Finnish Orthopedic Association

Helsinki, November 10–11, 1988

Editor: Seppo Seitsalo
Liinasaarenkuja 3–5 D7
Esbo, Finland

Histologic changes in the epiphyseal area in the early phase of physeal distraction

Anne Alberty, Jari Peltonen and Veijo Ritsilä

Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland

Introduction: Gradual distraction of the physis results in separation of the epiphysis from the metaphysis (Ilizarov and Deviatov 1969), elongation and hyperplasia of the physis, or chondrodiatasis (de Bastiani et al. 1986).

Material and methods: A unilateral external fixation device was applied over the distal femoral physis in 22 growing rabbits. The unoperated on femur served as a control. Distraction was started at a rate of 0.5–1.0 mm once a day for 1–4 days in Group 1, 5–9 days in Group II, 14 days in Group III, and 21 days in Group IV. Oxytetracycline was given intramuscularly before the operation and 1 day before the rabbits were killed.

The distal part of the femurs was sawed in the coronal plane and examined under fluorescent light. Histologic studies were done using hematoxylin and eosin, alcian blue, and van Gieson staining.

Results: Bowing of the femur was apparent in Groups III and IV, indicating asymmetric distraction. An increase in the diameter of the epiphyseal area could be seen, this being more marked (15 percent) in Groups III and IV. Histologic separation of the epiphysis from the metaphysis was first observed after 2 days of distraction. Chondrodiatasis and physeal hyperplasia in addition to separation of the physis could often be seen in the same sections. Separation occurred mainly through the hypertrophic zone, but in 2 animals it extended to the metaphysis, and in 2 others, to the proliferative cell layer. Disturbance in the palisade organization of the physis was noted.

Conclusions: In the early phase of distraction, chondrodiatasis and physeal separation were noted to occur simultaneously. The breakdown of the organized chondrocyte palisades, thus allowing cell proliferation by interstitial growth, could be an explanation for the latitudinal overgrowth.

Healing of subtrochanteric femoral osteotomy after fixation with an intramedullary polyglycolic acid implant: An experimental study on growing dogs

Hannu Miettinen, Antero Mäkelä, Jyrki Vainio, Minna Liinamaa, Matti Mero and Pertti Törmälä

Department of Surgery, Kuopio University Central Hospital, Kuopio, College of Veterinary Medicine, Helsinki, and Institute of Plastics Technology, Tampere University of Technology, Tampere, Finland

Polyglycolic acid (PGA) as an internal fixation device has been used successfully for fixation of cancellous bone fractures since 1984. However, all attempts at intramedullary fixation of diaphyseal fractures with biodegradable rods have failed thus far. The main cause of failure has been the relatively rapid loss of the load-carrying capacity of the implants. The healing of diaphyseal fractures in growing animals is rapid and complete in 6–12 weeks. This study used an intramedullary PGA-rod in the fixation of a subtrochanteric femoral osteotomy in a growing dog. Subtrochanteric osteotomy of the right femur was made in 5 12-week-old beagles, which weighed more than 3,600 g. After accurate reduction, fixation of the osteotomy was achieved with an intramedullary PGA-rod, which was 4.5 mm in diameter and 60 mm in length. In another 5 dogs, an intramedullary PGA-rod was driven into the marrow cavity of the right femur without osteotomy. Radiographs of both femurs were obtained 1, 2, 3, 6, 12, and 24 weeks after the operation. Blood cell counts were made at 6 and 24 weeks.

An intramedullary PGA-rod provided sufficient stability for rapid healing of a subtrochanteric femoral osteotomy in growing dogs and did not cause any significant growth disturbances. The rod did not have any adverse effect on blood cell counts. Biodegradable fixation of diaphyseal fractures of growing animals needs specific consideration and further experimental studies are in progress.

Collagen and bone formation after osteotomy and gradual distraction: A morphologic study

Jari Peltonen, Lars Lindbergh[1], Erkki Karaharju[2], Arvi Kahri[2] and Kari Aalto[2]

Orthopedic Hospital of the Invalid Foundation, College of Veterinary Medicine[1], and University Central Hospital[2], Helsinki, Finland

The mode of osteogenesis by gradual bone distraction has not been fully established yet. Two theories have been presented: 1) callus distraction and enchondral bone formation during the healing of the distraction area and 2) bone marrow contribution and bone formation into the organized collagen template in the distraction area.

