defect group: An artic-

ular subchondral defect was made in the intercondylar notch of the left femur. The rats were killed 4 and 7 days, 3, 6, 12, and 24 weeks after the operation. Examination methods used were hard-bone histology, tetracycline fluorescence, and microradiography.

After 24 weeks the surfaces of the defects were healed with fibrous- and hyaline-like cartilage. Although there was cartilage and new bone formation in the callus group after 4 and 7 days, the final healing did not differ from that of the bone-graft group. The mere defect healed first. No straight chondrogenic activity could be identified in the bone group. The repair tissue arose from the marrow spaces of the subchondral bone.

## Bone mineral content and mechanical strength of the human femur

A. Alho, T. Husby, A. Höiseth & E. Fönstelien

Ullevål Hospital, University of Oslo, Oslo, Norway

The mechanical strength on axial loading and bone mineral content was studied in 36 pairs of normal cadaver femora, 16 female and 20 male, aged 57–87 years. The relative bone mineral content was determined by computer-assisted tomography (G.E. 8800) in the femoral capital, cervical, trochanteric, diaphyseal, and condylar levels. Scan measurements between 100 and 1,000 Hounsfield units were chosen to omit soft tissue at one end of the density scale and cortical bone at the other end. The condylar area was technically best suited and gave the best correlation between the right and left side ($r = 0.90, P < 0.001$).

One femur of each pair was mounted on an Instron machine with the condyles on the platform and the cross head in the femoral head. The load deflection was determined at a speed of 5 mm/min. The maximal load at fracture varied from 2,750 to 9,610 newtons (median 5,490). Thirty-four femora fractured vertically in the neck – one fracture was subtrochanteric and one mid-diaphyseal. The trabecular bone mineral content of the distal femoral metaphysis showed a highly significant correlation (0.82, $P < 0.001$) with the maximal bending strength.

In conclusion, the wide strength range of femora in elderly persons is an expression of a varying degree of osteoporosis; in some cases the maximal strength was below the values stipulated for normal loading. Biomechanically, the femur may be considered as a cylinder, where density and strength are evenly distributed. The easily accessible distal metaphysis reflects the strength of the whole femur, and the fracture under a load occurs at a site that is determined by anatomy, usually in the cervical area.

# Pediatric orthopedics

## Displaced diaphyseal fractures of the radius and ulna in children treated by open reduction and internal fixation.

Seppo Vainionpää, Ole Böstman & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

A series of 14 children with displaced diaphyseal fractures of both bones of the forearm treated by open reduction and internal fixation using plates or intramedullary Kirschner wires was reviewed. The age of the patients at the time of the injury was 12 (7–14) years. They were examined at maturity after a mean follow-up time of 8 (5–11) years. The operatively managed fractures represented 9 per cent of all diaphyseal forearm fractures in children during the period under review.

In 10 cases the patient was asymptomatic at the follow-up examination, whereas 4 patients experienced pain upon exertion and restriction of the joint movements. A limitation of pro-supination was observed in 8 patients. This seemed to be associated with a fracture of the proximal third of the forearm or with a slight angular malunion (5–10 degrees). A 5 mm shortening of the ulna was observed in 3 patients, and 2 of these had a limited range of movement of the radiocarpal joint. There was one refracture after removal of the plates.

The average anatomic and functional outcome was better than has been reported after conservative treatment of comparable fractures. Consequently, open reduction and internal fixation should be readily considered in severely displaced fractures of the forearm in children.

## Surgical treatment of spondylolisthesis in children and adolescents

Masuno Ylikoski, T. Sam Lindholm, Paolo Ragni & Mikko Poussa

Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

Seventy-five cases (43 girls and 32 boys) with spondylolisthesis were operated on posterolaterally or intercorporeally from 1979 to 1984. At the time of operation the mean patient age was 14 years. They were followed-up clinically and radiographically for 14 (8 to 26) months. The mean preoperative slip of the olisthetic vertebra was 44 per cent in the girls

and 29 per cent in the boys. In some cases a slight decrease of displacement of the olisthetic vertebra was noticed during follow-up. In 64 patients the result of the operation was good, in 7 satisfactory, and in 4 cases bad.