Material and methods: We performed an osteotomy and gradual distraction by external fixation on the radius of 12 sheep. Distraction was started 1 week postoperatively at a rate of 0.5 mm/day. Biopsies were taken from the distraction area weekly. Conventional and electron (EM) microscopy were used to analyze the cell response, collagen and bone formation during the distraction.

Results: After 1 week of distraction hematopoietic cells and fibroblasts were found in the distraction area. Collagen bundles were thin but organized in the direction of distraction. At 2 weeks collagen producing fibroblasts dominated and traces of mineral were noted by EM. Collagen bundles were thicker than in the earlier stage. Mineralization started at 3 weeks centripetally from the osteotomized bone ends. Sporadic areas of cartilage were also noted. Consolidation of the distraction area (10 weeks) was followed by remodelling of the medullary canal.

Prophylaxis of thromboembolism in orthopedics and traumatology

E. Antero Mäkelä, Pertti Myllynen and Pentti Rokkanen

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

Pulmonary embolism is still perhaps the most common preventable cause of death in hospitals. Deep vein thrombosis (DVT), the precursor of pulmonary embolism, occurs in hip surgery at a frequency of over 50 percent in the absence of prophylaxis. The frequency of fatal pulmonary embolism ranges from 2 to 7 percent in patients undergoing emergency hip surgery.

In a retrospective study of 3,932 patients operated on during the second halves of 1981 and 1982, we collected the patient data concerning clinically detected thromboembolic complications. The relatively low incidence of DVT, 4 and 1 per thousand, respectively, could be explained by the frequent use of dextran as a volume expander in critically ill patients. The corresponding incidences of fatal pulmonary embolism were 0.6 and 0.2 per thousand. Twelve patients in 1981 and 6 patients in 1985 suffering from DVT were over 40 years old. An extremely high risk of postoperative thromboembolic complication appeared after operations for hip fractures in the older age group. Systematically used chemical prophylaxis seemed to minimize thromboembolic complications in orthopedic and trauma patients.

Comparison of cemented and cementless total hip arthroplasty—a survivorship analysis

Kaj B. Turula

Orthopedic Hospital of the Invalid Foundation, Helsinki, and Department of Public Health, University of Helsinki, Finland

Lord's cementless total hip prosthesis (499 hips) was compared with Lubinus cemented implant (1,086 hips) using survivorship analysis.

The end point was revision where one part of the prosthesis or the entire prosthesis was removed and/or exchanged due to mechanical failure. The 5-year crude probability of survival for the Lubinus prosthesis was 94 percent and for the Lord implant 93 percent,i.e., virtually the same.

The preliminary 5-year comparison of cementless total hip arthroplasty (THA) with cemented indicates that the noncemented alternative is justifiable and its further use in primary THA warranted. The biologic fixation of Lord's cementless endoprosthesis appears to be sound.

The Lubinus conventional prosthesis is still a dependable choice in THA.

Boytchev's operation for anterior instability of the shoulder

Pekka Jalovaara, Mirja Koskela, Pekka Kortelainen, Markku Päivänsalo and Ralf V. Lindholm

Department of Surgery, University of Oulu, Finland

This is a report of our first experiences with the procedure described by Boytchev in 1951 for the treatment of instability of the glenohumeral joint. The object of this operation is to provide an active muscular force that keeps the anteriorly dislocating head of the humerus steady in the glenoid joint cavity.

We made use of a slightly modified technique of the operation in which the attachments of three muscles to the coracoid process are transposed to a deep passage between the subscapsularis muscle and the capsule of the glenohumeral joint.

Fifteen patients with a mean age of 30 (18–65) years have been followed up postoperatively after an average interval of 14 (6–21) months. Thirteen suffered from anterior recurrent dislocation, while 2 had anterior chronic subluxation. One of the latter was also shown to have slight instability in the inferior direction.

At review, stability, movement, and function were scored according to the evaluation system of Rowe et al. The results were graded excellent in 7, good in 1, satisfactory in 3, and poor in 4 patients. Five patients had redislocation, 3 obvious subluxation, and 2 luxation.

Complications comprised comminution of the coracoid transplant with additional wiring in 1 cases, wound bleeding in another, and wound infection in 2. Loosening of the coracoid process resulted in repetition of the dislocation in 1 patient.

The probability of simultaneous inferior instability and glenoid rim defects being major reasons for failure is discussed. We suggest that cases of multidirectional instability should be diagnosed preoperatively by the available means and excluded as feasible candidates for the operation. We doubt that the biomechanical effect of the Boytchev procedure is sufficient enough to redress any inferior subluxation adequately.

Reconstruction of the foot with microsurgical free flap

Jorma Rautio, Sirpa Asko-Seljäsvaara, Maikku Härma and Börja Sundell

Töölö, Finland

Thirty-six microsurgical free-flap reconstructions of the foot were performed in 34 patients during an 8-year period for mainly traumatic soft-tissue defects. Twenty-four reconstructions were to the weight-bearing part of the foot. Three flaps were lost due to vascular complication, but in 2 cases the defect was closed with a second free-tissue transfer. Fasciocutaneous flaps were used in 26 successful reconstructions, the scapular flap in 17 cases. Musculocutaneous flaps and muscle flaps covered with free-splint skin grafts were used in 3 cases, respectively, and an osteomusculocutaneous iliac graft in 1 case. Follow-up ranged from 9 months to 8.5 years (mean 3 years).

The soft-tissue stability of the reconstruction was good in 26 and unsatisfactory in 7 cases. Only one full-thickness ulceration of the flaps occurred. Six breakdowns occurred in the weight-bearing heel area, the scapular flap being the most vulnerable. The walking ability of 23 patients was excellent or good and fair or poor in 10 cases. In the patients with significant gait problems, 9 were caused by skeletal deformity, and in only 1 case due to an unstable soft-tissue reconstruction.

The scapular flap can be used to cover even large defects without causing significant donor morbidity. It is not recommended for reconstructions of the heel where thin skin flaps such as the radial forearm flap give better stability. Muscle flaps covered with split-skin grafts also seem to give good soft-tissue stability on the weight-bearing parts of the foot sole. Amputation of the severely damaged foot should be indicated by the skeletal injury rather than the soft-tissue defect. The flap should be selected to satisfy the functional needs of the foot without causing undue donor-site morbidity.

Cancer risk after McKee-Farrar total hip replacement

Tuomo Visuri and Markku Koskenvuo

Orthopedic Hospital of the Invalid Foundation and Department of Public Health, University of Helsinki, Finland

The cancer incidence of 443 total hip replacements (McKee-Farrar) patients, operated on between 1967 and 1973, was followed for the equivalent of 5,729 years to the end of 1981. The number of observed and expected cancers was obtained from the data of the Finnish Cancer Registry. The expected number of natural deaths was slightly higher than observed (O/E = 97/103 = 0.94) suggesting some selection of the operated on patients. The risk of total cancer incidence did not increase (O/E = 38/37.1). The risk for site-specific cancers was 1.30 (O/E = 38/29.37, 95 percent confidence limits of 0.92–1.78). There were no observed cases of kidney or bladder cancer (E = 2.29) or of rare forms of cancer (E = 3.11), e.g., cancer of the mouth, the brain, or other nervous system cancers, the thyroid gland, or other endocrine glands or bones, connective tissue and muscle.

The risk of leukemias and lymphomas increased (O/E = 6/1.99 = 3.01) with 95 percent confidence limits of 1.11–6.56. The risk ratio for breast cancer (0/E = 2/3.74) was 0.54 with 95 percent confidence limits of 0.06–1.93. The increase in the risk of leukemias and lymphomas and the decrease in the risk of breast cancer were surprisingly similar to the results of a recently reported study by Gillespie et al. from New Zealand comprising 1,358 total hip prostheses.

Patients with a chrome-cobalt-molybdenum hip prosthesis have a cancer morbidity that differs from that of the normal population. This study, the local occurrence of cancer associated with prostheses made of this alloy as reported in the literature, as well as animal experiments, indicate that chrome-cobalt-alloy plays some role in cancerogenesis.

Prognosis of cemented revision total hip arthroplasty—a survivorship analysis

Kaj B. Turula and Sam Lindholm

Orthopedic Hospital of the Invalid Foundation, Helsinki, Finland, and Department of Public Health, University of Helsinki, Finland

A survivorship analysis of 530 cemented revision total hip arthroplasties (RTHA) originating from 3,556 cemented primary total hip arthroplasties (THA) was performed. The end point was re-revision where a part of the prosthesis or the entire prosthesis was exchanged due to mechanical failure.