### Factors contributing to the final result in the operative treatment of Perthes' disease

Mikko Poussa, T. Sam Lindholm & Veijo Hoikka

Orthopedic Hospital of the Invalid Foundation Helsinki, Finland

No correlation was observed between the result and the femoral neck-shaft angle measured preoperatively and after consolidation of intertrochanteric femoral varus derotation osteotomy in 102 children (112 hips) with Legg-Calvé-Perthes disease. The result deteriorated with increasing age of the patient, and it was seldom good when the patient's age was 9 years or more. Catterall grouping and the concept of head-at-risk were of prognostic significance in patients operated on before the age of 9 and before the disease had reached its healing phase. Subchondral fracture was identified in 59 per cent of the cases, but did not correlate with the result.

## Upper extremity

### Outcome of clavicular fractures

Antti Eskola, Seppo Vainionpää, Pertti Myllynen, Hannu Pätiälä & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

One hundred and eighteen patients with a clavicular fracture were treated in our department in 1982. Eighty-nine patients attended the follow-up examination in 1984. Eighty-three fractures were treated with immobilization in a sling. Four fractures were treated with plate fixation primarily, and 2 patients were operated on because of delayed union. The immobilization time was 21 (10–42) days. The result was good in 65 cases, satisfactory in 20, and poor in 4 cases. Patients with a primary dislocation of more than 15 mm or shortening observed at follow-up examination had significantly more pain than patients without these findings.

### Outcome of operative treatment in fresh clavicular fractures

Antti Eskola, Seppo Vainionpääm, Hannu Pätiälä & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

Twenty-three fresh, type II (Neer 1963) lateral clavicular fractures, one middle third, and one medial third fracture were treated operatively. In 19 cases, fixation was done with two Kirschner wires, in 5 cases plating was performed, and in 1 case a lateral fragment was removed. In the lateral fractures, the coracoclavicular ligament was left unsutured.

The follow-up period was 5 (1–12) years. In 23 cases out of 25, the subjective outcome was good or satisfactory. Twenty-four fractures united and complications were scanty.

### Median nerve as free tendon graft

Martti Vastamäki

Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

The m. palmaris longus tendon is most often used as the tendon graft. The tendon is located in the middle of the volar side of the wrist directly on tip of the median nerve. Under normal conditions, there are neither difficulties nor dangers involved in the taking of a tendon graft. However, the palmaris tendon may be either lacking or it may be very weakly developed. In such cases, someone who is insufficiently acquainted with the procedure might err and take the median nerve as the graft. In this report, 4 cases of this type are presented.

Three cases involved the repair of a flexor tendon injury and 1 the repair of an extensor injury. All the patients were male; the youngest 7 years old and the oldest 37. The palmaris longus tendon was missing in all cases. In 3 cases, reconstruction of the median nerve was performed with a free sural nerve graft. The nerve defect was in all cases about 13 cm. The result of reconstruction was good only in the youngest patient. Preoperative investigation of the palmaris longus tendon is emphasized.

## Spine

### Inflammatory involvement of cervical spine ligaments in rheumatoid arthritis

Yrjö Konttinen, Seppo Santavirta, Ville Bergroth & Jerker Sandelin

Fourth Department of Medicine, Division of Rheumatic Diseases, and Surgical Hospital, Division of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

Inflammatory involvement of cervical spine ligaments in rheumatoid arthritis was studied. Biopsy specimens were obtained in atlantoaxial stabilizing operations from ligament structures between the posterior arch of the atlas and the processus spinosus of C2. Inflammatory cells in situ in cryostat sections were stained using monoclonal hybridoma antiboides (Moab) applied in a sensitive avidin-biotin-peroxidase complex (ABC) method. In four out of six ligament specimens, focal inflammatory-cell infiltrates consisting of mononuclear cells were found (Table).

| MoAB | Specificity | % of all cells |
|---|---|---|
| T11 | T lymphocytes | 77 ± 9 |
| T4 | inducer/helper T | 49 ± 4 |
| T8 | suppressor/cytotoxic T | 24 ± 4 |
| B | B lymphocytes | 1 ± 1 |
| M1 | monocytes | 21 ± 6 |
| Ia | MHC locus II antigen | 46 ± 8 |
| Tac | interleukin-2 receptor | 0.6 ± 0.3 |
| T9 | transferrin receptor | 14 ± 5 |
| 4F2 | gp 80/40 | 38 ± 10 |

We conclude that the active immune inflammation of the cervical spine ligaments may contribute to 1) ligamentous laxity, subluxations, and instability and 2) occipitocervical pain in patients with long-term rheumatoid arthritis. On the basis of our findings, it also obvious that effective anti-inflammatory and antirheumatic medication can be recommended to prevent the development of rheumatoid cervical spine changes.

### Initial problems, complications, and prognosis in patients with high spinal cord injury

Pertti Myllynen, Aarne Kivioja & Pentti Rokkanen

Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki, Finland

The purpose of this study was to clarify the problems, complications, and prognosis of the initial treatment of patients with tetraplegia, and to study whether some primary posttraumatic clinical features or laboratory values can predict the development of complications or an otherwise poor prognosis. Fifty-four patients (48 males and 6 females) with tetraplegia (40 complete and 14 incomplete) were studied. During the intial posttraumatic phase, 15 patients (28%) were hypoxemic and 28 patients (52%) were hypoventilated or hyperventilated. Forty-three patients needed ventilatory assistance. Immediate posttraumatic bradycardia and hypotonia generally occurred and were most commmon in those who later developed several complications or died. Systolic blood pressure increased to normal during the first week, but diastolic blood pressure remained decreased. The patients required nasogastric suction for 9 days (mean), parenteral nutrition for 18 days (mean), and catheterization of the bladder for 22 days (mean). The most common general complications were urinary (57%) and respiratory (44%) infections, gastrointestinal bleeding (17%), thromboembolism, (13%), and mild skin problems. The frequency of complications correlated with the height of spinal cord injury. Eight patients died, 5 of bronchopneumonia, and 3 of a pulmonary embolism, and they all had spinal cord injury at the C4-C5 level. Neurologic recovery depended on the completeness of the primary lesion, and surgical therapy had no influence on it.

### CT, NMR, and discography in the evaluation of disk degeneration

Tapio Videman, K. R. Maravilla, Kevin Gill, G. W. Sory, T. Shimizu, P. C. Lesh & Vert Mooney

Institute of Occupational Health, Helsinki, Finland, and Division of Orthopedic Surgery, Department of Radiology, University of Texas Health Science Center at Dallas, U.S.A.

New methods to study patients with low back pain have already greatly increased our understanding of pathology of the lumbar spine. In this study, we used

NMR (nuclear magnetic resonance imaging), CT, and discograms to assess 73 disc levels in 13 cadaver spine specimens. These findings were then compared with the macroscopic anatomy at each level. A simple four-grade scale was used to assess the degree of disc degeneration, the type and degree of disc protrusion, and the condition of each facet joint. NMR and discogram correlated well with the degree of general disc degeneration. CT and discogram correlated with the axial plane discogram. Based on these comparative radiographic studies, as well as the macroscopic anatomy, we propose the following indications for lumbar disc evaluation. In general, no significant difference could be found between the NMR and CT in evaluating degeneration or protrusion. Both CT and NMR underestimated the facet joint changes. The focal annular tears and protrusions were best seen in axial view of the discogram, which can be performed clinically with the CT immediately following discography.