Seventy-five hips (14 percent) out of the 530 were re-revised during and up to the 15-year follow-up. The survival probability for cemented RTHA at 5 and 10 years was 87 and 71 percent, being respectively 7 and 12 percent inferior when compared with the crude survivorship of the 3,556 primary THAs.

Cementless implants have been used in RTHA at the Orthopedic Hospital of the Invalid Foundation almost exclusively since 1984, and the initial results are promising. The poor prognosis of cemented RTHA warrants further use of uncemented prostheses in revision hip surgery.

Traumatic dislocation of the knee: Analysis of 8 cases

P. Kortelainen, J. Puranen and P. Jalovaara

Oulu University Central Hospital

Eight patients with complete traumatic dislocation of the knee treated from 1978 to 1987 are presented. Five of these were male and 3 female. The mean age was 41 (22–71) years. The mean follow-up time was 27 (4–79) months. The mechanism of injury was traffic accident in 4 cases (2 drivers, 1 pedestrian, 1 bicyclist), in 2 cases the patient had slipped and in 1 case fallen. One man received a bilateral luxation when a log fell on his thighs. There were five luxations on the right side and four on the left side. The type of luxation was anterior in 5 cases, posterior in 1, and lateral in 3 cases. One patient with a lateral luxation had an associated fracture of the medial tibial condyle. Three patients had partial or incomplete peroneal nerve lesion and 2 patients had a rupture of the popliteal artery.

All the patients were operated on. The torn ligaments and capsules were sutured or reinserted and arterial injuries were treated by venous grafts. At follow-up the range of motion was on an average 118 (0–140)°. Six patients walked normally, and the patient with a below-knee amputation walked well with a prosthesis. Two patients had slight edema in the calf, 1 patient had a complete peroneal paralysis, and 2 patients had a partial lesion. One patient had significant pain in the involved knee. Four were completely painless. No patient had significant subjective instability, but four knees were clinically unstable.

Rehabilitation of fractures of the lower legs by intermittent pneumatic compression

Olavi Airaksinen and Pertti Kolari

Kuopio University Hospital, Finland

Accumulation of edema and reduced mobility are common responses to trauma or injury to the leg. The purpose of this study was to evaluate the effects of intermittent pneumatic compression therapy on the reduction of posttraumatic edema and dysfunction of the leg. The study group consisted of 39 subjects (mean age 43, SE 2.3 years). They had a total of 41 fractures of the lower legs immobilized with a cast for 6–12 weeks. The control group consisted of 21 subjects (mean age 45, SE 4.6 years) with fractures in the same areas. The study group was treated using an intermittent pneumatic compression (Ventipress®) device on 5 consecutive days every 75 min. The control group was not given any treatment. The relative edema of the involved legs was 13.5 percent, in the study group and 13.4 percent in the controls. During intermittent compression the volume decreased 161 (SE 13) mL in the study group, but only 27 (SE 38) mL in the control group $P < 0.01$). After the intervention a marked difference in the relative volume between these two groups was observed ($P < 0.01$).

Our results suggested that intermittent pneumatic compression management was effective among the patients with posttraumatic injuries in the lower legs.

Electrical stimulation in the treatment of a leg fracture after total knee replacement

Arvi Harju and E. Antero Mäkelä

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

Electrical stimulation has been used in the treatment of nonunion of fractures since the early 1950s, with an overall success rate of 80–85 percent. We report a case of nonunion of a leg fracture below a revised total knee prosthesis treated with electrical stimulation. Because of several earlier operations due to rheumatoid arthritis, the patient had a lack of autologous cancellous bone for transplantation. After an unsuccessful attempt at Phemister-Charnley bone grafting, electromagnetic coils were applied outside the fracture site 1 year after the primary injury. Consolidation of this difficult fracture was evident after treatment of 12 weeks with excessive callus formation.

Tibial shaft fracture repair imaged by magnetic resonance

Antti Kyrö, Erkki Laasonen, Ole Böstman and Ossi Korhola

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

Introduction: Magnetic resonance imaging (MRI) is sensitive to blood flow and to changes in the local molecular environment of the tissues. Thus, imaging of the intramedullary cavity and the soft tissues during the process of fracture healing may give new kinds of information, which cannot be obtained with older visualizing methods. This would be particularly important in the treatment of tibial shaft fracture, in which delayed union is still a common complication. However, before MRI can be utilized, we have to know the MRI findings for normal fracture healing. These have not so far been dealt with in the literature.

Patients and methods: Six randomly chosen patients with solitary, closed tibial diaphyseal fracture were studied with MRI scans during the first week after injury, and thereafter at 1-month intervals until union of the fracture. The fractures were treated conservatively with closed reduction and immobilization by a long-leg plaster cast.

MRI scans were obtained with 0.22 T (tesla) ultra-low field magnet equipment using two imaging modalities (saturation recovery sequences) generating predominantly and moderately T2-weighted images. The images were taken in transverse, coronal, and sagittal planes, and the uninjured leg was scanned simultaneously each time for comparison.

Results and discussion: The tibial-shaft fracture of all the patients studied healed without delay, the mean clinical union time being 14 (10–18) weeks. The tibial intramedullary cavity showed a marked decrease in signal intensity in the imaging for the first week on the moderately T2-weighted scans. This decrease continued, but from the 2-month scan, signal intensity stayed at the same reduced level. The decrease in signal intensity was probably a consequence of a partial interruption in medullary blood flow. The MRI scans suggested that resumption of this flow is a fairly slow process. During fracture repair of cortical bone, the black low-intensity signal changed slightly to dark gray within the fractured portion of the tibia. On the first scan, a very high signal intensity was generated in the soft tissues around the fracture. The intensity decreased on the 1-month scan. On the 1- and 2-month scans, the soft tissues showed a granular nonhomogeneity in the form of low intensity nodules. These seemed to correspond to the location of the first areas of the callus to be mineralized, as could be seen on plain radiographs several weeks later.

Cystic lesions of the calcaneus

Jerker Dödergård and Erkki O. Karaharju

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

Introduction: Although claimed to be the most common bone tumor of the foot, only about 100 reported cases of unicameral bone cysts of the calcaneus can be found in the literature. Other cystic lesions of the calcaneus are even rarer. A unicameral bone cyst is often asymptomatic, but can also be painful. The radiographic appearance is typical. The need for a diagnostic biopsy and the place of surgery in the treatment has not clearly been pointed out in the literature.

Material: Our material consists of 11 patients with a cystic lesion of the calcaneus. The patients were referred to the bone tumor unit during the period 1985–1987.

Results: Three patients with radiographs typical of unicameral bone cysts were operated on, the indication for surgery being prolonged pain. All of these had a histologic diagnosis typical of a unicameral bone cyst. Two patients with atypical radiographs were operated on. One had a chondromyxoid fibroma and the other fibrous dysplasia of the calcaneus. The treatment in all the cases was evacuation of the cyst cavity and bone grafting. No recurrence was observed during the follow-up at 1–2 years.

Conclusions: Patients with radiographs typical of unicameral bone cysts can be treated by observation. If pain is prolonged, surgery is justified. Patients with atypical radiographs should be biopsied.

Lumbar facet-joint syndrome: A randomized study in 109 patients

Gustaf Lilius, Arsi Harilainen, Erkki Laasinen and Pertti Myllynen

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

Facet-joint syndrome was diagnosed in 109 patients who had had unilateral low back pain over 3 months and who were treated with facet joint injections radomized into three therapy groups: cortisone and local anesthetic injected intraarticularly into two facet joints (28 patients), the same mixture injected pericapsularly around two facet joints (39 patients), and physiologic sodium hydrochloride injected intraarticularly into two facet joints (42 patients). During the follow-up examinations, 1 hour and 2 and 6 weeks after the treatment, the effect of the treatment was evaluated by work status, pain scale, disability score, and movements of the lumbar spine. In addition, the patients returned a questionnaire 3 months after the treatment. While a significant improvement was observed in the work status, pain scale, and disability score, this was, however, independent of the mode of treatment given. The observed movements of the lumbar spine were slight and not positively affected. Thirty-six percent of those patients with initial pain relief after injection reported persistent benefit at the 3-month follow-up, again, independent of the mode of treatment given. In conclusion, the facet joint injection is an unspecific method of treatment.

In order to obtain good results, the patients must have a tendency to spontaneous regression of the somatic and psychosocial aspects of the disease. The injections are useful for short-term relief, but it seems unnecessary to use tissue-damaging corticosteroids.